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AN
ENCYCLOPÆDIA
OF
GARDENING;

COMPRISING THE
THEORY AND PRACTICE
OF
HORTICULTURE, FLORICULTURE,
ARBORICULTURE,
AND
LANDSCAPE-GARDENING,
INCLUDING
All the latest Improvements;
A GENERAL HISTORY OF GARDENING IN ALL COUNTRIES;
AND A STATISTICAL VIEW OF ITS PRESENT STATE,
WITH SUGGESTIONS FOR ITS FUTURE PROGRESS, IN THE
BRITISH ISLES.

By J. C. LOUDON, F.L.S. H.S. &c.
AUTHOR OF
"A TREATISE ON FORMING AND IMPROVING COUNTRY RESIDENCES."

ILLUSTRATED WITH
NEARLY SIX HUNDRED ENGRAVINGS ON WOOD
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PREFACE.

The term Encyclopædia, applied to a single art, is meant to convey the idea of as complete a treatise on that art as can be composed at the time of its publication. No art has been more extended in its objects, or improved in its practices within the last fifty years than Gardening. During that period, numerous books have been written in various departments of the subject; but in no work has the whole Art of Gardening been included. The only books which have any pretensions to completeness are the Gardener's Dictionaries: but though some of these are copious on the culture of plants, and others, in botanical description; yet in none is the subject of design, taste, and the arrangement of gardens, adequately treated of; and scarcely any thing is contained in these books, either on the History or Statistics of Gardening. In the voluminous edition of Miller's Dictionary, by Professor Martyn, though the title announces "the addition of all the modern improvements of landscape-gardening," there is not an article bearing that title throughout the work; nor a single quotation or abridgement from the writings of Whately, G. Mason, Price, Repton, or any modern author, on the art of laying out grounds.

The Encyclopædia of Gardening now submitted to the public treats of every branch of the Art, and includes every modern improvement to the present year. How much more systematically it is arranged than any preceding work, will appear by inspecting the Table of Contents; and with what degree of copiousness every part is discussed, by glancing over the work itself; which, independently of the numerous illustrative engravings, and condensed descriptive tables of fruits and flowers, contains a much greater quantity of matter than the four folio volumes of Miller's Dictionary.

Though this work, like every other of the kind, can only be considered as a compilation from books, yet, on various subjects, especially in what relates to Gardening History and Statistics, it was found advisable to correspond with a number of persons both at home and abroad. The favors of these Correspondents are here thankfully acknowledged; and their farther assistance, as well as that of every Reader willing to correct an error or supply a deficiency, is earnestly entreated, in order to render any future edition of the work as perfect as possible.

Besides modern books, it became necessary to consult some comparatively ancient and scarce works only to be met with in particular collections. Our respectful acknowledgments are, on this account, due to the Council and Secretary of the Linnæan Society; to the Council and Secretary of the Horticultural Society; to Robert Brown, Esq. the possessor of the Banksian library; and to William Forsyth, Esq., whose collection of British works on Gardening is more than usually complete.

It remains only to mention, as a key to this work, that to save room, the prenoms and other additions to names of persons are not inserted; only contracted titles of the books referred to are given; and the names of gardens or country residences are mentioned, without, in many cases, designating their local situation. By turning to the General Index, the names of persons will be found, with the addition of their prenoms and other titles, where known, at length; and there the abridged titles of books are also given complete, and the names of residences, accompanied by that of the county or country in which they are situated. The botanical nomenclature which has been followed is that of Sweet's *Hortus Suburbanus Londinensis*, with only one or two exceptions; the reasons for which are given where they occur. The systematic names of insects, or other animals, or of minerals, are generally those of Linnæus: some exceptions are also noted. In various parts of the work etymological and other explanations will be found, which, to one class of readers, may be unnecessary. But it is to be considered that we address ourselves to Practical Gardeners as well as to the Patrons of Gardening; and our opinion is, that to enlighten, and generally to raise the intellectual character of the former, will ultimately be found the most efficient mode of improving them in their profession, and thus rendering them more truly valuable to the latter.

By referring to the Kalendarial Index, those parts of this work which treat of Garden Culture and Management may be consulted monthly, as the operations require to be performed; and by recourse to the General Index, the whole may be consulted in detached portions, as in a Dictionary of Gardening.

J. C. L.

Bayswater, March 12. 1822.

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ENCYCLOPÆDIA
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GARDENING.

THE earth, Herder observes, is a star among other stars, and man, its chief inhabitant, is acclimated in every zone of its diversified surface. The great mass of this star is composed of inorganic matters called minerals, from the decomposing surface of which proceed fixed organic bodies called vegetables, and moving organic bodies called animals. Minerals are said to grow, or undergo change only; vegetables, to grow and live; and animals to grow, live, and move. Life and growth imply nourishment; and primitively, vegetables seem to have lived on minerals; and animals, with some exceptions, on vegetables. Man, supereminent, lives on both; and, in consequence of his faculty of improving himself and other beings, has contrived means of increasing the number and ameliorating the quality of those he prefers. The business of private life in the country comprehends Husbandry, or Rural Economy, the res rustica of the Romans; and housewifery, or domestic economy. Rural economy is generally subdivided into two branches, agriculture and gardening.

Gardening, the branch to which we here confine ourselves, as compared with agriculture, is the cultivation of a limited spot, by manual labour, for culinary and ornamental products; but relative to the present improved state of the art, may be defined the formation and culture, by manual labour, of a scene more or less extended, for various purposes of utility, ornament, and recreation.

Thus gardening, like most other arts, has had its origin in the supply of a primitive want; and, as wants became desires, and desires increased, and became more luxurious and refined, its objects and its province became extended; till, from an enclosure of a few square yards, containing, as Lord Walpole has said, " a gooseberry-bush and a cabbage," such as may be seen before the door of a hut on the borders of a common, it has expanded to a park of several miles in circuit, its boundaries lost in forest scenery, — a palace bosomed in wood near its centre; the intermediate space varied by artificial lakes or rivers, plantations, pleasure-grounds, flower-gardens, hot-houses, orchards, and potageries: — producing for the table of the owner and his guests, the fruits, flowers, and culinary vegetables, of every climate and quarter of the world! — displaying the finest verdant landscapes to invite him to exercise and recreation, by gliding over velvet turf, or polished gravel walks, sheltered, shady, or open in near scenes, or with horses and chariots along rides and drives " of various view" in distant ones.

From such a variety of products and objects, and so extended a scene of operations, have arisen the different branches of gardening as an art; and from the general use of gardens, and of their products by all ranks, has originated their various kinds, and the different forms which this art has assumed as a trade or business of life. Gardening is practised for private use and enjoyment, in cottages, villas, and mansion gardens; — for public recreation, in umbrageous and verdant promenades, parks, and other scenes, in and near to large towns; — for public instruction, in botanic and experimental gardens; — for public example, in national or royal gardens; — and for the purpose of commerce, in market, orchard, seed, physic, florists', and nursery gardens.

To aid in what relates to designing and laying out gardens, artists or professors have arisen; and the performance of the operative part is the only source of living of a numerous class of serving gardeners, who acquire their art by the regular routine of apprenticeship, and probationary labour for some years as journeymen.

The products of the kitchen garden form important articles of human food for all ranks of society; and furnish the chief luxuries of the tables of the rich, and a main support of the families of the poor. One of the first objects of a colonist on arriving at a new settlement is to plant a garden, as at once a proof of possession, and a pledge of immediate enjoyment; and indeed the history of the civilization of mankind bears evidence, that there are few benefits which a cultivated people can bestow on savage tribes, greater than that of distributing among them the seeds of good fruits and oleraceous herbs, and teaching them their culture.

The pleasure attending the pursuit of gardening is conducive to health and repose of mind; and a taste for the enjoyment of gardens is so natural to man, as almost to be universal. Our first most endearing and most sacred associations, Mrs. Hofland observes, are connected with gardens; our most simple and most refined perceptions of beauty are combined with them; and the very condition of our being compels us to the cares, and rewards us with the pleasures attached to them. Gardening has been the inclination of kings and the choice of philosophers, Sir William Temple has observed; and the prince de Ligne, after sixty years' experience, affirms (*Lettres et Pensées*, tom. i.) that the love of gardens is the only passion which augments with age.

That which makes the cares of gardening more necessary, or at least more excusable, the former author adds, is, that all men eat fruit that can get it; so that the choice is only, whether one will eat good or ill; and for all things produced in a garden, whether of salads or fruits, a poor man will eat better that has one of his own, than a rich man that has none.

To add to the value and extend the variety of garden productions, new vegetables have been introduced from every quarter of the globe; to diffuse instruction on the subject, numerous books have been written, societies have been established, and premiums held out for rewarding individual merit; and where professorships of rural economy exist, gardening may be said to form a part of public instruction.

A varied and voluminous mass of knowledge has thus accumulated on the subject of gardening, which must be more or less necessary for every one who would practice the art with success, or understand when it is well practised for him by others. To combine as far as practicable the whole of this knowledge, and arrange it in a systematic form, adapted both for study and reference, is the object of the present work. The sources from which we have selected, are the modern British authors of decided reputation and merit; sometimes recurring to ancient or continental authors, and occasionally, though rarely, to our own observation and experience; — *observation* in all the departments of gardening, chiefly in Britain, but partly also on the Continent; and *experience* during nearly twenty years' practice as an architect of gardens.

With this purpose in view, Gardening is here considered, in

PART	BOOK
I. As to its origin, progress, and present state,	1. Among the different nations of the world.
	2. Under different political and geographical circumstances.
II. As a science founded on the	1. Study of the vegetable kingdom.
	2. Study of the natural agents of vegetable growth and culture.
	3. Study of the mechanical agents employed in gardening.
	4. Study of the operations of gardening.
III. As an art, comprehending the	1. Practice of horticulture.
	2. Practice of floriculture.
	3. Practice of arboriculture.
	4. Practice of landscape gardening.
IV. Statistically in Britain	1. As to its present state.
	2. As to its future progress.

A kalendarial index to those parts of the work which treat of culture and management, points out the operations as they are to be performed in the order of time and of the season: and

A general index, explains the technical terms of gardening; gives an outline of the culture of every genus of plants native or introduced in British gardens; and presents an analysis of the whole work in alphabetical order.

PART I.

GARDENING CONSIDERED IN RESPECT TO ITS ORIGIN, PROGRESS, AND PRESENT STATE AMONG DIFFERENT NATIONS, GOVERNMENTS, AND CLIMATES.

The history of gardening may be considered *chronologically*, or in connection with that of the different nations who have successively flourished in different parts of the world; *politically*, as influenced by the different forms of government which have prevailed; and *geographically*, as affected by the different climates and natural situations of the globe. The first kind of history is useful as shewing what has been done; and what is the relative situation of different countries as to Gardens and Gardening; and the political and geographical history of this art affords interesting matter of instruction as to its past and future progress.

BOOK I.

HISTORY OF GARDENING AMONG ANCIENT AND MODERN NATIONS.

Time, for our present purpose, may be divided into three periods; the *ages of antiquity*, commencing with the earliest accounts and terminating with the foundation of the Roman empire; the *ancient ages*, including the rise and fall of the Roman Empire; and the *modern times*, continued from thence to the present day.

Chap. I.

Of the Origin and Progress of Gardening in the earliest ages of Antiquity, or from the 10th century before the vulgar æra to the foundation of the Roman Empire.

1. No history can reach farther back than the organization of the people who followed the last grand revolution sustained by our globe. Every thing which pretends to go farther must be fabulous, and it is only the primeval arts of war and rural economy which can by any means go so far. The traditions collected by Herodotus, Diodorus, Hesiod, and some other authors, when freed from the mythological and mysterious terms in which they are enveloped, seem to carry us back to that general deluge, or derangement of the surface strata of our globe, of which all countries, as well as most traditions, bear evidence.

As to gardening, these traditions, like all rude histories, touch chiefly on particulars calculated to excite wonder or surprise in ignorant or rude minds, and accordingly the earliest notices of gardens are confined to fabulous creations of fancy, or the alleged productions of princes and warriors. To the first may be referred the gardens of Paradise and the Hesperides; and to the others the gardens of the Jews, Babylonians, Persians, and Greeks.

Sect. I. *Of the fabulous Gardens of Antiquity.*

2. The first efforts of authors seem to have been directed to the most difficult subjects, and accordingly the oldest writings in all countries treat of religion. To record traditions explanatory of what was too mysterious for unassisted reason to find out, or to produce original explanations of the nature of things, seems to have been the first essay of the learned among every people. The creation of the world and of man, and their final destinies, were fit subjects for the pen, and compose accordingly the introductory chapter to the different primeval religions which are found in the world. These religions have been arranged by philosophers (*De Paws Dissert.*) in three divisions; *Barbarism*, *Scythism*, and *Helenism*. To the latter belong the Hebrew, Greek, and Mahomedan species. Each of these has its system of creation, its heaven and its hell, and, what chiefly concerns us is, *each system has its garden*. The garden of the Jewish mythology is for the use of man; that of the Grecian polytheism is appropriated to the Gods; and the Mahomedan paradise is the reward held out to the good in a future state.

3. *Gan-eden*, or the Jewish paradise, is supposed to have been situated in Persia. Its description may be considered as exhibiting the ideas of a poet, whose object was to bring together every sort of excellence of which he deemed a garden susceptible; and it is remarkable that in so remote an age (1600, B. C.) his picture should display so much of general nature. Of great extent, watered by a river, and abounding in timber and woodiness, paradise seems to have borne some resemblance to a park and

pleasure grounds in the modern taste, to which indeed its amplified picture by Milton has been thought by Walpole and others to have given rise.

When Adam began to transgress in the garden he was turned out to till the ground, and paradise was afterwards guarded by a miraculous sword, which turned every way to meet trespassers. See *Genesis*, chap. ii. 3. *Bishop Huet on the Situation of Paradise*, 1691, 12mo. *Burnet's Theory of the Earth*, book ii. chap. ii. *Sickler's Geschichte der obst culture, &c.*, 1801. 1 *Band.*

4. The gardens of *Hesperides* were situated in Africa, near Mount Atlas, or, according to some, near Cyrenaica. They are described by Scylax, a geographer of the sixth century, B. C., as lying in a place eighteen fathoms deep, steep on all sides, and two stadia in diameter, covered with trees of various kinds, planted very close together, and interwoven with one another. Among the fruit trees were golden apples (supposed to be oranges), pomegranates, mulberries, vines, olives, almonds, and walnuts; and the ornamental trees included the arbutus, myrtle, bay, ivy, and wild olive.

This garden contained the golden apples which Juno gave to Jupiter on the day of their nuptials. They were occupied by three celebrated nymphs, daughters of Hesperus, and guarded by a dreadful dragon which never slept. Hercules carried off the apples by stratagem, but they were afterwards returned by Minerva.

What finally became of the nymphs of the garden, or of the apples, we are as ignorant as we are of the fate of paradise, or the tree "in the midst thereof," which contained the forbidden fruit, and of which, as Lord Walpole observes, "not a slip or a sucker has been left behind."

5. The promised garden of Mahomet, or the heaven of his religion, is said to abound in umbrageous groves, fountains, and Houri, or black-eyed girls: and the enjoyments, which in such scenes on earth last but for a moment, are to be there prolonged for a thousand years.

Dr. Sickler is of opinion, that the gardens of Eden and Hesperides allude to, or are derived from, one original tradition. Paradise, he considers as a sort of figurative description of the finest district of Persia; and he traces various resemblances between the apples of Eve and of Juno; the dragon which never slept, and the flaming sword which turned every way. Some very learned and curious speculations on this subject are to be found in his history of fruit-trees. *Geschichte der obst cultur, &c.*

With respect to the paradise of Mahomet, it is but of modern date, and may probably have been suggested by the gardens described in "Solomon's Song," and other poems: though some allege that the rural coffee-houses which abound in the suburbs of Constantinople gave the first idea to the prophet.

Sect. II. *Jewish Gardens.* B. C. 1500.

6. The principal Jewish garden on record is that of Solomon, who was at once a botanist, a *mason*, a man of learning, and a king. The area of his garden was quadrangular, and surrounded by a high wall; it contained a variety of plants, curious as objects of natural history, as the hyssop, (a moss, as Hasselquist thinks,) "which springeth out of the wall;" odoriferous and showy flowers, as the rose, and the lily of the valley, the calamus, camphire, spikenard, saffron, and cinnamon; timber trees, as the cedar, the pine, and the fir; and the richest fruits, as the fig, grape, apple, palm, and pomegranate. It contained water in wells, and in living streams, and, agreeably to eastern practices, a seraglio. The situation of the garden was in all probability near to the palace, as were those of Solomon's successors, Ahasuerus and Ahab.

Sect. III. *Phæacian Gardens.* B. C. 900.

7. The garden of the Phæacian king, Alcinous, was situated in an island of that name, by some considered Corfu, in the Ionian sea, and by others, and with more reason, an Asiatic island. It is minutely described by Homer in the Odyssey, and may be compared to the garden of an ordinary farm-house in point of extent and form; but in respect to the variety of fruits, vegetables, and flowers cultivated, was far inferior. It embraced the front of the palace; contained something less than four acres, surrounded by a hedge, (the first, as Harte remarks, which we read of in history,) and interspersed with three or four sorts of fruit trees, some beds of culinary vegetables, and some borders of flowers; it contained two fountains or wells, the one for the use of the garden, and the other for the palace.

The gardens of Laertes, described in the same work, appear to have been similar to the above in character and extent, use being more studied than beauty; and vicinity to the house or palace, for the immediate access of the queen or housewife, being a greater desideratum than extent, variety of products, or prolonged recreation.

The gardens of Alcinous and Laertes are by many ranked with those of Adonis (*Virg. Georg.* ii. 87.), Paradise, and Hesperides (*Virg. Æn.* iv. 484.); and considered with them as mere creations of the fancy. Sir W. Temple is of opinion that the principal gardens of Ionia may have had some resemblance to those described by Homer, as lying in the barren island of Phæacia; but that the particular instance stated as belonging to Alcinous is wholly poetical. (*Temple's Works. Essay on Gardens.*) *Gouget* rejects altogether the idea of Phæacia being an European isle, and considers the Phæacians as a Greek colony in one of the islands of Asia. *Origine de Loix, &c.* tom. iii. 174.

Sect. IV. *Babylonian or Assyrian Gardens.* B. C. 2000.

8. The gardens of Cyrus at Babylon, (*Plin.* xix. 4.), or of the kings of Assyria, or, according to Bryant, (*Anal. of Ancient Mythology*, vol. iii. p. 100.), of the chiefs of the ancient people called Semarim, were distinguished by their romantic situations, great extent, and diversity of uses and products, and were reckoned in their days among the wonders of the world.

The form of these gardens was square, and, according to Diodorus and Strabo, each side was four hundred feet in length, so that the area of the base was nearly four acres. They were made to rise with terraces constructed in a curious manner above one another, in the form of steps, somewhat like those of the Isola Bella in the *Lago Maggiore* in Italy, and supported by stone pillars to the height of more than three hundred feet, gradually diminishing upwards till the area of the superior surface, which was flat, was reduced considerably below that of the base.

"This building was constructed by vast stone beams placed on pillars of stone, (arches not being then invented,) which were again covered with reeds, cemented with bitumen, and next were laid a double row of bricks united by cement. Over these were laid plates of lead, which effectually prevented the moisture from penetrating downwards. Above all was laid a coat of earth, of depth sufficient for plants to grow in it, and the trees here planted were of various kinds, and were ranged in rows on the side of the ascent, as well as on the top, so that at a distance it appeared as an immense pyramid covered with wood. The situation of this extraordinary effort was adjoining or upon the river Euphrates, from which water was supplied by machinery for the fountains and other sources for cooling the air and watering the garden." *Dr. Falconer's Historical View of the Gardens of Antiquity*, &c. p. 17.

From the upper area was obtained a view not only of the whole city, and the windings of the Euphrates, which washed the base of the superstructure three hundred feet below; but of the cultivated environs of the city and surrounding desert, extending as far as the eye could reach. The different terraces and groves contained fountains, parterres, seats and banqueting-rooms, and combined the minute beauties of flowers and foliage, with masses of shade and extensive prospects; — the retirement of the grove in the midst of civic mirth and din; — and all the splendor and luxury of eastern magnificence in art, with the simple pleasures of verdant and beautiful nature. "This surprising and laborious experiment," G. Mason observes, "was a strain of complaisance in King Nebuchadnezzar to his Medean queen, who could never be reconciled to the flat and naked appearance of the province of Babylon, but frequently regretted each rising hill and scattered forest she had formerly delighted in, with all the charms they had presented to her youthful imagination. The King, who thought nothing impossible for his power to execute, nothing to be unattempted for the gratification of his beloved consort, determined to raise woods and terraces even within the precincts of the city, equal to those by which her native country was diversified." *Essay on Design*, &c. p. 9.

Elevation seems in these countries to have been an essential requisite to a royal garden, probably because the air in such regions is more cool and salubrious, — the security from hostile attack of any sort more certain, — and the prospect always sublime.

"When Semiramis came to Chanon," observes Diodorus Siculus, (Book ii. chap. xiii.) "a city of Medea, she discovered on an elevated plain, a rock of stupendous height, and of considerable extent. Here she formed another paradise, exceeding large, enclosing a rock in the midst of it, on which she erected sumptuous buildings for pleasure, commanding a view both of the plantations and the encampment."

Bryant (*Ancient Mythology*) gives his reasons for disbelieving the very existence of Queen Semiramis, who, Dr. Sickler says, was not a queen, but a (*freymädchen*) concubine. Bryant acknowledges, however, that paradises of great extent, and placed in elevated situations, were with great probability ascribed to the ancient people called Semarim.

Quintus Curtius (B. 15. chap. v.) calls these gardens "fabulous wonders of the Greeks;" and Herodotus, who describes Babylon, is silent as to their existence. Many consider their description as representing a hill cut into terraces, and planted: and some modern travellers fancied that they could discover traces of such a work. The value of such conjectures is left to be estimated by the antiquarian; we consider the description of this Babylonian garden as worth preserving for its grandeur and suitableness to the country and climate.

Sect. V. *Persian Gardens.* B. C. 500.

9. The Persian empire began with Cyrus, about 1500 years after the age of Semiramis, or the people called Semarim. Xenophon, who wrote in the fourth century before our æra, describes the Persian kings as very fond of gardens, which, he says, were cultivated for the sake of beauty as well as fruit. "Wherever the Persian king, Cyrus, resides, or whatever place he visits in his dominions, he takes care that the gardens, called Paradises, shall be filled with every thing, both beautiful and useful, the soil can produce." (*Xen. Memorab.* lib. v. p. 829.) The younger Cyrus was found by Lysander, as Plutarch informs us, in his garden or paradise at Sardis, and on its being praised by the Spartan general, he avowed that he had planted the whole himself. Cyrus had another paradise at Celenæ, which was very extensive and abounded in wild beasts; and we are informed that the same prince "there mustered the Grecian forces to the number of thirteen thousand." *De Cyri Exped.* lib. i.

G. Mason quotes the description of an ancient paradise said to have been situated in the island of Panchæa, near the coast of Arabia, and to have been in a florishing state in the time of Alexander's immediate successors, or about 300 B. C. Diodorus says it belonged to a temple of Jupiter Tryphilius. It had a copious fountain, which burst at once into a river, was cased with stone near half a mile, and was afterwards used for irrigation. It had the usual accompaniments of groves, fruit trees, thickets, and flowers.

Strabo (lib. xvi.) mentions a grove situate on the river Orontes in Syria, which in his time was nine miles in circumference. It is described by Gibbon as "composed of laurels and cypress, which formed in the most sultry summers a cool and impenetrable shade. A thousand streams of the purest water *issuing* from every hill preserved the verdure of the earth, and the temperature of the air; the senses were gratified with harmonious sounds, and aromatic odours; and the peaceful grove was consecrated to health and joy, to luxury and love." *Decline and Fall of the Roman Empire,* chap. xiii.

We learn little or nothing of the details of Persian paradises from the Geoponic writings of their successors, the Greeks; but as to gardens of a more limited description, we gather from Pliny and other Roman authors, that the trees were arranged in straight lines and regular figures; and that the margins of the walks were covered with tufts of roses, violets, and other odoriferous flowering plants. Among the trees, the terebinthinate sorts, the oriental plane, and, what may appear to us remarkable, the narrow-leaved elm (now called English, but originally, as Dr. Walker and others consider, from the Holy Land), held conspicuous places. Buildings for repose, or resting places, fountains for cooling the air, aviaries for choice birds, and towers for the sake of distant prospect, were introduced in the best examples.

Sect. VI. *Grecian Gardens.* B. C. 300.

10. The Greeks, who copied the manners and architecture of the Persians, would no doubt adopt their mode of gardening, as far as the difference of climate and state of society would admit.

Xenophon, a Greek philosopher of the fourth century before Christ, admired the gardens of the Persian prince Cyrus, at Sardis; and Diogenes Laertius informs us that Epicurus delighted in the pleasures of the garden, and made choice of one as the spot where he taught his philsoophy. Plato also lays the scene of his dialogue of beauty on the umbrageous banks of the river Ilissus.

Lord Bacon, in his Essay on Gardens, and G. Mason, already quoted, concur in considering gardening as rather a neglected art in Greece, notwithstanding the progress of the sister art of architecture, which gave rise to the remark of the former, "that when ages grow to civility and elegancy, men come to build stately sooner than to garden finely, as if gardening were the greater perfection."

The description of the vale of Tempé, however, in the third book of Elian's various history, and of the public gardens of Athens by Plutarch, prove that their philosophers and great men were alive to the beauties of verdant scenery. The academus or public garden of Athens, Plutarch informs us, was originally a rough uncultivated spot till planted by the general Cimon, who conveyed streams of water to it, and laid it out in shady groves, with gymnasia, or places of exercise, and philosophic walks. Among the trees were the olive, plane, and elm; and the two last sorts had attained to such extraordinary size, that at the siege of Athens by Sylla, in the war with Mithridates, they were selected to be cut down, to supply warlike engines. In the account of these gardens by Pausanias we learn, that they were highly elegant, and decorated with temples, altars, tombs, statues, monuments, and towers; that among the tombs were those of Perithous, Theseus, Œdipus, and Adrastes, and at the entrance was the first altar dedicated to love.

In the first eclogue of Theocritus, the scene is laid under the shade of a pine-tree, and the beauty of Helen is compared to that of a cypress in a garden. It would appear from this and other cirumstances, that the love of terebinthinate trees, so general in Asia, was also prevalent in Greece; and the same flowers (made choice of for their brilliant colours and odoriferous perfumes) appear to have been common to both countries. Among these may be enumerated the narcissus, violet, ivy, and rose. *Historical View*, &c. p. 30. *et seq.*

The learned German antiquarian Bættinger (*Racemaxionen zur Gartenkunst der Alten*) has amply illustrated the passages of the Greek poets and historians which relate to gardens; on which it may be remarked, that the qualities chiefly enlarged on are shade, coolness, freshness, breezes, fragrance, and repose — effects of gardening which are felt and relished at an earlier period of human civilization than picturesque beauty, or other poetical and comparatively artificial associations with external scenery: for though gardening as a merely useful art may claim priority to every other, yet as an art of imagination, it is one of the last which has been brought to perfection. In fact, its existence as such an art, depends on the previous existence of pastoral poetry and mental cultivation; for what is nature to an uncultivated mind?

Sect. VII. *Gardening in the ages of Antiquity, as to Fruits, Culinary Productions, and Flowers.*

11. The first vegetable production which attracted man's attention as an article of food, is supposed to have been the fruit of some tree; and the idea of removing such trees to a spot, and inclosing and cultivating them near his habitation, is thought to be abundantly natural to man, and to have first given rise to gardens. All the writers of antiquity agree in putting the fig at the head of the fruit trees that were first cultivated. The vine is the next in order, the fruit of which serves not only for food, like that of the fig, but also for drink. Noah the Jewish Bacchus, and the Bacchus of the Heathens, are alike placed in the very first age of the postdiluvian world. The almond and pomegranate were early cultivated in Canaan (*Gen.* xliii. 5. 11. and *Numb.* xx. 5.), and it appears by the complaints of the Israelites in the wilderness, that the fig, grape, and pomegranate, were known in Egypt from time immemorial.

It is said that the browsing of a goat gave the first idea of pruning the vine, as chance, which had set fire to a rose tree, according to Acosta, (*Histoire Nat. des Indes*,) gave the first idea of pruning the rose. Theophrastus informs us that fire was applied to the rose trees in Greece to enrich them, and that without that precaution they would bear no flowers.

Pliny and Lucretius have given very unsatisfactory accounts of the origin of the art of grafting. The crossing, rubbing, and subsequent growing together of two branches of a crowded tree or thicket, are more likely to have originated the idea: but when this was first noticed, and how grafting came to be used for the amelioration of fruits, will probably ever remain a secret. Macrobius, a Roman author of the fifth century, according to the taste of his time, says Saturn taught the art to the inhabitants of Latium. It does not appear to have been known to the Persians, or the Greeks, in the time of Homer, or Hesiod; nor, according to Chardin, is it known to the Persians at this day. Some, however, infer from a passage in Manlius, that it may have been mentioned in some of Hesiod's writings which are lost. With regard to culinary vegetables, they seem to have been known in Egypt at a very early period, for cucumbers, melons, leeks, onions, and garlick, had been eaten abundantly there by the Israelites. *Num.* xi. 5.

Moses gave some useful directions to his people on the culture of fruit trees. For the first three years, they are not to be allowed to ripen any fruit; the produce of the fourth year is for the Lord; and it is not till the fifth year that it may be eaten by the planter This must have contributed materially to their strength and establishment in the soil.

The gardens of Alcinous, in the ninth century before Christ, contained pears, pomegranates, figs, and olives, and other fruits "brilliant to the sight," which some consider to be oranges or citrons. The culinary vegetables are not particularised, but they were planted in beds.

The earliest accounts which we have of the use of plants not edible, refer to aromatic or other herbs used for medicinal purposes. Rachel demanded from her sister the mandrakes (*Atropa mandragora*, whose roots are thought to resemble the human form) which Reuben had brought from the fields; impressed, as she no doubt was, with the idea of the efficacy of that plant against sterility. Jacob was embalmed; and this would be done, in all probability, with aromatic herbs. Solomon was a botanist, an author on the subject, and a lover of flowers and aromatics, of which, as we have seen, (8.) he had a number in his garden.

The Greeks, Theophrastus (*Hist. Plant.* lib. vi. c. 5.) informs us, cultivated roses, gilly-flowers, violets, narcissuses, and irises; and we read in Aristophanes (*Acharn.* v. 212.) that a market for flowers was held at Athens, where the baskets were very quickly disposed of. From the writings of other authors, we learn that a continual use was made of flowers throughout all Greece. Not only were they then, as now, the ornament of beauty, and of the altars of tbe gods, but youth crowned themselves with them in the fêtes; priests in religious ceremonies; and guests in convivial meetings. Bundles of flowers covered the tables, and were worn during repasts, because the plants, of which they consisted, were supposed to possess the virtue of preserving the wearer from the fumes of wine, of refreshing the thinking faculty, preserving the purity of ideas, and the gaiety of the spirits. Garlands of flowers were suspended from the gates in times of rejoicing; and, what is still more remarkable, and more remote from our manners, the philosophers themselves wore crowns of flowers, and the warriors ornamented their foreheads with them in days of triumph. These customs existed in every part of the East.

There were at Athens, as afterwards at Rome, florists, whose business it was to weave crowns (*coronariæ*) and wreaths of flowers. Some of these crowns and garlands were of one species of flower; others of different species; or of branches of peculiar plants, relating to some symbolical or mythological idea. Hence the term, *coronariæ*, was applied to such plants as were consecrated to those uses, and of which some were cultivated, and others gathered in the fields; but the name was applied to all such as were distinguished by the beauty or fragrance of their flowers. *Paschalis de Coronis*, lib. x. *Sabina, by Bættinger*, in *N. Mon. Mag. Jan. and Feb.* 1819.

Chap. II.

Chronological History of Gardening, from the time of the Roman Kings in the sixth century B. C. to the Decline and Fall of the Empire in the fifth century of our æra.

We shall consider gardening among the Romans, 1. As an art of design or taste: 2. In respect to the culture of flowers and plants of ornament: 3. As to its products for the kitchen and the dessert: 4. As to the propagation of timber trees and hedges: and 5. As a science, and as to the authors it has produced.

Sect. I. *Roman Gardening as an Art of Design and Taste.*

12. The first mention of a garden in the Roman history is that of Tarquinius Superbus, 534 B. C., by Livy and Dionysius Halicarnassus. From what they state, it can only be gathered that it was adjoining to the royal palace, and abounded with flowers, chiefly roses and poppies. The next in the order of time are those of Lucullus, situated near Baiæ, in the bay of Naples. They were of a magnificence and expense rivalling that of the eastern monarchs; and procured to this general, the epithet of the Roman Xerxes. They consisted of vast edifices projecting into the sea; of immense artificial elevations; of plains formed where mountains formerly stood; and of vast pieces of water, which it was the fashion of that time to dignify with the pompous titles of *Nilus* and *Euripides*. Lucullus had made several expeditions to the eastern part of Asia, and it is probable, he had there contracted a taste for this sort of magnificence. Varro ridicules these works for their amazing sumptuosity; and Cicero makes his friend Atticus hold cheap those magnificent waters, in comparison with the natural stream of the river Fibrenus, where a small island accidentally divided it. (*De Legibus*, lib. ii.) Lucullus, however, had the merit of introducing the cherry, the peach, and the apricot from the East, a benefit which still remains to mankind. See *Plutarch in vita Luculli; Sallust;* and *Varro de Re Rustica.*

We know little of the gardens of the Augustan age of Virgil and Horace, generally thought to be that in which taste and elegance were eminently conspicuous. In a garden described by the former poet in his Georgics (lib. iv. 121.), he places only chicory, cucumbers, ivy, acanthus, myrtles, narcissus, and roses. — Both Virgil and Propertius mention the culture of the pine tree as beloved by Pan, the tutelar deity of gardens; and that the shade of the plane, from the thickness of its foliage, was particularly agreeable, and well adapted for convivial meetings. The myrtle and the bay they describe as in high esteem for their odour; and to such a degree of nicety had they arrived in this particular, that the composition or mixture of odoriferous trees became a point of study; and those trees were planted adjoining each other, whose odours assimilated together.

Open groves in hot countries are particularly desirable for their shade, and they seem to have been the only sort of plantation of forest trees then in use. From Cicero and the elder Pliny, we learn that the quincunx manner of planting them was very generally adopted; and from Martial, that the manner of clipping trees was first introduced by Cneus Matius, a friend of Augustus. Statues and fountains, according to Propertius, came into vogue about the same time, some of them casting out water in the way of *jets d'eau*, to occasion surprise, as was afterwards much practised in Italy in the dawn of gardening in the sixteenth century.

13. The most detailed account of the gardens and pleasure-grounds of a Roman villa, is in the writings of the younger Pliny; and from which, delineations have been published by Castell in his *Villas of the Ancients*. One of these villas, the *Laurentinum*, was a winter residence on the Tiber, between Rome and the sea, now called *San Lorenza*, near Paterno, seventeen miles from Rome. The garden was small, and is but slightly described. It was surrounded by hedges of box, and where that had failed, by rosemary. There were platforms and terraces; and figs, vines, and mulberries were the fruit trees. Pliny seems to have valued this retreat chiefly from its situation relatively to Rome and the surrounding country, which no walls, fortresses, or belt of wood, hid from his view. On this region he expatiates with delight, "pointing out all the beauty of his woods, his rich meadows covered with cattle, the bay of Ostia, the scattered villas upon its shore, and the blue distance of the mountains; his porticoes and seats for different views, and his favorite little cabinet in which they were all united. So great was Pliny's attention in this particular, that he not only contrived to see some part of this luxurious landscape from every room in his house, but even while he was bathing, and when he reposed himself; for he tells us of a couch which had one view at the head, another at the feet, and another at the back." *Preface to Malthus's Introduction to Girardin's Essay*, &c. p. 20. We may add with Eustache and other modern travellers, that the same general appearance of woods and meadows exists there to this day.

14. Pliny's Thuscum, or *Tusculan villa*, now *Frascati*, was situated in a natural amphitheatre of the Appennines, whose lofty summits were then, as now, crowned with forests of oak, and their fertile sides richly covered with corn-fields, vineyards, copses, and villas. Pliny's description of this retreat, though well known, is of importance, as shewing what was esteemed good taste in the gardens and grounds of a highly-accomplished Roman nobleman and philosopher, towards the end of the first century, under the reign of Trajan, when Rome was still in all her glory, and the Roman people the mistress of the world in arts and in arms.

The Tusculan gardens, Malthus thinks, may have contained from three to four acres, and lay round the house. "The Xystus, or terrace," says the author of the *Historical Essay*, "is described as in the front of the portico and near to the house; from this descended a lawn covered with acanthus (by some supposed to be a sort of moss, *Lycopodium clavatum*), and adorned with figures of animals cut out in box-trees, answering alternately to one another. This lawn was again surrounded by a walk enclosed with tonsil evergreens sheared into a variety of forms. Beyond this was a place of exercise, of a circular form, ornamented in the middle with box-trees sheared as before into numberless different figures, together with a plantation of shrubs kept low by clipping. The whole was fenced in by a wall covered by box rising in different ranges to the top.

"Another quarter of the house encompassed a small space of ground, shaded by four plane trees, with a fountain in the centre, which overflowing a marble basin, watered the trees and the verdure beneath them. Opposite to another part of the building was a plantation of trees, in form of an hippodrome, formed of box and plane trees alternately planted, and connected together by ivy. Behind these were placed bay trees, and the ends of the hippodrome, which were semicircular, were formed of cypress. The internal walks were bordered with rose trees, and were in a winding direction, which however terminated in a straight path, which again branched into a variety of others, separated from one another by box-hedges; and these, to the great satisfaction of the owner, were sheared into a variety of shapes and letters, some expressing the name of the master, others that of the artificer, while here and there small obelisks were placed, intermixed with fruit trees.

"Further on was another walk, ornamented with trees sheared as above described, at the upper end of which was an alcove of white marble shaded by vines, and supported by marble pillars, from the seat of which recess issued several streams of water, intended to appear as if pressed out by the weight of those that reposed upon it, which water was again received in a basin, that was so contrived as to seem always full without overflowing. Corresponding to this was a fountain, or *jet d'eau*, that threw out water to a considerable height, and which ran off as fast as it was thrown out. An elegant marble summer-house opening into a green enclosure, and furnished with a fountain similar to that last described, fronted the above. Throughout the walks were scattered marble seats, near to each of which was a little fountain; and throughout the whole, small rills of water were artificially conducted among the walks, that served to entertain the ear with their murmurs as well as to water the garden." *Historical View*, &c. p. 53.

Pliny's Epistles, B. v. letter 6. See also *Felibien Plans et Descr.*, &c.; and *Castell's Villas of the Ancients.*

" It is almost superfluous to remark," observes the author of the *Historical View*, " the striking resemblance which Pliny's Gardens bear to the French or Dutch taste. The terraces adjoining to the house; the lawn declining from thence; the little flower-garden, with the fountain in the centre; the walks bordered with box, and the trees sheared into whimsical artificial forms; together with the fountains, alcoves, and summer houses, form a resemblance too striking to bear dispute."

" In an age," observes Lord Walpole, " when architecture displayed all its grandeur, all its purity, and all its taste; when arose Vespasian's amphitheatre, the temple of Peace, Trajan's forum, Domitian's bath, and Adrian's villa, the ruins and vestiges of which still excite our astonishment and curiosity; a Roman consul, a polished Emperor's friend, and a man of elegant literature and taste, delighted in what the mob now scarce admire in a college-garden. All the ingredients of Pliny's garden correspond exactly with those laid out by London and Wise on Dutch principles; so that nothing is wanting but a parterre to make a garden in the reign of Trajan serve for the description of one in the reign of King William." Entertaining a more liberal feeling on this subject than that displayed by this elegant author, we consider the censure implied in the above passage as proceeding from much too limited a view of the subject. Because the Roman gardens were considered as scenes of art, and treated as such, it does not follow that the possessors were without a just feeling for natural scenery.— Where all around is nature, artificial scenes even of the most formal descriptions will please, and may be approved of by the justest taste, from their novelty and contrast, and other associations. If all England were a scattered forest like ancient Italy, and cultivation were to take place only in the open glades or plains, where would be the beauty of our parks and pleasure-grounds? The relative or temporary beauties of art should therefore not be entirely rejected in our admiration of the more permanent and absolute beauties of nature.

15. That the ancient Romans admired natural scenery with as great enthusiasm as the moderns, is evident from the writings of their eminent poets and philosophers; scarcely one of whom has not in some part of his works left us the most beautiful descriptions of natural scenery, and the most enthusiastic strains of admiration of all that is grand, pleasing, or romantic in landscape; and some of them, as Cicero and Juvenal, have deprecated the efforts of art in attempting to improve nature. " Whoever," says G. Mason, " would properly estimate the attachment to rural picturesque among the heathen nations of old, should not confine their researches to the domains of men, but extend them to the temples and altars, the caves and fountains dedicated to their deities. These, with their concomitant groves, were generally favorite objects of visual pleasure, as well as of veneration." *Essay on Design*, p. 24.

The same taste as that displayed by Pliny appears to have prevailed till the fall of the Roman empire; and by existing in a faint degree in the gardens of religious houses during the dark ages, as well as in Pliny's writings, has thus been handed down to modern times.

After this view of the Roman taste in gardening, we shall briefly notice their general arrangement of the constituent parts of a country-seat. Cicero (*De Legg.* iii. 15.) informs us that it was in their country villas that the Romans chiefly delighted in displaying their magnificence; and in this respect, the coincidence in habits between ourselves and that great people is a proud circumstance.

The word villa originally denoted a farm-house and offices; and the origin of these may be traced to the first ages of the republic, when the conquered provinces of Italy were distributed to the citizens for cultivation. Granaries were erected on these portions of ground long before regular houses. Huts or cabins for the shepherds and laborers were next erected, but no magnificence or ornament would be displayed. Nothing would be planted around these cottages to satisfy the eye or the smell; but every thing grown would be destined for use.

In process of time, however, as comfort and luxury gained ground, the word villa was applied to a group of buildings erected for accommodating the family of an opulent Roman citizen in the country. " Such a villa (*Adam's Rom. Antiq.*) was divided into three parts, the *Urbana*, *Rustica*, and *Fructuaria*. The first contained dining-rooms, parlors, bed-chambers, baths, tennis-courts, walks, terraces, &c. adapted to the different seasons of the year. The *villa rustica* contained accommodations for the various tribes of slaves and workmen, stables, &c.; and the *fructuaria*, wine and oil cellars, corn-yards, barns, granaries, storehouses, and repositories for preserving fruit. In every *villa urbana* there was commonly a tower, in the upper part of which was a supper-room, where the guests, while reclining at table, might enjoy at the same time a pleasant prospect of the country. Adjoining to the *villa rustica* were places for keeping hens, geese, ducks, and wild fowl, birds, dormice, swine, hares, rabbits, bees, snails, fish, &c.

16. It is not exactly known in what situation the *Hortus pinguis*, or kitchen-garden, was placed, though most probably adjoining these conveniences. The ornamental gardens or pleasure-grounds, we have seen from Pliny, were joined to the front of or surrounded the dwelling-house, or *villa urbana*; and at the extremity of these, or probably adjoining the *villa rustica*, was situated the park, *Paradisus*, *Theriotrophium*, or *Vivarium*, containing fifty acres or upwards, and used for preserving game, deer, and wild beasts, partly for breeding, but chiefly to retain those which had been caught in the chase, till wanted for use. All these works of art were surrounded by natural scenery, or by tracts of open cultivated surface or meadow; and most commonly by both, intermingled with vineyards and orchards, as we may observe in Italy at the present day. Hedges in those times were only used in gardens, and the planting of strips or masses of forest trees for shelter or timber was unknown. The open uncultivated tracts were kept in alternate fallow and tillage (*Dickson's Agriculture of the Ancients*, vol. i.), as at the present time on every part of the continent; so that the country residence of an ancient Roman, not only as to his garden, as Lord Walpole has observed, but even as to the views and prospects from his house, as Eustache and Malthus hint, bore a very near resemblance to the chateau of a French or German nobleman thirty years ago, and to not a few in France and Italy at the present day.

17. It is justly remarked by Professor Hirschfield (*Theorie des Jardins*, tom. i. p. 25.), that as the descriptions of the ancient Roman authors make us better acquainted with their country-houses than with their gardens; and as the former appear more readily submitted to certain rules than the latter, we are apt to bestow on the gardens the reputation which really belongs to the country-houses, and give the one a value which does not belong to the other. The different manner in which the ancients speak of country-houses and of gardens, may lead us to judge which of the two objects had attained the highest degree of perfection. The descriptions of the first are not only more numerous but more detailed. Gardens are only mentioned in a general manner; and the writer rests satisfied with bestowing approbation on their fertility and charms. Every country-house had its gardens in the days of Pliny; and it is not too much, taking this circumstance in connection with the remarks of Columella, to hazard a conjecture that even the Romans themselves considered their gardens less perfect than their houses. Doubtless the Roman authors, so attentive to elevate the glory of their age in every thing concerning the fine arts, would have enlarged more on this subject, if they had been able to produce any thing of importance. To decide as to the perfection which a nation has attained in one of the arts, by their perfection in another, is too hazardous a judgment; the error has been already committed in regard to the music of the ancients, and must not be repeated in judging of their gardens. The Romans appear in general to have turned their attention to every thing which bore the impression of grandeur and magnificence; hence their passion for building baths, circuses, colonnades, statues, reservoirs, and other objects which strike the eye. Besides, this taste was more easily satisfied, and more promptly, than a taste for plantations, which required time and patience. In all probability the greater number contented themselves with the useful products of the soil, and the natural beauty of the views, bestowing the utmost attention to the selection of an elevated site commanding distant scenery.

Various attempts were made, soon after the introduction of the modern or natural style of laying out grounds, to trace it to the Greeks and Romans; but an impartial examination of the evidence afforded by classic authors will not discover a single fact to prove that they imitated nature in their gardens; though there can be no doubt, as we have already stated, that they possessed a just relish for rural beauty.

SECT. II. *Roman Gardening considered as to the Culture of Flowers and Plants of Ornament.*

18. The gardens of the Romans under the kings, and during the first ages of the republic, contained but few flowers. But as luxury began to be introduced, and finally prevailed to a great degree, the passion for flowers became so great that it was found necessary to repress it by sumptuary laws. The use of crowns of flower swas forbid to such as had not received the right to use them, either by the eminence of their situation, or by the particular permission of the magistrates. Some acts of rigour towards offenders did not hinder their laws from being first eluded, and at last forgotten, till that which was originally a distinction became at last a general ornament. Men the most elevated in dignity did not hesitate to set up that elegance of dress and of ornament which is repugnant to the idea of a warlike people; and Cicero, in his third harangue against Verres, reproaches this pro-consul with having made the tour of Sicily, in a litter seated on roses, having a crown of flowers on his head, and a garland at his back.

The *Floralia*, or flower-feasts, were observed on the four last days of April; they were attended with great indecency, but they shew that the common people also carried a taste for flowers to excess. *Pliny*, xiii. 29.

The luxury of flowers was carried to the extreme of folly under Augustus. Heliogabalus caused his beds, his apartments, and the porticoes of his palace, to be strewed with flowers. Among these, roses were the sort chiefly employed, the taste for that flower being supposed to be introduced from Egypt, where, as Athenæus informs us, Cleopatra paid a talent for the roses expended at one supper; the floor of the apartment in which the entertainment was given, being strewed with them to the depth of a cubit. This, however, is nothing to what Suetonius relates of Nero, who spent upwards of four millions of sesterces, or above thirty thousand pounds, at one supper on these flowers. From Horace it appears that roses were cultivated in beds; and from Martial, who mentions roses out of season as one of the greatest luxuries of his time, it would appear that it was then the caprice, as at present, to procure them prematurely or by retardation. Columella enumerates the rose, the lily, (*tuberose*,) the hyacinth, and the gilly-flower, as flowers which may embellish the kitchen-garden; and he mentions, in particular, a place set apart for the production of late roses. Pliny says, the method by which roses were produced prematurely was, by watering them with warm water when the bud began to appear. From Seneca and Martial, it appears probable they were also forwarded by means of *specularia*, like certain culinary productions to be afterwards mentioned.

The Romans were not a scientific people, and had formed no regular system of nomenclature for the vegetable kingdom; they had in consequence no botanic gardens. Pliny informs us that Anthony Castor, one of the first physicians at Rome, had assembled a number of medical plants in his garden, but they were, in all probability, for the purposes of his profession.

SECT. III. *Roman Gardening in respect to its Products for the Kitchen and the Dessert.*

19. In the laws of the *Decemviri*, which are supposed to be as old as the establishment of the Romans as a people, the term *hortus* is used to signify both a garden and a country-house, but afterwards the kitchen-garden was distinguished by the appellation *Hortus Pinguis*. Pliny informs us, that a husbandman called a kitchen-garden a second dessert, or a flitch of bacon, which was always ready to be cut; or a sallad, easy to be cooked and light of digestion, and judged there must be a bad housewife (the garden being her charge) in that house where the garden was in bad order.

As horticultural results of the universal empire of the Romans, Hirschfield mentions the fig introduced from Syria, the citron from Media, the peach from Persia, the pomegranate from Africa, the laurel from Cyprus, the apricot from Epirus, apples, pears, and plums from Armenia, and cherries from Pontus. The rarity and beauty of these trees, he observes (*Theorie des Jardins*, vol. i. p. 27.), joined to the delicious taste of their fruits, must have enchanted the Romans, especially on their first introduction, and rendered ravishing to the sight, gardens which became insensibly embellished with the many productions which were poured into them from Greece, Asia, and Africa.

20. According to Pliny, who wrote about the end of the first century, the following fruits were cultivated at Rome in his time.

Almonds. Sweet and bitter. *Apricots.*

Apples. Twenty-two sorts at least: sweet apples (*melimala*) for eating, and others for cookery. They had one sort without kernels.

Cherries. Eight kinds, a red one, a black one, a kind so tender as scarcely to bear any carriage, a hard-fleshed one (*duracina*), like our Bigarreau, a small one with bitterish flavour (*laurea*), like our little wild black, also a dwarf one not exceeding three feet high.

Chesnuts. Six sorts, some more easily separated from the skin than others, and one with a red skin; they roasted them as we do.

Figs. They had many sorts, black and white, large and small; one as large as a pear, another no larger than an olive. *Medlars.* Larger and smaller.

Mulberries. Two kinds of the black sort, a larger and smaller. Pliny speaks also of a mulberry growing on a brier; but whether this means the raspberry, or the common blackberry, does not appear.

Nuts. They had hazel-nuts and filberds, which they roasted.

Pears. Of these they had thirty-six kinds, both summer and winter fruit, melting and hard; some were called *libralia*: we have our pound pear.

Plums. They had a multiplicity of sorts, black, white, and variegated; one sort was called *asinina*, from its cheapness; another *damascena*, which had much stone and little flesh: we may conclude it was what we now call *prunes*.

Quinces. They had three sorts, one was called *crysomela*, from its yellow flesh; they boiled them with honey, as we make marmalade.

Services. They had the apple-shaped, the pear-shaped, and a small kind, probably the same as we gather wild, possibly the *azarole*.

Strawberries they had, but do not appear to have prized: the climate is too warm to produce this fruit in perfection, unless on the hills.

Vines. They had a multiplicity of these, both thick-skinned (*duracina*) and thin-skinned: one vine growing at Rome produced 12 amphoræ of juice, 84 gallons. They had round-berried and long-berried sorts, one so long that it was called *dactylides*, the grapes being like the fingers on the hand. Martial speaks favorably of the hard-skinned grape for eating.

Walnuts. They had soft-shelled and hard-shelled, as we have. In the golden age, when men lived upon acorns, the gods lived upon walnuts; hence the name *Juglans*, *Jovis Glans.* To these may be added, *gourds*, *cucumbers*, and *melons* of various sorts.

The greatest attention was paid to the cultivation of the vine and the olive, as branches of general economy, for which ample instructions are to be found in all their writers on Geoponics. Some plantations mentioned by Pliny are supposed still to exist, as of olives at Terni and of vines at Fiesoli. Both these bear marks of the greatest age.

21. Of culinary vegetables, we learn from Columella that they had the following sorts.

Of the *brassica tribe*, several varieties. Cabbages, Columella says, were esteemed both by slaves and kings.

Of *leguminous plants*, they had the pea, bean, and kidney-bean.

Of *esculent roots*, they had the turnip, carrot, parsnip, beet, skirret, and radish.

Of *spinaceous plants*, they appear to have had at least sorrel.

Of the *alliaceous tribe*, the onion and garlick of several sorts.

Of *salads*, they had endive, lettuce, and chicory, mustard and others.

Of *pot* and *sweet herbs*, they had parsley, orache, alisanders, dittander, elecampane, fennel, and chervil.

And they had also *mushrooms*, *fuci*; and cultivated *bees*, snails, dormice, &c. in or near to their kitchen-gardens in appropriate places.

22. The Romans, it would appear, had even arrived at the luxury of forcing vegetables. Specularia, or plates of the *lapis specularis*, we are informed by Seneca and Pliny, could be split into thin plates, in length not exceeding five feet; a remarkable circumstance, since few pieces larger than a fifth of these dimensions are now any where to be met with. We learn from Columella (B. xii. ch. 3.), Martial (lib. viii. 14. & 68.), and Pliny (lib. xix. 23.), that by means of these *specularii*, Tiberius, who was fond of cucumbers, had them in his garden throughout the year. They were grown in boxes or baskets of dung and earth placed under these plates, and removed to the open air in fine days, and replaced at night.

Sir Joseph Banks (*Hort. Tr.* vol. i. 148.) conjectures, from the epigrams of Martial referred to, that both grapes and peaches were forced; and Daines Barrington supposes that the Romans may not only have had hot-houses, but hot-walls to forward early productions. Flues, Sir Joseph Banks observes (*Hort. Tr.* i. 147.), the Romans were well acquainted with; they did not use open fires in their apartments, as we do, but in the colder countries at least, they always had flues under the floors of their apartments. Lysons found the flues, and the fire-place from whence they received heat, in the Roman villa he has described in Gloucestershire. Similar flues and fire-places were also found in the extensive villa lately discovered on the Blenheim estate, in Oxfordshire. The Romans used flues chiefly for baths or sudatories, and in some of these which we have seen in the disinterred Greek city of Pompeii, the walls round the apartment are flued, or hollow, for the circulation of hot air and smoke.

Daines Barrington observes as "remarkable," that at the period when the Romans began to force fruits, they also first found out the luxury of ice in cooling their liquors. He adds, as a singular coincidence, the coeval invention of these arts in England.

Sect. IV. *Roman Gardening considered in respect to the Propagation and Planting of Timber Trees and Hedges.*

23. The Romans propagated fruit and forest trees and shrubs by the methods now in common use in our nurseries. Fruit trees were generally grafted and inoculated, and forest trees generally propagated by seeds and suckers.

Trees which do not *stole*, (*arbores cæduæ*,) were distinguished from such as being cut over spring up again (*succisæ repullulant*): of the former class was the larch, which was most in use as timber. Pliny mentions a beam 120 feet long and 2 feet thick.

Though forest trees were reared with great care round houses in the city (*Hor. ep.* i. 10. 22.) yet it does not appear clear that they were planted in masses or strips expressly for useful purposes. They were planted in rows in vineyards on which to train the vine; and the sorts generally preferred were the poplar and the elm. Natural forests and copses, then, as now, supplied timber and fuel.

Willows were cultivated for binding the vines to the trees that supported them; for hedges; and for making baskets (*Virg. G.* ii. 4. 36.) moist ground was preferred for growing them, *Udum salictum.*

Hedges were of various sorts, but we are not informed what were the plants grown in those used for defence. They surrounded chiefly vineyards and gardens; for agriculture was then, as now, carried on in the common or open field manner.

Sect. V. *Roman Gardening as a Science, and as to the Authors it produced.*

24. The gardening of the Romans was entirely empirical, and carried on with all the superstitious observations dictated by a religion founded on polytheism. Almost every operation had its god, who was to be invoked or propitiated on all occasions. "I will write for your instruction," says Varro to Fundasius, "three books on husbandry, first invoking the twelve *dii consentes*." After enumerating the gods which preside over household matters, and the common field operations, he adds, "adoring Venus as the patroness of the garden, and offering my intreaties to Lympha, because agriculture is drought and misery without water." The elements of agriculture, he says, are the same as those of the world — *water, earth, air*, and the *sun*. Agriculture is a necessary and great art, and it is a science which teaches what is to be planted and done in every ground, and what lands yield the greatest profit. It should aim at utility and pleasure, by producing things profitable and agreeable, &c.

The lunar days, he says, are to be observed, and some things are to be done in the fields while the moon is increasing; others, on the contrary, when she is decreasing, as the cutting of corn and underwood. "I observe these things," says Agrasius, (one of fifty authors who Varro says had written on husbandry, but whose writings are now lost,) "not only in shearing my sheep, but in cutting my hair, for I might become bald if I did not do this in the wane of the moon."

Columella says that husbandmen who are more religious than ordinary, when they sow turnips, pray that they may grow both for themselves and for their neighbours. If caterpillars attack them, Democritus affirms that a woman going with her hair loose, and bare-footed, three times round each bed will kill them. Women must be rarely admitted where cucumbers or gourds are planted, for commonly green things languish and are checked in their growth by their handling of them.

It was a doctrine held by Virgil, Columella, and Pliny, that any scion may be grafted on any stock; and that the scion partaking of the nature of the stock, had its fruit changed in flavor accordingly. Pliny mentions the effect of grafting the vine on the elm, and of drawing a vine shoot through the trunk of a chesnut; but modern experience proves that no faith is to be given to such doctrines, even though some of these authors affirm to have seen what they describe.

Some barren trees and shrubs, as the poplar, willow, osier, and broom, were thought to grow spontaneously; others by fortuitous seeds, as the chesnut and oak; some from the roots of other sorts of trees, as the cherry, elm, bay, &c. Notwithstanding the ignorance and inaccuracy which their statements betray, the Romans were aware of all our common, and some of our uncommon practices: they propagated plants as we do; pruned and thinned, watered, forced, and retarded fruits and blossoms, and even made incisions and ringed trees to induce fruitfulness.

25. There is no Roman work exclusively on gardening; but the subject is treated, more or less, by the following authors on rural affairs.

Cato and Varro lived, the former 150 B. C., and the latter 28 B. C.: both wrote treatises on rural affairs, *De Re Rustica;* but, excepting what relates to the vine and the fig, have little on the subject of gardens.

Virgil's *Georgics* appeared in the century preceding the commencement of our era. Virgil was born in Mantua about 70 B. C.; but lived much at Rome and Naples. He appears to have taken most of his ideas from Cato and Varro.

Pliny's *Natural History* was written in the first century of our era. Pliny was born at or near Rome, and lived much at court.

The *Rural Œconomy* of Columella is in twelve books, of which the eleventh, on Gardening, is in verse. He was born at *Gades*, now Cadiz, in Spain, but passed most of his time in Italy.

Chap. III.

Chronological History of Gardening, from the Time of the Romans to the present Day, or from A. D. 500 to A. D. 1820.

26. The European part of what was the Roman empire, after having been plundered by invaders from the north and the south, and suffering all the evils of intestine war, at last, about the tenth century, assumed those political divisions which it, for the greater part, still retains. We shall take a cursory view of the past and present state of gardening in each of these states.

The ages, Hirschfield observes, which followed the fall of the republic, the violence committed by several of the emperors, the invasion of the barbarians, and the ferocity introduced by the troubles of the times, extinguished a taste for a country life, in proportion as they destroyed the means of enjoying it. So many injuries falling on the best provinces of the Roman empire, one after another, soon destroyed the country-houses and gardens. Barbarism triumphed over man and the arts, arms again became the reigning occupation, superstition allied itself to warlike inclinations, and spread over Europe a manner of thinking far removed from the noble simplicity of nature. The mixture of so many different nations in Italy did not a little contribute to corrupt the taste; the possessions of the nobles remaining without defence, were soon pillaged and razed, and the earth was only cultivated from necessity.

Soon afterwards the first countries were considered those where one convent raised itself beside another. Architecture was only employed in chapels and churches, or on warlike forts and castles. From the establishment of the ecclesiastical government of the Popes in the eighth to the end of the twelfth century, the monks were almost the only class in Europe who occupied themselves in agriculture; many of these, carried away by their zeal, fled from the corruption of the age, and striving to overcome their passions, or indulge their gloomy humour, or, as Herder observes, to substitute one passion for another, retired into solitary deserts, unhealthy vallies, forests, and mountains; there they laboured with their own hands, and rendered fertile, lands till then barren from neglect, or in a state of natural rudeness.

The sovereigns, in procuring pardon of their sins by bestowing on the monks extensive tracts of country and slaves, thus recompenced their activity as rural improvers. The monks of St. Basil and St. Benedict, Harte informs us, rendered many tracts fertile in Italy, Spain, and the south of France, which had lain neglected ever since the first incursions of the Goths and Saracens. Others were equally active in Britain in ameliorating the soil. Walker (*Essays*) informs us that even in the remote island of Iona, an extensive establishment of monks was formed in the sixth century, and that the remains of a corn-mill and mill-dam built by them still exist; and indeed it is not too much to affirm, that without the architectural and rural labors of this class of men, many provinces of Europe which at present nourish thousands of inhabitants would have remained deserts or marshes, the resorts only of wild beasts, and the seminary of disease; and architecture and gardening, as arts of design, instead of being very generally diffused, would have been lost to the greater part of Europe.

Sect. I. *Of the Revival, Progress, and present State of Gardening in Italy.*

The blessings of peace and of commerce, the remains of ancient grandeur still existing, and the liberty which some cities had acquired through the generosity and splendor of some Popes and Princes, united with other causes in the revival of the arts in Italy rather than in any other country.

Subsect. 1. *Italian Gardening, in respect to Design and Taste.*

27. One of the most ancient Italian authors on rural affairs is Pierre de Crescent, a senator of Bologna. He composed in the beginning of the fourteenth century a work on agriculture, which he dedicated to Charles II. king of Naples and Sicily. In the eighth book of this work the author treats of gardens of pleasure. These he divides into three classes; those of persons of small fortune; those of persons in easy circumstances; and those of princes and kings. He teaches the mode of constructing and ornamenting each; and of the royal gardens observes, that they ought to have a menagerie and an aviary; the latter placed among thickets, arbors, and vines. Each of the three classes ought to be decorated with turf, shrubs, and aromatic flowers.

Gardening, with the other arts, Roscoe informs us, was revived and patronised by the Medici family in the beginning of the sixteenth century, and the most celebrated gardens of these times were those of Lorenzo de Medici, and of the wealthy Bernard Rucellai. They were in the geometric and architectural taste of those of Pliny, and served as models or precedents for other famous gardens which succeeded them till within the last sixty years, when, as Eustace observes, a mixture of the modern or natural-like manner was generally admitted.

About this time (the beginning of the sixteenth century) the taste for distributing statues and urns in gardens is said to have been revived by Cardinal D'Este from an accidental circumstance of his having formed a villa on the site of that of the emperor Adrian, near Rome, where finding a number of antiquities, he distributed them over the newly arranged surface. This mode was soon imitated by Francis I. of France, and afterwards by the other countries. Gardens of plants in pots and vases began to be introduced about the same time, and were used to decorate apartments, balconies, and roofs of houses.

The celebrated Montaigne, who travelled in Italy towards the end of the sixteenth century, has left us some accounts of the principal gardens of that age. He chiefly enlarges on their curious hydraulic devices, for which the garden of the Cardinal de Ferrara at Tivoli was remarkable. *Jour. en Ital.* tom. ii.

Warton (*Essay on Pope*) mentions that in *L'Adamo,* a poem written and published at Milan in 1617, by G. B. Andreini, a Florentine, " the prints that are to represent paradise are full of clipt hedges, square parterres, straight walks, trees uniformly lopt, regular knots and carpets of flowers, groves nodding at groves, marble fountains, and water works." This may be considered as a poetic assemblage of the component parts of a fine garden in the seventeenth century.

28. Evelyn, the author of *Sylva,* visited Italy in the middle of the same century. Of the palace of *Hieronymo del Negro,* at Genoa, he says, " on the terrace or hilly garden, there is a grove of stately trees, among which are sheep, shepherds, and wild beasts, cut very artificially in a grey stone; fountains, rocks, and fish-ponds. Casting your eyes one way, you would imagine yourself in a wilderness and silent country; sideways, in the heart of a great city." *Memoirs by Bray,* i. 75.

He says, there are more than a thousand palaces, and country-houses of note, in the neighbourhood of Florence. He particularises those of Boboli at the ducal residence, (the Palace Pitti,) in the town, which still exist and are kept in tolerable order.. In and near Rome, he mentions those of the Borghese family, and of Cardinal Aldobrandini at Frascati, " surpassing, in my opinion, the most delicious places I ever beheld for its situation, elegance, plentiful waters, groves, ascents, and prospects." He mentions several hydraulic conceits, some of which still exist, and also that " of a copper ball, supported by a jet of air issuing from the floor, and continually dancing about."

The palace and gardens of Este at Tivoli are mentioned with similar encomiums. Speaking of the palaces and gardens of Lombardy, he observes, " No disgrace in this country to be some generations in finishing their palaces, that, without exhausting themselves by a vast expence at once, they may at last erect a sumptuous pile. " An Italian nobleman," Forsyth remarks, " will live on a crown a day, but spend millions for the benefit of posterity, and the ornament of his country."

At *Vilmarini,* near Vicenza, he found an orangery, " eleven score paces long, full of fruit and blossoms. In the centre of the garden, a magnificent wire cupola supported by slender brick piers, and richly covered with ivy. A most inextricable labyrinth." P. 207. Volkman, a German traveller, whom Hirschfield considers as deserving credit, and a good judge, visited Italy in 1700, about twenty years after Evelyn. He considers the Italian gardens as inferior to those of France in point of superb alleys, lofty clipt hedges, and cabinets of verdure; but, he adds, that they please the greater part of travellers from the north of Europe, more than the French gardens, from the greater variety of plants which they contain, and their almost perpetual luxuriance and verdure. Among the fine gardens, he includes those of *Venerie, Stupigni,* and *Vigne de la Reine,* near Turin, which do not appear to have been visited by Evelyn. The beauties of most of the gardens near Rome, he considers as depending more on their situations, distant views, c[illegible]mains and associations, luxuriant vegetation, and fine climate, than on their design, which, he says, exhibits " all the puerilities of the French taste, without its formal grandeur." (*Nachrichten von Italien,* 1 *ster band.*)

About this time the English style of gardening began to attract attention in Italy, though partly from the general stagnation of mind, and partly from the abundance of natural beauty already existing, it has never made much progress in that country. Unfortunately, observes Eustache (*Tour,* i. 426.), a traveller abndantly partial to Italy, " the modern Romans, like the continental nations in general, are not partial to country residence. They may enjoy the description or commend the representation of rural scenes and occupations in books and pictures; but they feel not the beauties of nature, and cannot relish the calm, the solitary charms, of a country life." The Italians in general, he elsewhere adds (i. 98.), have very little taste in furnishing a house, or in laying out grounds to advantage.

Notwithstanding these remarks, and the known paucity of specimens of landscape gardening in Italy, an Italian author of eminence, Professor Malacarne of Padua, has lately claimed for Charles Imanuel, first Duke of Savoy, the honor of having invented and first displayed an English garden or park in the neighbourhood of Turin; and which park he proves by a letter of Tasso, that poet wished to immortalise " as much as he could," in the well-known stanza of his Jerusalem, which Chaucer copied, and which Warton and Eustace suggest as more likely to have given the first idea of an English garden, than Milton's description of Paradise. See *New Mon. Mag. for July* 1820, or *Pindemonte su i Giardini Inglese, Verona,* 1817.

29. We shall now submit a slight sketch of the present state of gardening in Italy, as an art of design, partly from writers of the present century, and partly from our own inspection in 1819.

The palace and gardens of Venerie, near Turin, still exist, but are only remarkable for extent, and for an old orangery nearly six hundred feet in length. The surface of the park is irregular, and the trees distributed in avenues, alleys, and geometrical figures; the grounds of some of the numerous white villas near the city are romantic, and command extensive prospects; but very few aspire to the character of fine gardens.

The best garden at Genoa is that of Sig. di Negro, situated within the city. It is elevated, irregular, and singularly varied; rich in views of the town, the sea, and the mountains; abounds in fruits, botanical riches, shady and open walks, turrets, and caves. There is one large cave in which dinner parties are frequently given by the proprietor; and once a year, we believe on his birth-day, this grotto is decorated with some hundreds of religious puppets in gilt dresses, accompanied with pictures of saints, sculls, crucifixes, relicks, tapers, and lamps. This forms a part of the gardener's business, who preserves these paraphernalia through the rest of the year in a sort of museum. We mention the circumstance as characteristic of the Italian taste for *spectacle*, so different from that of the English. The gardens of Hipolito Durazo, and of Grimaldi, are more extensive, but less select than those of S. di Negro. Like them they are singularly varied in surface, and rich in marine views. The whole coast from Savonna to Genoa, and from Genoa to Nervi, is naturally very irregular, and abounds in beautiful gardens, abundantly stocked with orange trees, partly in pots, and in the warmest situations trained against walls, or planted as standards. We visited many of these gardens, and the only general fault seemed to be the want of order and keeping; properties which are essential to the full effect of every style in every country.

30. The ducal gardens of Boboli at Florence are the most remarkable in Tuscany. They occupy two sides of a conical hill, and part of a bottom, and consist of three parts; a botanic and exotic garden close to the palace Pitti and the celebrated museum; a kitchen garden near the hill top; and, a geometric garden which occupies the greater part of the hill. This scene abounds in almost every ingredient of the style in which it is laid out. The ground being very steep, almost all the walks slope considerably; but a few, conducted horizontally, are level, and serve, if the expression be admissible, as resting walks. There are abundance of seats, arbours, vases planted with agaves and orange trees; and a prospect tower on the summit, from which, as well as from many other points, are obtained fine views of Florence and the environs. In the lower part or bottom is a handsome basin of water, with an island and fountains in the centre, verged with a marble parapet ornamented with vases of orange trees, and surrounded by shorn hedges and statues. On the whole, nothing has been spared to render these gardens complete of their kind, and the effect is perhaps as perfect as the situation, from its irregularity and steepness, admits of.

The public promenade to the *Cassino*, deserves notice as among the best in Italy. It consists of shady avenues, extending for several miles on a flat surface near the Arno, varied by occasional views of villas and distant scenery. The trees are chiefly elms and chestnuts.

There are numerous private gardens round Florence, but none of them remarkable. The fortuitous scenery of Vallombrosa and other romantic situations, are the grand attractions for strangers. On Mount Fiesole and thence to Bologna, are some country seats with lodges, and winding approaches, which, considering the arid soil, are highly beautiful, and come the nearest to those of England of any in the warmer regions of Italy.

31. The villas of Rome, Forsyth observes, are to this day the "ocelli Italiæ." Their cassinos generally stand to advantage in the park, light, gay, airy, and fanciful. In the ancient villas the buildings were low, lax, diffused, and detached. In the modern they are more compact, more commodious, and rise into several stories. In both the gardens betray the same taste for the unnatural, the same symmetry of plan, architectural groves, devices cut in box, and tricks performed by the hydraulic organ. *Remarks on Italy*, 173.

The *Villa Borghese* is the most noted in the neighbourhood of Rome. It has a variety of surface formed by two hills and a dell, and a variety of embellishments, cassinos, temples, grottoes, aviaries, modern ruins, sculptured fountains, a crowd of statues, a lake, an aqueduct, a circus; but it wants the more beautiful variety of an English garden; for here you must walk in right lines, and turn, at right angles fatigued with the monotony of eternal ilex." *Remarks, &c*, 216.

Eustache says these gardens are laid out with some regard both for the new and the old system, because winding walks are to be found intersecting the long alleys. This is true; but the whole is so frittered down by roads, walks, paths, and alleys, and so studded with statues and objects of art, as to want that repose, simplicity, and massive appearance, essential, at least to an Englishman's idea, of an English garden. Simplicity, however, is a beauty less relished among the nations of the Continent than in this country, and less relished by the Italians than by any other continental nation.

The grand object of an Italian nobleman is to produce a huge pile of architecture, externally splendid, and to collect a gallery of pictures and statues. The furnishing of this pile for domestic use, or even the internal finishing of great part of it, he cares little about; and the park or gardens are inferior objects of attention. The Romans, when at the highest point of power, seem to have had exactly the same taste, as may be gathered from their writings, and seen in the existing ruins of the Villa Adriana, near Tivoli, and many others.

A few cardinals, Forsyth observes, created all the great villas of Rome. Their riches, their taste, their learning, their leisure, their frugality, — all conspired in this single object. While the eminent founder was squandering thousands on a statue, he would allot but one crown for his own dinner. He had no children, no stud, no dogs to keep; he built indeed for his own pleasure, or for the admiration of others, but he embellished his country, he promoted the resort of rich foreigners, and he afforded them a high intellectual treat for a few pauls, which never entered into his pocket. This taste generally descends to his heirs, who mark their little reigns by successive additions to the stock. How seldom are great fortunes spent so elegantly in England! How many are absorbed in the table, the field or the turf! Expences which center, and end in the rich egotist himself! What English villa is open like the Borghese, as a common drive to the whole metropolis? *Remarks on Italy*, 216.

The *Villa Panfili* displays the most architectural gardens of any about Rome. Here, as Forsyth observes, laurel porticoes of ilex, green scutcheons, and clipt coronets, are seen vegetating over half an acre; theatres of *jets d'eau*, geometrical terraces, built rocks, and measured cascades.

A number of other villas might be enumerated; but as far as respects gardens, the description, if faithful, might be tiresome and monotonous. Even Eustache allows that "howsoever Italian gardens may differ in extent and magnificence, their principal features are nearly the same; the same with regard to artificial as well as natural graces. Some ancient remains are to be found in all, and several in most of them. They are all adorned with the same evergreens, and present, upon a greater or less scale, the same Italian and ancient scenery. They are in general much neglected, but for that reason the more rural." *Classical Tour*, vol. i. chap. 18.

32. The same general character belongs to the principal gardens about Naples, with the exception of those of Caserta. The royal gardens at Portici are chiefly walled, cultivated enclosures, abounding in oranges, figs, and grapes, with straight alleys and wooded quarters entirely for shade. There is one small department, of a few perches, devoted to the English taste; but it is too small to give any idea of that style. There is also a spot called *La Favorita*, in which, says M. Starke, (*Letters*, ii. 125.) the present king has placed swings and wooden horses, or hurly-burlies (such as are to be seen at our fairs), for his own particular amusement, and that of his nobility.

The approach to this garden is through the palace court, great part of which is occupied as a barrack by troops. The filth and stench of this court is incredible; and yet it is overlooked by the windows of the king's dining-room, who sat down to dinner, on his return from the chace, as we passed through the palace on the 2d of August, 1819. We know no scene to which it could be compared, but that of the court of some of the large Russian inns in the suburbs of Petersburgh.

The gardens of Prince Leopold of Villa Franca almost adjoin those of the king. They are less extensive, but kept in much better order by a very intelligent German. The orange groves and trellises in both gardens are particularly fine; and in that of Prince Leopold, there is a tolerable collection of plants. There is in Naples a royal garden in the geometric style, combining botany and some specimens of the English manner, which is now enlarging, and has the advantage of an elevated situation and fine marine views.

The *Chiaja* is a public garden on the quay, used as a promenade. The outline is a parallelogram, the area arranged in three alleys, with intermediate winding walks, fountains, rock-works, basins, statues, parterres, with and without turf; and oranges, flowers, &c. in pots. It is surrounded by a parapet surmounted by an iron fence, and contains cassinos for gambling, *cafés*, baths, taverns, &c. The view to the bay, and the breezes thence arising are delightful. It is justly reckoned one of the finest walking promenades in Italy.

It is customary in Naples to have extensive gardens of pots and boxes on the roofs of the palaces, and other houses. Viewed from the streets they have a singular effect, and from their beauty and fragrance, from the fresh breezes in these elevated regions, and the comparative absence of that stench with which the lower atmosphere of Naples is almost continually charged, they are very agreeable to the possessors.

83. *Caserta* is a royal residence about seventeen miles from Naples. The palace, in which, as Forsyth observes, the late king sought grandeur from every dimension, is situated in an immense plain, and is a quadrangle, the front of which is upwards of seven hundred feet long. The park extends from the palace to a range of mountains at two miles distance, some of which it includes. It may be said to consist of four parts; open pasture, almost without trees, near the palace; woody scenery, or thick groves and copses, partly near to, but chiefly at a considerable distance from the palace; mountainous scenery devoted to game and the chace, at the extreme distance; and an English garden on one side, skirting the mountains. There are besides, St. Lucio a large village, a silk manufactory, a farm, &c., all of which are minutely described by different tourists, and minutely by Vasi, in his *Guide to Naples and its Environs.* But the most remarkable feature of the whole, and that which renders this park, in our opinion, the most extraordinary in Europe, is the cascade and canal. The water is begun to be collected above thirty miles distance among the mountains, and after being conducted to a valley about five miles from Caserta, is carried over it by an aqueduct consisting of three tiers of arches, nearly two hundred feet high and two thousand feet long. The volume of water is four feet wide by three and a half feet deep, and moves, as near as we could estimate, at the rate of one foot in two seconds. Arrived at the back of the mountain Gazzano a tunnel is cut through it, and the stream, bursting from a cave about half way between the base and the summit, forms a cascade of fifty feet directly in front of the palace. The waters are now in a large basin, from which, under ground, tunnels and pipes proceed on two sides, for the purposes of supplying the lakes or rivers in the English garden, the fish-ponds, various jets d'eau, and for irrigation to maintain the verdure of the turf. From the centre of this basin proceeds a series of alternate canals and cascades of uniform breadth, and in a direct line down the slope of the hill, and along the plain to within a furlong or little more of the palace. Here it terminates abruptly, the waters being conveyed away under ground for other purposes. The effect of this series of canals and cascades, viewed from the garden front of the palace, or from the middle entrance arch through that "long obscure portico or arcade which pierces the whole depth of the quadrangle, and acts like the tube of a telescope to the waters," is that of one continued sheet of smooth or stagnant water resting on a slope; or of a fountain which had suddenly burst forth and threatened to inundate the plain; but for this idea the course of the water is too tame, tranquil, and regular, and it looks more like some artificial imitation of water than water itself. In short the effect is still more unnatural than it is extraordinary; for though jets and fountains are also unnatural, yet they present nothing repugnant to our ideas of the nature of things; but a body of water seemingly reposing on a slope, and accommodating itself to the inclination of the surface, is a sight at variance with the laws of gravity. Unquestionably the cascade at the extremity is a grand object of itself; but the others are so trifling, and so numerous, as in perspective, and viewed at a distance, to produce this strange effect of continuity of surface. As a proof that our opinion is correct we refer to the views of Caserta, which are got up by the Neapolitan artists for sale; had these artists been able to avoid the appearance in question, even by some departures from truth, there can be no doubt they would not have hesitated to do so.

The cascade, in our opinion, should have been of more than double the present height, and after one or more additional falls the water should have disappeared, or only appeared again from the palace in a situation below its level. All the effects we have mentioned are considerably above it, and for that reason alone censurable.

Forsyth seems to have paid little attention to this water, having been chiefly struck with the palace. Eustache says "the palace is one of the noblest edifices of the kind in Europe; the gardens extensive, regular, but except a part in the English style, uninteresting. From a reservoir on the mountain Gazzano, the water is precipitated down the declivity to the plain, where, collected in a long straight canal, it loses its rapidity and beauty, and assumes the appearance of an old fashioned stagnant pool." *Tour in Italy,* vol. i. p. 602.

Wilson says the cascade of Caserta might have been made the finest of its kind in the world; but it has been spoiled by a love of formality, which has led the copious stream drizzling over regular gradations of steps into a long stagnant canal. *Tours,* &c. vol. ii. p. 217.

The English garden was formed by Græffer a German, who had been some time in England, and author of a "*Catalogue of Herbaceous Plants.*" He was sent to the king of Naples about 1760, by Sir Joseph Banks, and has formed and preserved as perfect a specimen of English pleasure ground as any we have seen on the continent. The verdure of the turf is maintained in summer by a partially concealed system of irrigation; and part of the walks were originally laid with Kensington gravel. Every exotic, which at that time could be furnished by the Hammersmith nursery, was planted, and many of them form now very fine specimens. Among these the Camelias, Banksias, Proteas, Magnolias, Pines, &c. have attained a large size, and ripen their seeds. There is a good kitchen and botanic garden, and extensive hot-houses, chiefly in the English form; but now much out of repair. Indeed this remark will apply to the whole place, excepting the palace. Græffer laid out the gardens of the Duke de San Gallo, at Naples, and various others. He was not liked by the peasants of St. Lucio, who, taking the advantage of him, when thrown from a cabriolet, stabbed him mortally before he could recover himself, in 1816.

34. The soil and climate of Lombardy are the most congenial to agriculture and gardening, not only in Italy, but perhaps in Europe. It is not so favorable for the perfection of the grape and the orange as the climate of Naples, nor for the production of large turnips and succulent cabbages as that of Holland, but it possesses a medium of temperature and humidity between the two climates which is perhaps favorable to a greater number of vegetable productions, than any one climate on the face of our globe.

There are few princely gardens in this kingdom, but many of moderate size well stocked with trees and plants of ornament, and sometimes neatly kept. Those on the Brenta still retain marks of their ancient celebrity. The extent and beauty of those of the *Isola Bella*, have been greatly exaggerated by Eustache, and other travellers. The justest description appears to us to be that of Wilson. "Nothing," he says, "can be so noble as the conversion of a barren rock, without an inch of earth on its surface, into a paradise of fertility and luxury. This rock, 180 years ago, produced nothing but mosses and lichens, when Vitaliano Boromeo conceived the idea of turning it into a garden of fruits and flowers. For this purpose he brought earth from the banks of the lake, and built ten terraces on arches, one above the other to the top of the island on which the palace is posted. This labor has produced a most singular pyramid of exotics and other plants, which make a fine show, and constitute the chief ornament of this miracle of artificial beauty. The orange and lemon-trees are in great luxuriance, and the grove of laurel leaves is hardly to be equalled any where in Europe; two of them in particular are said to be the largest known in existence." *Wilson's Tours*, vol. iii. p. 449.

The finest garden scenery in Italy is at Monza, the royal residence near Milan. The park contains upwards of 3000 acres, of a gently varied fertile surface. It is chiefly laid out in the regular style; but contains also an English garden of considerable extent and beauty. It is well watered, and the walks are not so numerous as to disturb the unity and repose of the scenes. The culinary, flower, botanic, and fruit-gardens, orangeries, and hot-houses, are all good, and as well managed as the penuriousness of the present vice-king will admit. Very fine avenues lead from this residence to Milan. The whole was begun in Beauharnois' time, under the direction of Sig. Villaresi, one of the most scientific gardeners in Italy, and is still managed under his direction, but with greatly diminished resources.

There are various gardens pointed out to strangers as English, *veramente Inglese*, near Milan, and also at Verona, Vicenza, Brescia, Porta, &c. "In many of the villas on the lake of Como," Wilson observes, "it is most delightful to behold the lofty crags frowning over the highly cultivated gardens, with hot-houses of exotic plants, neat terraces, and ornamental summer-houses, subduing the natural wildness of the situation." Most of those which we visited were too much ornamented, and too full of walks, seats, arbors, and other ornaments, for that repose and simplicity which, according to our ideas, is essential to an English garden.

Art, in most of these gardens, is as much avowed as in the French style; whereas in the true English garden, though art is employed, yet it is not avowed and ostentatiously displayed; on the contrary, the grand object is to follow the directions of the Italians themselves, and study that the art "*che tutto fa, nullo si scopre.*"

SUBSECT. 2. *Italian Gardening in respect to the Culture of Flowers and Plants of Ornament.*

35. The introduction of the Christian religion as a national worship, though at present favorable, was at first adverse to the use of flowers. Tertullian and Clement of Alexandria, in the second century, inveighed against their use with all their eloquence: and the rites of the Catholic religion, then carried on in gloomy vaults, were not, as now, accompanied by bands of music, statues, pictures, and enriched altars decorated with flowers. Flowers, therefore, appear to have been little cultivated by the modern Romans previously to the tenth century. P. de Crescent in the beginning of the fourteenth century, mentions only the violet, lily, rose, gilly-flower, and iris. Commerce began to flourish in the century which succeeded, and various plants were introduced from the Eastern countries, by the wealthy of Venice and Genoa. We are informed by Stephanus, (*De re Hortensi*, § 113.) that Gaspar de Gabriel, a wealthy Tuscan noble, was at considerable expense to form a collection of plants at Padua, and which he accomplished about 1525; and thus appeared the first private botanic garden in Europe.

Though not a public institution, it was open to all the curious. To this garden succeeded that of Corner, at Venice, and Simonetta, at Milan; those of some convents at Rome, and of Pinella, at Naples, with others enumerated by botanical historians. *Haller's Bib. Bot.* 21. *Tiraboschi's Stor. del Litt. Ital.* *Gesner Hort. German.*, &c.

The first public botanic garden established in Europe was that of Pisa, begun, according to Deleuze, in 1543, by Cosmo de Medici; and of which Ghini, and Cesalpin, celebrated botanists, were successively the directors.

Belon, a French naturalist, who was at Pisa in 1555, was astonished at the beauty of the garden, the quantity of plants it contained, and the care taken to make them prosper. In 1591 the number of new plants was found so far accumulated as to render a larger garden necessary, and that space of ground was fixed on which is the present botanic garden; two borders were destined for ornamental flowers, and a green-house was formed for such as were too tender for the open air. In the beginning of the eighteenth century, a great accession was obtained to the garden by the double flowers of Holland, then introduced in Italy for the first time. *Calvio Hist. Pisani.*

The example of Pisa was soon imitated by other cities and universities in Italy and Germany. In 1545, (not 1533, as stated by Adamson, see *Deleuze*,) the public botanic garden of Padua was agreed on by the senate of Venice. It contained in 1581 four hundred plants cultivated in the open air, besides a number kept in pots to be taken into houses or sheds during winter. The garden of Bologna was next established by Pope Pius the Vth; then that of Florence by the Grand Duke, and afterwards that of Rome. From that time to the present day, the number of botanic gardens have been continually increasing, so that there is now one belonging to almost every principal city in Italy; an exertion the more remarkable as botanic gardens in that country are proportionally more expensive than in England, from the necessity of conveying a stream of water to them, and forming a regular system of irrigation.

A taste for flowers and ornamental plants, native and exotic, has through these botanic gardens been generally diffused in Italy; and at the same time the means of gratification afforded, by the superabundant plants and seeds of these gardens being given away or sold at very moderate prices to the curious. About this time also the Dutch made regular exchanges of their bulbous roots for the orange trees of Genoa and Leghorn; and the double night smelling jessamine was introduced at Pisa from Spain, and so highly prized as to have a centinel placed over it by the governor.

The use of flowers, it is probable, was never entirely laid aside in Italy as ornaments to female dress; but in the progress of refinement their application in this way became more general, and more select sorts were chosen; they became in demand both gathered in bouquets, and with the entire plants in pots; they were used as household ornaments both internal and external; and the church, thinking that what pleased man must be pleasing to the gods; or conforming to the taste of the times, and desirous of rendering religion as attractive as possible to the multitude, introduced flowers as decorations of altars and statues, and more especially in their fêtes and processions. Pots and boxes of orange trees, pomegranates, bays, oleanders, myrtles, and other plants, are now let out by the day, for decorating the steps and approaches to altars, or sold for ornamenting roofs, balconies, virandas, courts, yards, passages, halls, staircases, and even shops and warehouses in most of the large towns of Italy.

A flower in great demand by the church is the lily (*Lilium candidum*) with which the (*Madona*) Virgin, that bore the child, is decorated as an emblem of her virginity. The typha (*T. latifolia*,) is much used when in seed to put into the hands of statues of Christ, being considered as the reed with which the soldiers handed him a spunge of vinegar. In Poland, where the typha has not been easily procured, we have seen leeks in the flower-stalk used as a substitute. The rose, the stock-gilly-flower, the jessamine, &c. are next in demand, and are used in common with such others as are presented gratis, or offered for sale, as decorations indiscriminately to the crowd of statues and pictures of saints which decorate the churches, to private houses, and as ornaments of female dress.

Flowers are also much used in Italy on occasions of public rejoicing. Favorite princes and generals are received into towns and even villages through triumphal arches decorated with flowers, and the ground is also sometimes strewed with them. The lives of Buonaparte, Murat, and Beauharnois, afford many examples. The Emperor of Austria made a tour of Italy in 1819, and though every where disliked, every where walking on a mine ready to explode, he was in many places so received; and at the famous cascade of Marmora, near Terni, a slight arcade, 300 yards in length, was formed to guide the steps of the imperial visitor to the best point of view. It was covered with intersecting wreaths of flowers and foliage, and the sides ornamented with festoons of box, myrtle, and bay. At Milan, a very gay city, flowers are greatly prized, and in the winter season are procured from the peculiarly warm and ever verdant gardens between Genoa, and Nervi. A louis-d'or, we were informed, is sometimes paid for a single nosegay. During the carnival the demand is great throughout Italy, But notwithstanding this taste for flowers, the climate of Italy is not favorable to the production of florists' flowers, that is, of those which are called flowers by way of eminence. Fine varieties of the bulbous tribe, of the auricula, polyanthus, &c. are soon lost there, and obliged to be renewed from more temperate countries. They excel, however, in the culture of the tuberose, which forms an article of commerce at Genoa, as does the paper narcissus, (*N. orientalis,*) at Naples. In roses, jessamines, oleanders, oranges, they also excel; and also in most single flowers not natives of cold climates. Sig. Villaresi, already mentioned, has raised from seeds of the Bengal rose, (*Rosa indica,*) impregnated promiscuously with other roses, upwards of fifty distinct varieties, many of which are of great beauty, and very fragrant. In general, flowers and ornamental plants are most in demand, and cultivated to the greatest degree of perfection in Lombardy, of which the flower-markets of Milan and Venice afford most gratifying proofs. Many of the Chinese, New Holland, and some of the Cape trees and shrubs, thrive well, and blossom luxuriantly in the open air in the warmer regions, as in S. di Negro's garden, at Genoa, and those of Pisa and Caserta. Evelyn says, he saw at Florence, in 1664, a rose grafted on an orange-tree; the same tricks are still passed off with the rose, jessamine, oleander, myrtle, &c. at Genoa, and even in some parts of Lombardy.

On the whole, the taste for flowers and plants of ornament, is rather on the decline than otherwise in Italy. Much depends on the taste of the princes in this as in every other matter, and unfortunately those of Italy are at present mere cyphers. The king of Naples knows no pleasures but those of the table, the seraglio, and the chace. The Pope is debarred from pleasure by his office; the Grand Duke of Tuscany has some taste for plants, but more for a heavy purse; his relation, the vice-king of Lombardy, is more a priest than a prince; though he has some fondness for succulent exotics, of the common sorts of which he has a large collection. The king of Sardinia is an old man and a mere king, *Dei gratia.*

Subsect. 3. *Italian Gardening in respect to its Products for the Kitchen and the Desert.*

86. The Italians have somewhat increased the varieties of the species of fruits cultivated by the Romans, but have made few additions to the original sorts, if we except the orange and the pine-apple. The orange is supposed to have been introduced between the time of Pliny and Palladius; it is the fruit in which they excel, more from climate and soil than science. There are supposed to be nearly a hundred varieties of this fruit in Italy; but in the orange nurseries at Nervi, it is not easy to make out more than forty or fifty distinct sorts. These have mostly been obtained from seeds. They have not the Mandarine orange, nor some varieties of shaddock, (*C. decumana,*) which we possess. The most regular and systematic orange orchards are at Nervi; and the largest trees around Naples, and at Sorenta, Amalphi, &c. The more rare sorts are kept in conservatories at Rome, and the largest house, and best collection, is that of the Borghese. At Florence and Milan, all the sorts require to be housed during winter, but at Hieres and Nice, in France, and at Genoa and Nervi, they stand the common winters in the open air. Last winter, that of 1819, they are said to have suffered severely.

There are above twenty varieties of peaches cultivated in the neighbourhood of Rome and Naples; and these fruits, grown on standard trees, as apples and pears are in this country, arrive at a very high degree of perfection. It is in fact, the stone fruit in which the Italians most excel. They have few sorts of apricots and nectarines, and not many plums; but their *Regina Claudia*, or *gages*, are excellent.

Cherries are everywhere excellent in Italy, especially in Tuscany. The Milan or Morella cherry, is noted for its prolific qualities, and for having a consistency and flavor somewhat resembling the *Morchella esculenta*, or morel.

Their varieties of the vine are not so numerous as in France or Spain; they are, for the most part, the result of long growth on one soil and situation. Grapes are indifferent to eat in most parts of Lombardy, and in the best districts are nearly equalled by muscats, sweet-waters, muscadines, and other sorts grown in hot-houses in this country. The grape is the only berry that thrives in Italy. Collections of gooseberries from Lancashire have been introduced at Leghorn, Genoa, and Monza; and, grown in the shade, thrive moderately at the gardens of the latter place. The currant, the raspberry, and the strawberry, though natives of the Alps and Appenines, do not thrive in the gardens.

Apples and pears, and kernel-fruits, in general, are excellent in the north of Italy; but indifferent in the warmer regions. Services in considerable variety abound in Piedmont, and part of Lombardy.

The Pine apple is cultivated in a few places in Italy, but with little success, excepting at Florence and Milan. There are a few in the Royal gardens at Portici, but weak, yellow-leaved, and covered with insects. The few grown in the Pope's garden, and in one or two other villas near Rome, are little better. By far the best and greatest quantity are in the vice-royal gardens of Monza. The last king of Sardinia sent his gardener, Brochieri, to England to study their culture. He returned, and in 1777, published a tract on them, with a plan of a pit for their reception; and in this way they are universally grown in Italy.

Of the Melon tribe, the variety in Italy is endless, of every degree of flavor, from the richness of the cantaloupe, to the cool, icy, sub-acid taste of the *citrouille* or water melon. Too little care is bestowed in selecting good fruits for seeds, and in preventing hybridism from the promiscuous intercourse with surrounding sorts of *cucumis*; and, hence, seeds sent from Italy to this country are little to be depended on, and generally produce varieties inferior to those of British growth. There are a few sorts of cucumbers, and though there are a great number of gourds and pompions cultivated, the sorts, or conspicuous varieties of both, are less numerous than in this country. Italian cucumbers are never so succulent as those grown in our humid frames by dung-heat.

Near Rome and Naples the love-apple, egg-plant, and capsicum, are cultivated for the kitchen; the fruit of the first attaining a larger size, and exhibiting the most grotesque forms. It is singular, that in Sicily this fruit, when ripe, becomes sour, and so unfit for use, that the inhabitants are supplied with it from Naples.

The larger varieties of strawberries are only attempted to be grown in a few spots in Lombardy and Piedmont, and do not succeed. The wood-strawberry is, however, abundant in the native woods; and with these the markets of Naples, Rome, Florence, and most towns, are supplied for several months in the year.

Were the demand sufficient to encourage the production of the fruits of the northern climates in warm regions, there can be no doubt means would soon be resorted to, to produce them in as great perfection, as we do their fruits here: all that is necessary, is to imitate our climate by abstracting or excluding heat, and supplying moisture; but luxury in Italy has not yet arrived to the degree adequate to produce this effect.

Of culinary vegetables, the Italians began with those left them by the Romans (21), and they added the potatoe as soon as us, or before us, to their number. They now possess all the sorts known in this country, and use some plants as salads, as the chiccory, ox-eye daisy, *rucca*, or rocket, which are little used here. The turnip and carrot tribe, and the cabbage, savoy, lettuce, and radish, thrive best in the northern parts; but the potatoe grows well every where, and the Italian autumn is favorable to the growth of the cauliflowers, and broccolis, which are found of large size at Rome, Florence, and Bologna, in the months of September and October; and very large at Milan, all the summer and autumn. The leguminous tribe thrive every where; but in some places the entire pod of the kidney bean is so dry and hard, as to prevent its use as a substitute for pease. In short, though the Italians have the advantage over the rest of Europe in fruits, that good is greatly counterbalanced by the inferiority of their culinary vegetables. Much to remedy the defect might be done by judicious irrigation, which in the south of Italy, and even in Lombardy, is so far necessary as to enter into the arrangement of every kitchen-garden. Shading, blanching, and change of seed, will also effect much; but the value of good culinary vegetables is not known to the greater part of the wealthy Italians.

Subsect. 4. *Italian Gardening, in respect to the planting of Timber Trees and Hedges.*

37. The Italians, like the Romans, are chiefly supplied with timber from the self-sown forests of the Alps and Appenines; and timber trees are chiefly propagated for parks, public walks, and lining the great roads. The vine is still, in many places, trained on the poplar and elm; but in Tuscany and Lombardy, where the culture is deemed superior, the common maple (*a campestre*), and flowering ash (*fraxinus ornus*) are preferred. *Sigismondi. Agr. Toscan. Chateauvieux. Lettres, &c.* 1812.

The most common tree for every other purpose is the narrow-leaved elm, which lines the road from Rome to Naples, for upwards of twenty miles together. Near Milan, the Lombardy poplar is a great deal used; but a late author, Gautieri (*Dello, Influsso del Boschi, &c.* 1817,) argues in favour of cutting down, rather than planting in the Milanese plains. The finest avenues and public equestrian promenades in Italy are those around Milan and at Monza; the trees are of various sorts, as the tulip tree, platanus, lime, acacia, melia zederach, various oaks, chestnuts, beeches, &c.; they were planted in Beauharnois' time; and such is the rapidity of vegetation in this climate, that already the tulip trees produce blossoms, and in seven years more the effect will be complete. The sorts are everywhere mixed, in order that the failure or defective growth of one species may have a chance of being compensated by the growth of that, or of those adjoining; or that if a malady were to attack one sort of tree, it might not lead to continuous defalcation. Most of those trees were planted by *Villaresi*, who, before the late political changes, had constantly under his direction not fewer than three thousand men for public and royal improvements.

The timber trees of the native forests of Italy are chiefly oak, chestnut, and beech; the undergrowths are of numerous species, including the arbutus, ilex, and myrtle. This class of forests skirts the Alpine mountains, and covers, in many places, the Appenine hills. In higher regions the larch abounds, and in sheltered dells the silver fir. The stone and cluster pine are confined to the lower regions, as the vales of Arno, Tiber, &c.

Hedges are in general use in Italy, but are very imperfectly formed and managed. In Lombardy the hawthorn is a good deal used; but in Tuscany, the states of the church, and those parts of the Neapolitan territory which are hedged, the *rhamnus paliurus* is the prevailing plant, mixed, however, with the pyracantha, pomegranate, myrtle, and with wild roses, brambles, hazels, reeds, &c. seldom without gaps and holes, open or filled up with dead bushes or reeds. The willow alone often forms a hedge in Lombardy, where the shoots are valuable for tying up the vine.

Subsect. 5. *Italian Gardening as empirically practised.*

38. During the time of the Romans, it is probable that none but free men had gardens; but in the present age, the system of slavery being abolished, they are common to every class of citizens.

It is a general remark of travellers, and of acknowledged truth, that the state of cottage gardens indicates that of the peasantry; and those of Italy confirm the justness of the observation. Almost the only plants grown in them are gourds and Indian corn. In Tuscany and Lombardy some of the cabbage tribe, the kidney bean, and occasionally the potatoe, are to be seen, but rarely any thing else. The gardens of the farmers are somewhat better, especially in the northern districts, where they often contain patches of hemp, potatoes, parsnips, lettuce, and some flowers and fruit-trees. The gardens of small proprietors are still better stocked; those of wealthy bankers and merchants are generally the best in Italy. The gardens of the more wealthy nobles are only superior to those in extent, and are distinguished as such, by having more or less of an accompanying park. The gardens of the convents are, in general, well cultivated, and rich in fruits and culinary vegetables, with some flowers and evergreens for church decorations. The priests assist in their cultivation, and some of these men are much attached to gardening.

Gardening is chiefly practised for commercial purposes by market gardeners, who also grow flowers, act as orchardists, and often make wine. There are hardly any nurseries for trees and shrubs in Italy, if we except those for orange trees at Nervi, and two small ones for general purposes at Milan. Those who form new gardens are chiefly supplied from France, or from their friends, or from private gardens; most of which last sell whatever they have got to spare.

The operative part of gardening in Italy is performed more by labourers than by regular apprentices and journeymen; and thus good practical gardeners are more the result of accident than of design. The great defect of both is the want of a taste for order and neatness.

The artists or professors are of two classes. First, The architects, who adopt the rural branch of their art, (*architetti rustici,*) and who give plans for parks, chiefly or almost entirely in the geometric style, to be executed under their direction, and that of the head gardener. Secondly, The artist gardeners, (*artisti giardinieri,*) who are generally the gardeners, or directors of gardens, of some great establishment, public or private, and who give plans for gardens, chiefly in what is there considered the English manner, and for kitchen-gardens; and as in England, either direct, by occasional visits, or undertake by contract their execution and future occasional inspection.

Subsect. 6. *Italian Gardening, as a Science, and as to the Authors it has produced.*

39. The Romans, as we have seen, were almost totally ignorant of gardening, as a science, but their successors have, by the establishment of professorships of botany and botanic gardens, in the sixteenth century, materially contributed to the study of the vegetable kingdom, without some knowledge of the physiology of which, the practice of gardening must be entirely empirical. Malphigi is considered the father of vegetable physiology in Italy.

It must be confessed, however, that the scientific knowledge of the Italians is chiefly confined to their professors and learned men: the practical gardener is yet too ignorant either to study or to understand the subject; too much prejudiced to old opinions to receive new ideas; and partly from climate, but chiefly from political and religious slavery, too indifferent to wish to be informed. Some exceptions must be made in favor of such gardeners as have been apprenticed in botanic and eminent gardens, or under intelligent Germans, who are here and there to be found superintending the gardens of the nobles. The bastardizing of the cucumis tribe, by proximity, and the striking phenomena of the male and female hemp, have introduced some vague ideas of the sexuality of vegetables; but the use of leaves, by far the most important knowledge which a gardener can possess, seems no where understood, by ordinary master gardeners. Grafting and laying are practised without any knowledge of the effects of the returning sap, or of the exclusion of air and light. Nothing can be worse than the practice of budding orange-trees at Nervi; to be convinced of which, it is only necessary to compare the plants imported from thence with those brought from Malta or Paris.

The culture of the vine, the olive, and the fig, belongs to the rural economy of the country; that of the vine is abundantly careless, and the practice of the caprification of the fig, though laughed at by the professors, is still followed in various places near Rome and Naples.

With the Romans it was customary before any grand operation of agriculture was undertaken to consult or invoke the god of that department, as of Flora, Pomona, &c. and to pay attention to the age of the moon and other signs (24). A good deal of this description of ceremony is still carried on in general economy by the priests and farmers, and gardening has not yet entirely thrown off the same badge of ignorance and religious slavery. Many gardeners regulate their sowings of kitchen crops by the moon, others call the priest to invoke a blessing on large breadths of any main crop; some, on minor occasions, officiate for themselves, and we have seen a poor market gardener at Savonna muttering a sort of grace to the virgin over a bed of new-sown onions. Father Clarici, a priest who published *Istoria e Culture delle piante, &c.* so late as 1726, countenances most of these practices, and describes many absurd and foolish ceremonies used for procuring good crops, and destroying insects, &c.

The Italians are particularly unskilful in the management of plants in pots, and especially of exotics, which require protection by glass. These are put into houses with upright or slightly declining $(90^\circ \div 15^\circ)$ glass fronts, and opaque roofs; there they remain during a winter of from three to five months; want of light and air renders their leaves yellow and cadaverous; and when they are taken out they are placed in the most exposed parts of the garden, often on parapets, benches, or stages. Here the sudden excess of light soon causes them to lose their leaves, which they have hardly time to regain before the period arrives for replacing them in the conservatory or hot-house. We know of few exceptions to this censure, excepting at Monza, and Caserta, where they are kept in winter, in glass-roofed houses, as in England, and placed out in summer under the shade of poplars or high walls. Dr. Oct. Tazetti, professor of rural economy at Florence, and who lectures in a garden in which specimens are displayed of the leading sorts of Italian field and garden-culture, acknowledged the justness of this remark.

40. Of the Italian authors on gardening, few or none are original. Filippo Re has written a great many books, and may be compared to our Bradley. Silvo Sigismondi of Milan, has written a work on English Gardening, resembling that of Hirschfield, of which it is, in great part, a translation. Clarici is a very copious writer on culinary-gardening, and the culture of flowers; and the most approved writer on the orange tribe is Gallesio of Savonna.

Sect. II. *Of the Revival, Progress, and present State of Gardening in Holland and Flanders.*

41. If in modern times gardening was first brought into notice in Italy, it was first brought to a high degree of perfection in Holland and the Netherlands. The crusades, in the twelfth century, are generally supposed to have excited the taste for building and gardening in the north of Europe. But from Stephanus and Gesner, it appears that a taste for plants existed among the Dutch, even previously to this period. It is to be regretted that scarcely any materials are to be found from which to compose such a history as this interesting circumstance requires. Harte (*Essays on Agriculture*) conjectures that the necessities arising from the original barrenness of the soil, that of Flanders being formerly like what Arthur Young describes Norfolk to have been nearly a century ago, together with a certain degree of liberty, the result of the remoteness of the situation from kings and priests, may have contributed to improve their agriculture; and that the wealth acquired by the commercial men of Holland, then the most eminent in the world, enabled them to indulge in country-houses and gardens, and to import foreign plants. To this we may add, that the climate and soil are singularly favourable for horticulture and flower gardening, the two departments in which the Dutch are most eminent.

Subsect. 1. *Dutch Gardening as an Art of Design and Taste.*

42. Hirschfield observes, that though it has been stated that the Dutch have a particular taste in gardening, yet their gardens appear to differ little in design from those of the French. The characteristics of both are symmetry and abundance of ornaments. The only difference to be remarked is, that the gardens of Holland are more confined, more covered with frivolous ornaments, and intersected with still, and often muddy pieces of water. The gardens of Ryswick, Houslaerdyk, and Sorgvliet, were, in the beginning of the last century, the most remarkable for geometrical beauty of form, richness in trees and plants, and careful preservation. It is singular our author observes, that the Dutch are so fond of intersecting their gardens with canals and ditches of stagnant water, which, so far from being agreeable, are muddy and ugly, and fill the air with unwholesome vapours. Yet they carry this taste, which has no doubt originated in the nature of their country, to the East Indies; and the numerous country-houses belonging to the Dutch settlement in Batavia, are all furnished with gardens and canals like those in the neighbourhood of Amsterdam; as if to render the unwholesome air of that country still more dangerous. Every field is there crossed by a canal; and houses on eminences are surrounded at great expence by a moats and draw-bridges like those of the Hague. Such is the influence of habit, and the love of country; and therefore, however at variance with local circumstances, and sometimes even with utility, it cannot be altogether condemned.

The climate and soil of Holland are favourable for turf, and hence grassy slopes, green terraces and walks are more common there than in any other country of the continent, and may be said to form, with their oblong canals, the characteristics of the Dutch style of laying out grounds.

Hague, the Versailles and Kensington of Holland, and in fact the most magnificent village in Europe, contains two royal palaces with their gardens in the ancient style. Evelyn in 1641 describes them as "full of ornament, close walks, statues, marbles, grottoes, fountains, and artificial music," and of the village he says, "beautiful lime-trees are set in rows before every man's house." Sir J. E. Smith, (*Tour on the continent*, vol. i.) described them in 1783, the one garden as full of serpentine and the other as full of straight lines. In 1814, these gardens had lost much of their former beauty, partly from age and decay, but principally from neglect. Jacob (*Travels in Germany*), in the same year found them formal and crowded with high trees. It is intended, we learned in 1819, to preserve their style, and if possible to renew their youth.

Among other curiosities at Brussels, Evelyn mentions a hedge of jets d'eau, lozenge-fashion, surrounding a parterre; and "the park within the walls of the city furnished with whatever may render it agreeable, melancholy, and country-like." It contained "a stately heronry, divers springs of water, artificial cascades, rocks, grottoes, statues, and root-houses." This park was considerably enlarged some years ago; the then decayed root-houses, grottoes, and more curious water-works removed, and the whole divided by broad sanded paths, and decorated with good statues, seats, fountains, and *cafés* for refreshment.

The modern, or English style of gardening, Sir J. E. Smith informs us, was "quite the fashion" in Holland, in 1783; but neither the surface of the ground, the confined limits of territorial property, nor the general attention to frugality and economy, are favorable to this style. Some attempts, on a small scale, may be seen from the canals, but we know of no extensive parks and pleasure-grounds in this manner. It is in kitchen and flower-gardens that the Dutch excel all the other continental nations.

Subsect. 2. *Dutch Gardening, in respect to the Culture of Flowers and Plants of Ornament.*

43. The early history of the Dutch and Flemings is little known, and we can only offer a conjecture, that, as they were the most commercial people in Europe early in the twelfth century, the rudiments of that taste for flowers, which has since so distinguished them in the annals of Gardening, might then take its rise.

It would be a curious subject to enquire, whether the taste for flowers first gave rise to the lace and ornamental linen-manufactures of the Flemings; or, whether these manufactures gave rise to the taste for flowers. In all probability the former would take place, as the excellence to which the Dutch have arrived in flower-painting, is well known to be an effect; and not a cause of their taste for flowers.

Lobel, in the preface to his *Histoire des Plantes*, 1576, states, that the taste for plants existed among the Flemings during the crusades, and under the dukes of Burgundy; that they brought home plants from the Levant, and the two Indies; that exotics were more cultivated there than any where else; and that their gardens contained more rare plants than all the rest of Europe besides, till, during the civil wars which demolated this country in the sixteenth century, many of their finest gardens were abandoned or destroyed.

The botanic garden of Leyden was begun in 1577, thirty-one years after that of Padua. It was confided to Cluyt, a celebrated botanist, afterwards to Bontius, and, in 1592, L'Ecluse, from Frankfort, was appointed professor of botany. In 1599, they constructed a green-house, and, in 1633, the catalogue of the garden contained 1104 species.

At this time the magistrates, the learned men, and the wealthy citizens were occupied in facilitating the progress of botany, and the introduction of new plants. A ship never left the port of Holland, Deleuze observes, the captain of which was not desired to procure, wherever he put into harbour, seeds and plants. The most distinguished citizens, Beverning, Favel, Simon de Beaumont, and Rheede, filled their gardens with foreign plants at great expence, and had a pleasure in communicating those plants to the garden of Leyden. This garden, in Boerhaave's time, who, when professor of botany there, neglected nothing to augment its riches and reputation, contained (*Index alter Plant.* 1720.) upwards of 6000 plants, species, and varieties. Boerhaave here exemplified a principle, which he laid down (*Elementa Chemia*) for adjusting the slope of the glass of hot-houses, so as to admit the greatest number of the sun's rays, according to the latitude of the place, &c. These principles were afterwards adopted by Linneus at Upsal, and by most of the directors of botanic gardens in Europe. It was in this garden, about the beginning of the eighteenth century, that the geraniæ and ficoidiæ, and other ornamental exotics were first introduced from the Cape.

The garden of Leyden was visited by Sir J. E. Smith in 1786 (*Tour*, &c. vol. i. p. 11.), who observes, that it had been much enlarged within the last forty years, and was now about as large as the Chelsea Garden.

In 1819 it appeared rather neglected; many blanks existed in the general collection of hardy plants, and the hot-houses were much out of repair.

Leyden, Deleuze informs us, was, for more than fifty years, the only city in Holland where there was a botanic garden; but before the middle of the seventeenth century, they were established in all the provinces. Those of Amsterdam and Groningen merit particular notice. The former was under the direction of the two Commelins, John and Gaspar, and was the first garden in Europe that procured a specimen of the coffee-tree. A seedling of this tree was sent to Paris in 1714. Two seedlings from this plant were sent to Martinique in 1726, and these the Abbé Raynal observes (*Hist. de Commerce, tome* xvi. ch. 20.) produced all the coffee-trees now cultivated in the French colonies.

The garden of Groningen was begun by Henry Munting, a zealous botanist and learned man, who had spent eight years travelling in the different countries of Europe, establishing correspondences between botanists and cultivators. He spent the greatest part of his fortune upon his garden; but, in 1641, the states of Groningen, thinking so useful an establishment ought to be under the protection of the republic, purchased it, and appointed him professor. The catalogue of this garden, published in 1646, contains about 1500 plants, without comprehending more than 600 varieties; 100 of pinks, and 150 of tulips. Henry Munting was succeeded by his son, Abraham, esteemed for his posthumous work *Phytographia Curiosa.*

Both these gardens are still kept up, but without that enthusiastic ardor which distinguished the citizens of Holland, when under more auspicious political circumstances than they are at the present time.

The Antwerp garden was formerly one of considerable repute in the Low Countries. In 1579 a catalogue of this garden was given by Dodoens (*Florum et Coronarium arb. Hist.*), which contained a considerable number of plants, including a great variety of tulips and hyacinths. This garden is still kept up, and is, perhaps, next in order to that of Ghent.

44. In the beginning of the seventeenth century, double flowers were first noticed, or brought into repute, which may be said to have created a new era in gardening, and certainly laid the foundation in Holland of a considerable commerce: — the more valuable, as it is totally independent of political or civil changes, and founded on the peculiar qualities of the soil and climate for growing bulbous roots. The florimania, as it is termed by the French, existed in the highest degree among the Dutch, from the beginning to the middle of the seventeenth century. Many noted instances are on record, of the extravagant sums given for flowers possessing certain qualities agreed on by florists as desiderata, and established about this time as canons of beauty. Hirschfield states, that in the register of the city of Alkmaar, in the year 1637, they sold publicly, for the benefit of the Orphan Hospital, 120 tulips, with their offsets, for 9000 florins; and that one of those flowers, named the Viceroy, was sold for 4203 florins. When we consider the value of money at this remote period, these sums appear enormous, a florin at that

time in Holland (Anderson's *History of Commerce*) being the representative of nearly an English bushel of wheat.

At present this mania is much abated, not only in Holland but throughout Europe, having, about the middle of the last century, given way to the more scientific taste for the new plants then beginning to be introduced from North America, the Cape, and the Indies.

The number of florimanists, Bosc observes, was much more considerable towards the middle of the last century than at this moment (1809). "One does not now hear of twenty thousand francs being given for a tulip; of a florist depriving himself of his food, in order to increase the number and variety of his anemonies, or passing entire days in admiring the colours of a ranunculus, the grandeur of a hyacinth, or trembling, lest the breath of an over-curious admirer should hurt the bloom of an auricula."

Holland, Deleuze observes, had at the end of the seventeenth century, a crowd of distinguished botanists; and was then, as during the century preceding, the country the most devoted to gardening. In 1737, the garden of Clifford, near Haerlem, of which Linneus published the history, was the most celebrated. Clifford got all the new plants from England, and corresponded with the botanists of every country.

Boerhaave gave him the plants of the Leyden garden; Siegesbeck sent him those of Russia; Haller, those of the Alps; and Burman, Roell, Gronovius, and Miller, sent him portions of the seeds which they received from different parts of the world. This garden had four magnificent hot-houses; one for the plants of the Levant and the south of Europe, one for Africa, one for India, and one for America.

In the present day, the richest and best kept garden of the Netherlands, is that of Ghent, established in the latter part of the last century. The area is larger than that of most botanic gardens: it has a considerable collection of hardy herbaceous plants, arranged after the Linnæan method; a pleasure-ground, in which the trees and shrubs are distributed in natural families, and so as to combine picturesque effect; and a range of hot-houses with glass roofs, in the English manner. In the pleasure-ground the busts of eminent botanists are distributed with good effect; and on the large boxes of palms, and other exotics, are marked the name of the donor, or the year in which the plant or tree was originated or introduced to the garden. On the whole, it is more complete than any garden we have seen south of the Rhine, excepting that of Paris.

The royal botanic-garden of Brussels, is of a very inferior description: that of the Prince of Salm-Dyck, near Anholt, is noted for a good collection of succulents, of which the owner is said to be passionately fond. See *Hortus Dyckensis*, 1816.

Subsect. 3. *Dutch Gardening in respect to the Culture of Fruits and Culinary Vegetables.*

45. Notwithstanding the eminence of the Dutch in this branch, we have almost nothing to offer in the way of historical information. Those gardens, which Gesner and Stephanus informs us were so richly stocked with flowers early in the sixteenth century, would, no doubt, be equally so with fruits and legumes. One of the earliest books on the horticulture, of the Low Countries, is that of Van Osten, published about the end of the seventeenth century. They appear at that time to have had all the fruits, now in common cultivation, in considerable variety, excepting the pine-apple which Miller informs us was then introduced by Le Cour of Leyden, from the West Indies, although not mentioned by Van Osten, or Commelin. It is generally said, that about the same period all the courts in Europe were supplied with early fruits from Holland. Bénard admits, (*Repertory of Arts*, 1802,) that this was the case with the court of France so late as the reign of Louis the Fourteenth. Miller, informs us that Le Cour paid great attention to gardening, and especially to the culture of wall-fruits, and that he tried the effects of different kinds of walls and modes of training. Speechly, early in the eighteenth century, made a tour in that country, chiefly to observe the Dutch mode of cultivating the pine and the grape; they forced, he informs us, (*Tr. on the Vine*,) chiefly in pits and low houses, and produced ripe grapes of the *sweet-water* kind in March and April.

When forcing-houses were first used in Holland, we have not been able to learn. It is singular that they are not once mentioned in the early editions of Van Osten, published from 1689 to 1750; but Adanson (*Familles des Plantes, Preface*,) writing about the latter period, speaks of the hot-houses of the Dutch in terms which evidently refer to forcing-houses. Orangeries, and botanic-houses, we have seen (43.) were in use so early as 1599.

Within the last twenty years the demand for forced productions has greatly diminished in Holland. Summer, or what are called main crops, are now chiefly attempted, both in public and private gardens; but after the annexation of Holland to France, and since its subsequent union with Flanders, the spirit for enjoyments of even this sort has declined with the means of procuring them.

The Low Countries are celebrated for good varieties of the apple and pear. The supplies of these articles sent to the markets of Brussels, Antwerp,- and Amsterdam, are equal, if not beyond any thing of the kind to be met with elsewhere in Europe. The climate of Flanders suits these fruits, and that of Holland is peculiarly favorable for the herbaceous tribe of edible plants. Forcing, in pits and frames, is there carried to great perfection, and melons and pines of a large size are, at the present time, sent to the London and Paris markets, and sold for very moderate prices. Brussels is noted for the greens or sprouts, which bear the name of that town; and Van Mons informs us, (*Hort. Trans.* 3. 197.) that they are mentioned in the market regulations of that city so early as 1213.

The Caledonian Horticultural Society, in 1817, sent a deputation of three of their members to inspect the gardens of Holland, with a view to horticultural enquiries, but the result of their journey has not yet been published.

Subsect. 4. *Dutch Gardening, in respect to the planting of Timber Trees and Hedges*

46. In a country so thickly peopled as Holland, and so conveniently situated in respect to marine commerce, it is not likely that much ground would be devoted to merely useful plantations. In the more inland parts of Flanders, there are natural forests; these have been, and continue to be kept up, and in some cases increased in extent by planting land too poor for cultivation. We observed, in 1819, some belts and clumps forming, in the English manner, on some waste lands near Cambray, and that the Duke of Wellington was planting on his estate at Waterloo.

Between Aranagoen and Rhenen, a tract of land, several miles in extent, and no better in quality than Bagshot-heath, is planted with Scotch firs, Weymouth pines, beech, and birch; and many hundred acres adjoining have been sown with acorns for copse, and enclosed with thorn hedges.

The principal plantations of the Dutch, however, are avenues, hedge-rows, and ozier holts. In these they excel, and the country in consequence resembles a series of gardens. The elm and oak are the chief trees used in their avenues, which, being public property, are under the care of proper officers. Judging from the vigorous growth of the trees, and the manner in which they are pruned, these officers seem to understand their business, and to do their duty.

The hornbeam is a very common plant for the garden hedges. Every plant in the row or hedge is trained with an upright stem, and the side shoots are shorn so closely, that we often find hedges of six or eight feet high, not more than eighteen inches wide at base, contracted to six inches wide at top. These hedges receive their summer shearing in July, by which time scarlet runners are ready to shoot up from the garden side of their base, which in the course of two months, cover the hedge with their fresh verdure and brilliant blossoms, and present a good crop in October and the beginning of November.

The Dutch have also very excellent field-hedges of birch and willow, as well as of all the usual hedge-plants, and the gardeners are particularly dextrous at cutting, training, and shearing them.

The deep moist grounds on the banks of their estuaries are particularly favorable for the growth of the willow, and the hoops of two years growth from the Dutch willow, (a variety of *salix alba*, with a brownish bark,) are in great esteem in commerce.

Their common basket-willows (S. *viminalis*) are also excellent.

Subsect. 5. *Dutch Gardening, as empirically practised.*

47. Happily the use of gardens is universal in the Netherlands; and of the Dutch and Flemings it may be truly said in the words of Lord Temple, " that gardening has been the common favorite of public and private men; a pleasure of the greatest, and a care of the meanest, and indeed an employment and a possession, for which no man there is too high nor too low."

The gardens of the cottagers in these countries are undoubtedly better managed and more productive than those of any other country; no man who has a cottage is without a garden attached; often small, but rendered useful to a poor family by the high degree of culture given to it. Every available particle of matter capable of acting as a manure is assiduously collected, and thrown into a neat ridge, cone, or bed, which is turned over frequently, and when sufficiently fermented and ameliorated, applied to the soil. The plants in general cultivation in the cottage-gardens are, the cabbage tribe, including Brussels sprouts, the white beet for the leaves and stalks, the parsnip, carrot, yellow and white turnip, potatoe, the pea, bean, and kidney-bean; the apple, pear, and currant, and, in some places, the vine trained over the cottage, are the fruits; and double stocks, rockets, wall-flowers, pinks, violets, roses, and honey-suckles, the leading flowers and plants of ornament.

It is almost unnecessary to add, that the gardens of the tradesmen, farmers, citizens, private gentlemen, and princes, rise in gradation, in extent, riches, and high keeping.

In the neighbourhood of Amsterdam, Haerlem, and Antwerp, are the principal nurseries and florists' gardens. These nurseries formerly supplied trained trees, vines, and all the most valuable plants to Britain, and other parts of Europe; and the florists still continue to monopolize the commerce of bulbous roots. Great part of the fruit-trees sent by London and Wise from their nursery at Brompton Park, in the beginning of the eighteenth century, were previously imported from Holland; many of them, reared in large wicker-baskets, were sent over in that state, and produced fruit the first year after final planting.

Justice (*Brit. Gard. Dir.*) gives credit to the Dutch nurserymen for accuracy and punctuality; he mentions Voerhelms and Van Zompell as tradesmen which he could recommend; and it is remarkable, that the same establishment (now G. Voorhelm Schneevooght) is the most eminent at this day.

The operative gardeners in Holland are for the most part apprenticed, and serve as journeymen before they are employed to undertake the care of gardens where several hands are employed; but every labourer is considered as capable of cropping and dressing an ordinary tradesman or farmer's garden.

There are few or no artist gardeners in Holland. Eminent practical gardeners are employed to lay out walled kitchen-gardens; and artists from Paris generally called in to lay out parks or pleasure-grounds of more than ordinary extent.

Subsect. 6. *Dutch Gardening, as a Science, and in respect to the Authors it has produced.*

48. Horticulture has, perhaps, been less cultivated as a science in the Netherlands than in Italy or France. The botanists of the country were not among the first to advance the study of physiology, nor has any of their practical men appeared with the science of a Quinteney or a Miller.

" The patience and riches, Bosc observes, which produced so high a degree of florimania in Holland, might have been usefully employed in advancing vegetable physiology; but science owes nothing to the Dutch in this branch."

At the present time, when science is so rapidly and so universally spread, the learned in the Netherlands are unquestionably on a footing with those of other countries, a proof of which may be derived from the remarks of Van Mons, Van Marum, and other Dutch and Flemish correspondents of our Horticultural and Linnæan Societies.

The majority of working gardeners may be considered as nearly on a par with those of this country in point of science, and before them in various points of practice.

The Dutch and Flemings, as already observed, have produced few books on gardening, and the reason may be, the universality of practical knowledge in that country. Commelin and Van Osten are their principal authors. The former published the Hortus Amstelodamus, in 2 vols. folio, in 1697, and subsequently a small work on orange-trees; and Van Osten, who was gardener at Leyden, published his Dutch Gardener about 1710. Various French works on gardening have been printed at the Hague, and other parts of Holland.

Sect. III. *Of the Rise, Progress, and present State of Gardening in France.*

Three æras mark the gardening of France; that of Charlemagne, in the eighth; of Louis XIV., in the middle of the seventeenth; and that of the Revolution, at the end of the eighteenth centuries. The first introduced the best fruits, and spread the use of vineyards and orchards; the second was marked by splendor in design; and the third by increased botanical and scientific knowledge.

Subsect. 1. *French Gardening, as an Art of Design and Taste.*

49. Though the gardening of Charlemagne was chiefly of the useful kind, yet he is said (see *Nigellius*) to have had a noble palace at Ingleheim, on the Rhine, supported by a hundred columns of Italian marble. This could hardly be erected, without an accompanying and decorative garden, though the frugal habits of that prince might prevent an extravagant display of design.

Any notices of gardening in France previously to the sixteenth century, chiefly relate to other branches than that under consideration. At the end of this century, Francis the First married the daughter of Leo the Tenth; and there is no doubt, that during this reign the court at least, began to copy something of what that illustrious pontiff had done in Italy.

Stephens and Liebault published their *Maison Rustique* about this time; the early editions contain little on the subject of design, farther than directions for forming avenues, arbors, and flower-gardens.

In the beginning of the seventeenth century, Hirschfield observes, the gardens of France consisted only of a few trees and flowers, some plots of turf, and pieces of water; the whole, he adds, according to their own accounts, "totally deprived of taste, and completely wild and neglected."

Evelyn, who visited France in 1644, the second year of Louis the Fourteenth's reign, makes the following remarks on the gardens in and near Paris.

"*The Garden of the Thuilleries* is rarely contrived for privacy, shade, or company, by groves, plantations of tall trees, especially that in the middle, being of elms, and another of mulberries. There is a labyrinth of cypress, noble hedges of pomegranates, fountains, fish-ponds, and an aviary. There is an artificial echo, redoubling the words distinctly, and it is never without some fair nymph singing to it. Standing at one of the focuses, which is under a tree, or little cabinet of hedges, the voice seems to descend from the clouds; at another, as if it were under ground. This being at the bottom of the garden, we were let into another, which, being kept with all imaginable accurateness as to the orangery, precious shrubs, and rare fruits, seemed a Paradise."

St. Germains en Lay. "By the way I alighted at St. Cloes, where, on an eminence near the river, the archbishop of Paris has a garden, for the house is not very considerable, newly watered, and furnished with statues, fountains, and groves; the walks are very fine; the fountain of Laocoon is in a large square pool, throwing the water near forty feet high, and having about it a multitude of statues and basins, and is a surprising object; but nothing is more esteemed than the cascade, falling from the great steps into the lowest and longest walk from the Mount Parnassus, which consists of a grotto, or shell-house, on the summit of the hill, wherein are divers water-works, and contrivances to wet the spectators."

"*Cardinal Richelieu's Villa at Ruell.* The house is small, but fairly built in form of a castle, moated round. The offices are towards the road, and over-against them are large vineyards walled in.

"Though the house is not of the greatest size, the gardens about it are so magnificent, that I doubt whether Italy has any exceeding it for varieties of pleasure. The garden nearest the pavilion is a parterre, having in the midst divers brass statues, perpetually spouting water into an ample basin, with other figures of the same metal; but what is most admirable is the vast inclosure, and a variety of ground in the large garden containing vineyards, corn-fields, meadows, groves, (whereof one is of perennial greens), and walks of vast lengths, so accurately kept and cultivated, that nothing can be more agreeable. On one of these walks, within a square of tall trees, is a basilisk of copper, which, managed by the fountaineer, casts water near sixty feet high, and will, of itself, move round so swiftly, that one can hardly escape wetting. This leads to the *Citronière* where is a noble conserve of all those rarities; and at the end of it is the arch of Constantine, painted on a wall in oil, as large as the real one at Rome, so well done, that even a man skilled in painting may mistake it for stone and sculpture. The sky and hills, which seem to be between the arches, are so natural, that swallows and other birds, thinking to fly through, have dashed themselves against the wall. At the farther part of this walk is that plentiful, though artificial, cascade, which rolls down a very steep declivity, and over the marble steps and basins, with an astonishing noise and fury; each basin hath a jette in it, flowing like sheets of transparent glass, especially that which rises over the great shell of lead, from whence it glides silently down a channel, through the middle of a spacious gravel-walk, terminating in a grotto. Here are also fountains that cast water to a great height, and large ponds, two of which have islands for harbour of fowls, of which there is store. One of these islands has a receptacle for them, built of vast pieces of rock, near fifty feet high, grown over with moss, ivy, &c. shaded, at a competent distance, with tall trees; in this the fowls lay eggs and breed. We then saw a large and very rare grotto of shell-work, in the shape of satyrs, and other wild fancies; in the middle stands a marble table, on which a fountain plays in forms of glasses, cups, crosses, fans, crowns, &c. Then the fountaineers represent a shower of rain from the top, met by small jets from below. At going out, two extravagant musketeers shot us with a stream of water from their musket-barrels. Before this grotto is a long pool, into which ran divers spouts of water from leaden escallop basins. The viewing this Paradise made us late at St. Germains."

St. Germains. "The first building of this palace is of Charles V. called the Sage; but Francis I. (that true *virtuoso*) made it complete. Speaking as to the style of magnificence then in fashion, which was with too great a mixture of the Gothic, as may be seen of what there is remaining of his in the old castle, an irregular piece as built on the old foundation, and having a moat about it. It has yet some spacious and handsome rooms of state, and a chapel neatly painted. The new castle is at some distance, divided from this by a court, of a lower but more modern design, built by Henry IV. To this belong six terraces, built of brick and stone, descending in cascades, towards the river, cut out of the natural hill, having under them grandly vaulted galleries; of these, four have subterraneous grots and rocks, where are represented several objects, in the manner of scenes, and other motions by force of water, shown by the light of torches only; amongst these is Orpheus, with his music, and the animals which dance after his harp; in the second, is the king and dolphin (dauphin); in the third is Neptune sounding his trumpet, his chariot drawn by sea horses; in the fourth, Perseus and Andromeda; mills, hermitages, men fishing, birds chirping, and many other devices. There is also a dry grot to refresh in, all having a fine prospect towards the river, and the goodly country about it, especially the forest. At the bottom is a parterre; the upper terrace near half a mile in length, with double declivities, arched and balustered with stone of vast and royal cost.

"In the pavilion of the new castle are many fair rooms, well painted, and leading into a very noble garden and park, where there is a pall-mall, in the midst of which, on one of the sides, is a chapel with a stone cupola, though small, yet of a handsome order of architecture. Out of the park you go into the forest, which, being very large, is stored with deer, wild boars, wolves, and other wild game. The Tennis-court, and Cavalerizzo, for the maneged horses, is also very observable."

"*The Count de Liancourt's Palace*, in the *rue de Seine*, is well-built. Towards his study and bed-chamber joins a little garden, which, though very narrow, by the addition of a well-painted perspective, is to appearance greatly enlarged; to this there is another part, supported by arches, in which runs a stream of water, rising in the aviary, out of a statue, and seeming to flow for some miles, by being artificially continued in the painting, where it sinks down at the wall. It is a very agreeable deception. At the end of this garden is a little theatre, made to change with divers pretty scenes, and the stage so ordered that figures of men and women, painted on light boards, and cut out, are by a person who stands underneath, made to act as if they were speaking, by guiding them, and reciting words, in different tones, as the parts require, &c."

"*A pretty Garden at Caen*, planted with hedges of alaternus, having at the entrance a screen of an exceeding height, accurately cut in topiary work."

The Gardens of the Luxembourg are near an English mile in circumference. "The parterre is, indeed, of box, but so rarely designed and accurately kept cut, that the embroidery makes a wonderful effect to the lodgings which front it. The walks are exactly fair, long, and variously descending, and so justly planted with limes, elms, and other trees, that nothing can be more delicious, especially that of the hornbeam hedge; which, being high and stately, buts full on the fountain." *Memoirs*, vol. i. 40—52.

1649. "Visited President Maison's palace and gardens, between St. Germains and Paris. The palace is environed by a dry moat; the offices underground, the gardens are very excellent, with extraordinary long walks, set with elms and a noble prospect towards the forest, and on the Seine towards Paris. Take it altogether, the meadows, walks, river, forest, corn-ground, and vineyards, I hardly saw any thing in Italy to exceed it. The iron gates are very magnificent." *Memoirs*, *p.* 239.

50. Le Notre Daies Barrington observes, (*Archæologia*,) during the reign of Louis the XIV. improved and settled the French taste in laying out gardens. His taste and style continued in full repute for upwards of a century; and appears to have been in general vogue so late as 1771, fifty years after the introduction of the modern style in England. However remarkable this may appear, it is a fact which does not admit of a doubt; for Millin, the editor of the Journal Encyclopedique, in a critique on the translation of Wheatley's *Observations on Modern Gardening*, published that year, after the most liberal encomiums on the work, expresses his doubts as to how the modern style would be received in France, where, he adds, "Le Notre's school is still followed, and every rich proprietor is anxious that his garden, if it does not resemble, shall at least recal to his mind those of the court, at Versailles, Trianon, Meudon, Sceaux, or Clugny."

"If Le Notre, observes Hirschfield, had been born under any other monarch than Louis the XIV. his taste would, in all probability, never have spread, or his name been known to posterity. But that age, in which a feeling for the fine arts had begun to awake in men's minds, together with the personal character of this monarch, was favorable to pomp and brilliancy. The nation and the court wished to be dazzled and enchanted by novelty and singularity; and though there certainly was nothing in Le Notre's manner that had not before been displayed in France and Italy, and with the exception of parterres, even by the Romans, yet the grand scale and sumptuous expense of the plans surpassed every thing before seen in France, and produced precisely the desired end. His long clipt alleys, triumphal arches, richly decorated and highly wrought parterres; his fountains and cascades, with their grotesque and strange ornaments; his groves, full of architecture and gilt trellises; his profusion of statues and therms; all these wonders springing in a desert-looking open country, dazzled and enchanted every class of observers."

Le Notre was educated an architect, and had attained his fortieth year before he finished his first work in the rural department of his profession, the garden of *Vaux le Vicompte*, afterwards *V. le Villars*, and now Praslin. The king, enchanted with this decoration, made Le Notre his controller-general of buildings and director of gardens, loaded him with presents, gave him a patent of nobility, and made him Knight of the Order of Saint Michael. His principal works are Versailles, which cost nearly 200 millions of francs; Trianon, Meudon, Saint Cloud, Sceaux, Chantilly, and the celebrated terrace of Saint Germains. The gardens of the Tuilleries, the Champs Elysees, and many others were either formed by him or improved from his designs. In 1678 he went to Italy, where he furnished the plans of several gardens, particularly those of the villas Pamphili and Ludovisi. England, Sweden, and all Europe adopted his manner. He died in 1700. *Hirschfield*, tom. v. 298.

The gardens of Versailles have been so frequently described, and are so generally known, that we shall only quote one or two opinions concerning them. Hirschfield considers them, not as models of taste, but as models of a particular class or character of gardens. Gray the poet was struck with their splendour when filled with company, and when the water-works were in full action. Lord Kaimes says they would tempt one to believe that nature was below the notice of a great monarch, and therefore monsters must be created for him, as being more astonishing productions. Bradley says, "Versailles is the sum of every thing that has been done in gardening." Agricola, a German author, declares (*Phil. Treat. on Ag. trans. by Bradley*,) that the sight of Versailles gave him a foretaste of Paradise. Our opinion coincides with Gray's: "Such symmetry," as Lord Byron observes, "is not for solitude."

After Le Notre, Dufresnoy, controller of buildings, whose taste differed entirely from that of his predecessor, determined on inventing a style different and more picturesque. He preferred unequal surfaces, and sometimes attempted these by art. His style had something of the modern English manner, but his projects were rarely carried into execution. He was accused of being too expensive, but it is more probable that the chief objection to his taste was the continued prevalence of that of his predecessor. However, he constructed, in a style superior to that of Le Notre, the gardens of the Abbé Pajot, near Vincennes, and in the Faubourg Saint Antoine, two other gardens of his own, now known under the names of Moulin and of Chemincreux.

Marly has been erroneously attributed to Dufresnoy, but it was constructed from the plans of the architect Drusé, controller of the works at Saint Germains. The garden of Bagnolet is the principal work of Desgodetz, a relation of Le Notre.

Chapelle d'Isle and the brothers Mansard, and other architects, at that time constructed several gardens in France, but on the general plan of that of Le Notre. Le Blond, a pupil of this artist, has given a complete view of his style in his *Theorie des Jardins*. Millin considers Dufresnoy as an artist of much greater genius than Le Notre, and more attached to natural beauties, though less known by his talent for designing gardens than by his comedies.

"The natural taste of the French," observes Professor Hirschfield, in 1777, "is chiefly devoted to what is light and brilliant, and has consequently stifled in that people every inclination for a rural life. The estates are almost every where ill cultivated, and the oppression, poverty, and filthiness of the peasantry have but few attractions. Love of gain draws men to cities; devotion, gallantry and the pleasures of society occupy the best families; and the ambition of the first class is the gratification of the vain pride of appearing at court. False grandeur dazzles the eyes of this nation to such a point, that the greatest misfortune that can happen to a minister of state, is permission to retire to his paternal domains; hence it arises that the French have few country houses or extensive gardens, in comparison with other countries equally civilized; for the famous gardens of Versailles, Marly and Fontainbleau belong to the king." "Custom and prejudice," he adds, "have endeavoured to erect this taste into a law for their own as well as other countries, instead of presenting it as a kind or species of taste, suitable to particular circumstances of country and society."

51. After the peace of 1762, the English style of gardening began to pass into France, and was soon afterwards pursued with the utmost enthusiasm. Hirschfield affirms that they set about destroying the ancient gardens, and replanting them in the English manner, with a warmth more common to the mania of imitation than the genius of invention. Even a part of the gardens of Versailles were removed, as De Lille laments, (*Les Jardins*, *4th edit. p.* 40.) to make way for a young plantation *à l'Angloise*.

Dufresnoy, as we have already stated, had been bold enough to depart from the formal style, and Gabriel Thouin, in the preface to his *Plans Raisonnés des Jardins*, *&c.* (1818,) says, this artist gave the model of natural gardens on a piece of ground which belonged to him in the Faubourg Saint Antoine, already alluded to, and thus fixed the principles of natural (that is English) gardening in France about the commencement of the last century. Laugier is the first French author who espoused the English style of gardening in France, in his *Essai sur' l'Architecture*, published in 1753; and next in order

Prevôt, in his *Homme du Goût*, published in 1770. About the same time, the first notable example was preparing at Ermenonville, the seat of Viscount Girardin, about ten leagues from Paris. An account of this place was written by Girardin himself in 1775, and published in 1777. It was soon after translated into English by D. Malthus, Esq. and is well known for its eloquent descriptions of romantic and picturesque scenes. Ermenonville (still in the same family, but now rather neglected,) appears to have been laid out in a chaste and picturesque style, and in this respect to have been somewhat different and superior to contemporary English places. Useless buildings were in a great degree avoided, and the picturesque effect of every object carefully considered, not in exclusion of, but in connection with their utility. There is hardly an exceptionable principle, or even direction referring to landscape-gardening laid down in the course of Girardin's Essay; and in all that relates to the picturesque, it is remarkable how exactly it corresponds with the ideas of Price. Girardin, high in military rank, had previously visited every part of Europe, and paid particular attention to England, and before publishing his work, he had the advantage of consulting that of Wheatley, Shenstone, G. Mason, and Chambers, from the first of which he has occasionally borrowed. He professes, however, that his object is neither to create English gardens, nor Chinese gardens, and less to divide his grounds into pleasure grounds, parks, or ridings, than to produce interesting landscapes, "*paysages interessans*," &c. He received the professional aid of J. M. Morel, the Kent of France, who afterwards published *Theorie des Jardins*, and probably that of his guest Rousseau, who seems to have composed the advertisement to his book. M. Magellan in the *Gazette Litteraire de l' Europe* for 1778, in giving some account of the last days of Rousseau, who died at Ermenonville, and was buried in the Island of Poplars there, informs us, that M. Girardin kept a band of musicians who constantly perambulated the grounds, making concerts, sometimes in the woods, and at other times on the waters, and in scenes calculated for particular seasons, so as to draw the attention of visitors to them at the proper time. At night they returned to the house, and performed in a room adjoining the hall of company. Madame Girardin and her daughters were clothed in common brown stuff, *en amazones*, with black hats, while the young men wore "*habillements le plus simple et le plus propres à les faire confondre avec les enfans du campagnards*," &c.

52. The next example of English gardening in France is of a very different description, and is that of M. Watelet, the author of an *Essai sur les Jardins*, which appeared in 1774. M. Watelet's garden was situated in the suburbs of Paris, and contained about four acres, varied by buildings, grottoes, temples, and inscriptions, and was on the whole, more in the Chinese style, than in that of Kent or Shenstone. The author, who professes to take utility for the basis of his art, seems to have felt something wanting in this particular, to his temples and altars, and is ridiculed by Hirschfield (*Theroie des Jardins*, tom. 1. p. 168.) for proposing occasionally "*de faire paroître aupres les temples, et les autels, les arcs de triomphe, &c. une troupe de pantomimes vetues suivant le costume necessaire imitant des ceremonies, faisant des sacrifices, allant porter, des offrandes*," &c. The object of such as attempt English gardening in France on a small scale is still more to imitate the garden of M. Watelet, than the "*paysages interessans*" of Girardin. In much better taste is the *Theorie des Jardins* of J. M. Morel, already mentioned, and published in 1776. It appears from this judicious writer, that very little had been done in France up to the period in which he wrote. One place only is mentioned besides Ermenonville as worthy of attention. Soon after this, Delille's celebrated poem, (*Les Jardins*,) made its appearance, and is perhaps a more unexceptionable performance than *The English Garden* of Mason. The French, indeed, have written much better on gardening and agriculture than they have practised,—a circumstance which may be accounted for, from the general concentration of wealth and talent in the capital, where books are more frequent than examples; and of professional reputation in that country, depending more on what a man has written, than on what he has done.

It does not appear that English gardening was ever at all noticed by the court of France. The garden of Mousseau, before the revolution the property of the Duke of Orleans, was laid out by Blaikey, an Englishman, in a romantic and irregular style, as were some scenes in that of the Petit Trianon, especially in the lower part of the grounds, now occupied by ruins, water, and a cottage, and in their kind very picturesque. Bagatelle, in the Bois de Boulogne, formerly a retreat of Count d'Artois, was laid out in the same taste. *Ed. Encyc.* xii. 543.

Besides these, De Lille cites the gardens of Belœil, the chateau of the Prince de Ligne, an enthusiastic admirer of gardens, (*Lettres et Pensées*, &c. 2 tom. 1809.) Montreuil, a garden of the Princess Gremené; Maupertuis, a garden of the Marquis de Montesquieu, with a beautifully varied surface, abundance of wood and water, and a desart after the manner of Monville. He mentions several others, all of which are figured in *Recueil des Jardins*, 16 *cahiers*, *folio*, and most of them described by Hirschfield, (tom. i. and v.) who considers Arnonville, and Ermenonville, as the two best specimens of English gardening in France.

During the consulate, Malmaison, the residence of Josephine, was laid out avowedly in the English style by Blaikey, and richly stocked with trees and shrubs from London. Since that time little has been done on an extended plan; and one may travel from one extremity of the kingdom to the other, without seeing any scene having the general external appearance of an English park. The works of this kind which are executed, are on a very limited scale, and crowded with walks and ornaments. Most of them may be called fanciful, ingenious, and pretty, but few are simple and grand.

53. With regard to the present state of this department of gardening in France, the royal gardens, the Tuilleries, Versailles, St. Cloud, and the Trianons are still kept up in a respectable style. Ermenonville is in possession of the son of its creator, who being friendly to the Buonaparte family, was made a president during the reign of a hundred days, and is consequently at present not in favour at Court. The grounds are still shown to strangers, but their effect, and the order in which they are kept is far inferior to what one is led to expect from the description in the *Essai sur la Composition des Paysages*, &c. and from what as we were informed (in 1815, and again in 1819,) actually was the case half a century ago. We saw no reason to admire the turf which Sir J. E. Smith informs us, (*Tour, &c.*) had been in 1786; about two years under the care of an intelligent Scotch gardener, and who "assured us, and indeed what we saw confirmed it, that the superior beauty of our British grass plats to those of other countries is principally owing to management, and not to soil and climate." The lawns of Girardin, and of the king in the grounds we have enumerated are, we fear, sad proofs of the fallacy of this gardener's opinion, and of the unsuitableness of dry arenaceous soils and warm climates for those "velvet lawns" which are at once the greatest beauty and the characteristic of English gardening in England.

There are various Chinese and English gardens in the neighbourhood of Paris which might be mentioned; what they call Chinese gardens differ from their English or (as G. Thouin calls them,) natural gardens, in being still more frittered down by walks, and ornamented by Chinese-looking ornaments. One of the prettiest town gardens in France, and which it is but justice to say is unequalled by any of the kind in Britain, is that of M. Bourseau, in Paris, (*Rue Mont Blanc*,) about an acre in extent; one of the handsomest and best kept villa gardens is that of Blaikey already mentioned, about two miles from Paris, and containing about forty acres.

The most natural-like garden in the neighbourhood of Bourdeaux, is that of Flochons; it is of moderate extent, a league from the city, and under the management (1819) of an English gardener.

Near Lyons is Hermitage, Guilliard St. Etienne, much spoken of in the guides, and by French tourists. It is of small extent, on the rocky umbrageous banks of the Saone, and thickly set with columns, statues, busts, and every sort of garden ornament, with a sort of museum. It is much too theatrical for a garden, and gives more the idea of folly in the proprietor than of any thing else. So much natural beauty required, at the utmost, only as much art as was sufficient to mark its appropriation by man.

Around Montpellier and Marseilles, there is nothing in the way of landscape-gardening worth mentioning.

The French revolution, however favorable to the progress of society, by the emancipation of energies and intellects, and by the general subdivision and distribution of property, has, as was to be expected, been injurious to gardening as an art of design; but if once the nation were politically content, a few years of quiet and prosperity, by enriching some and impoverishing others, would end in grouping property in more unequal masses: and the superfluous wealth of the opulent would be employed as before, under the advantages of much more skill to display, and taste to approve what is beautiful or excellent.

France, like most countries on the Continent, excels in public gardens or promenades: the demand for these arises from the social habits of the people and the mildness of the climate; and their growth, even in the middle of the cities, as in the Tuilleries and Boulevards of Paris, and the street avenues of Bourdeaux, Lyons, Marseilles, Montpelier, &c. is not impeded by the smoke of coal.

Subsect. 2. *French Gardening, in respect to the Culture of Flowers, and Plants of Ornament.*

54. The Gauls and the ancient people of the north, observes Deleuze (*Recherches, &c. Annales du Musée, tom.* 8. 1806.) did not occupy themselves with the culture of flowers, the taste for which was not introduced into these regions till commerce had produced relations with the Levant and the south of Europe. Charlemagne promoted agriculture, and especially orcharding and the culture of the vine. He loved gardens, and was most particular in giving directions to his gardeners. In his *Capitulaire de Villis et Curtis*, he enumerates seventy-three sorts of plants which he desires may be grown in all his gardens. All of these, however, excepting the rose and the lily, are medicinal; and these too, were probably used as herbs; for the greatest beauty, in barbarous times, is utility.

It was in the thirteenth century that ornamental plants began to be introduced to France as such. The crusades had brought to notice the gardens of the infidels in Egypt and Syria; the Christians could not avoid being struck with their beauty, imitated their plans, and imported their productions into Europe.

The culture of flowers, however, did not spread till the sixteenth century, when botany began to become a science, independent of medicine. Gardens were then constructed, destined for curious and beautiful plants; and the discovery of America, and the passage to the Indies, augmented their number. Travellers collected seeds, which they sent home to their respective countries; great care was bestowed on such as appeared the most ornamental; of some flowers, doubled varieties were produced, and the colours and size of others, varied by culture, till advancing, by degrees, they at length became an object of luxury, and trade and caprice, fashion and variety gave incredible prices for some of these productions; for in what, observes Deleuze, will extravagance not intermingle. In 1635, the varieties of tulips, ranunculuses, and anemonies in the Jardin des Plantes, exceeded that of the species in 1800. Evelyn mentions, in 1644, (*Memoirs*, I. 52.) a M. Morine, who from an ordinary gardener had become one of the most skilful persons in France, who had a rare collection of shells and flowers, and above 10,000 sorts of tulips alone. This florimania seems to have declined and given way to a taste for exotics, during the reigns of Louis the fifteenth and sixteenth, which has ever since continued to prevail.

55. The study of botany began to be cultivated in France at an early period, and has since attained great consideration in that country from the labours of Adanson, the two Jussieus, Mirbel, Humboldt, and De Candolle. The first botanic-garden was formed in 1597, at Montpelier in Henry the Fifth's reign, through the representations of Belon. In the following year it contained 1300 distinct species, the greater part gathered in the neighbourhood. The garden of Paris was founded by Louis the thirteenth, in 1626, and finished in 1634, after, as La Brosse the first director remarks, "eighteen years of prosecution, and six of culture." The subsequent history and description of this garden, at different epochs, are given by Adanson, Jussieu, and Thouin. It was visited by Sir J. E. Smith, in 1786, who observes that, "it used, in summer, to be the evening walk of literary people, and even of persons of fashion; and was, besides, frequented all day long by students of both sexes. Here ladies might be seen at close study dissecting flowers, and reading their descriptions; nor is it at all unusual, at Paris, for the fair sex to attend scientific lectures, in considerable numbers. The collection of plants is generally reckoned inferior to that of Kew; it contains, however, many plants not in England, mostly from Peru and the Levant."

The garden has been greatly enlarged and much improved since 1786, and now includes departments which may be considered, as far as vegetables are concerned, schools of horticulture, planting, agriculture, medicine, and general economy. In different volumes of the *Annales du Musée*, may be seen plans and descriptions of the garden, with the modes of instruction pursued by Professor Thouin. There can be no question of its being the most scientific and best kept garden in Europe; and in our opinion, the Chevalier Thouin, its director, and the professor of rural economy, has an equal claim to superiority as a scientific gardener.

The Trianon was established by Louis the XV. at the suggestion of the Duke de Noailles, for the display of exotic trees, and a general collection of plants, for the amusement of the royal family. Here B. de Jussieu disposed, for the first time, the plants in the order of natural families. The botanic department of this garden is at present in a state of neglect. There are various botanic-gardens established in the provinces of France, which maintain a regular correspondence with that of Paris as the common centre. Each of these gardens has, as it were, the care of the botany and horticulture (for these are not separated) of a certain district, and when any new or valuable plant is increased in the Paris garden, it is immediately distributed among the provincial gardens, to be by them cultivated and increased, and distributed among the nurserymen and practical gardeners. In this way good sorts of potatoes have been very generally distributed in France.

Since 1813, those provincial gardens have suffered for want of funds; and most of them are but indifferently kept up. We could not help being struck with this in viewing the very well-contrived new garden at Marseilles, almost without plants. The richest, for its size, and the best in order, after that of Paris, appeared to us (in 1819) to be that of Toulon.

Subsect. 3. *French Gardening, in respect to its horticultural Productions.*

56. Nature, Professor Thouin observes (*Essai sur l'Exposition, &c. de l'economie rural*, p. 55.) has only given to France, the acorn, the chestnut, the pear, the wild apple, and some other inferior fruits. Every thing else which we have, agreeable or useful, is the product of foreign climates, and we owe them in great part to the Phœnicians, Greeks, Carthaginians, Romans, and Saracens. The less ancient acquisitions are those of the crusades, or of accidental travellers. The pine, the peach, the fig, the mulberry, and cherry, and the olive, were doubtless introduced to France by the Romans; the orange by the Italians; and the pine-apple by the Dutch. Apples, pears, and plums, are the fruits recommended for cultivation by Charlemagne, in his *Capit. de Villis et Curtis, &c.* prepared about the end of the eighth century, and referred to by Montesquieu, as a *chef d'ouvre* of prudence, good administration, and economy. The Abbe Schmidt, informs us, (*Mag. Encyc.*) that this monarch, who had domains in every part of France, gave the greatest encouragement to the eradication of forests, and the substitution of orchards and vineyards. He was on terms of intimate friendship with the Saracenic Prince Haroun al Raschild, and by that means procured for France the best sorts of pulse, melons, peaches, figs, and other fruits. He desires that fennel, rosemary, sage, rue, wormwood, and above sixty other pot-herbs and medicinal plants, should be cultivated. One which he calls *anthyllus* (thought to be the house-leek) was to be planted before the gardener's house, probably as being vulnerary.

Oliver de Serres is considered by the French as the renovator of their agriculture. He wrote early in the sixteenth century, and was soon after followed by Stephens and Leibault, in whose *Maison Rustique* will be found the culture of gardens, and the catalogue of fruits and legumes of that day. They had then all the species at present in use, excepting the pine-apple, sea-kale, and some others of more recent introduction. Some remarks on the state of horticulture at the end of this century are given by Bénard (*Mem. de la Soc. Agr. du Seine et Oise*, 1801.) and L. Deslongchamps. (*Bon. Jard.* 1817–1818.)

Bénard informs us, that arcades open to the south were first erected in Henry IVth's time, for accelerating the growth of pease at St. Germain's en Laye; and that, in the end of the reign of Louis the XIVth, Fagon, at the Jardin des Plantes, constructed some hothouses with glass roofs, which he warmed with stoves and furnaces for the preservation of tender plants; and which gave rise to all the hand-glasses, frames, and houses subsequently erected in France. Melons and early cucumbers had been hitherto grown on beds of dung, and covered at night with loose straw; early salading was raised in pots and boxes exposed to the sun during day, and placed in sheds or arbours during night. But Richard Senior, observing what Fagon had done, built for himself at St. Germains, and afterwards for Louis XV. at Trianon, hot-houses, in which were seen, for the first time in France, peaches, cherries, plums, strawberries, bearing fruit in the depth of winter. In the *Ecole Potagere*, written by Combles about the year 1750, are the details relative to these buildings.

57. French horticulture received a grand accession of theoretical and practical knowledge from the writings of Quintinye. John de Quintinye was born at Poictiers in 1626, put to school among the Jesuits, took lessons in law, and afterwards travelled to Italy with M. Tambonneau. Here his taste for agriculture began, or greatly increased. He applied to its study as a science, and, on his return, Tambonneau committed his gardens to his care. He attracted the attention of the court soon afterwards, and was made director of several of the royal gardens during the reign of Louis XIV. Among other works, he wrote *The complete Gardener*, translated by Evelyn, and abridged by London and Wise. He died in 1701. After his death the King always spoke of him with regret, and Switzer says, assured his widow, that the King and she were equally sufferers.

Quintiney, in his work on fruit-trees, has developed a system of pruning, which has not yet been surpassed by that of any other author. Before his time the culture of wall, or espalier trees, was little attended to; gardens had been generally surrounded by high hedges, but for these were now substituted walls of masonry, or of earth *en pisé*. A considerable number of stone walls plastered over may be seen at Montreuil near Paris, a village celebrated for the culture of the peach-tree; at Argenteuil, noted for the culture of the fig, are a number formed *en pisé*; and this last manner of building is carried to a great extent in the neighbourhood of Lyons.

It is somewhat singular that the pine-apple has never been very successfully cultivated in France. The late Duke of Orleans, before the revolution, took over a complete English pinery from Lord Egremont, with the bricks, frames, flues, bark, plants, earth, and the gardener who managed them; but, after some years' trial, the culture of that fruit, in the Duke's gardens near Neuilly, was obliged, it is said, to be given up. We have heard of various other unsuccessful trials near Paris, and in different parts of France; but we suspect there has been some defect in all of them, as there are now tolerably good pines produced in M. Boursault's garden in Paris, and a few in the nursery of M. Sédi at Lyons.

France long supplied a great part of Europe with fruit-trees, from the celebrated nursery of the Fathers of the Chartreuse. That establishment does not now exist; but V. Hervé, the son of its manager, has the care of the collection of fruit-trees and vines in the national garden of the Luxembourg. This extensive collection was formed by Chaptal, the celebrated chemist, when minister of the interior, with a view to ascertain the best sorts, and distribute them in the provinces. See the preface to the Catalogue of the Luxembourg Garden, 1814; and also *Cours d'Agriculture*, &c. art. *Vigne*.

SUBSECT. 4. *French Gardening, in respect to the planting of Timber-trees and Hedges.*

58. Planting for profit has never been extensively practised in France, owing to the abundance of natural forests in every part of the kingdom. These forests were much neglected till within the last thirty years; but they are now (being mostly national property) under a more regular course of management; their limits defined by fences, and the blanks filled up from the national nurseries. The roads of France being also kept up by government, much attention is paid to lining them with rows of trees. In some places, as in Alsatia, the walnut, cherry, apple, pear, and other fruit-trees are used; in other districts the elm, oak, or poplar are employed; and in the south, we frequently find the mulberry, and sometimes the olive. The resinous tribe are rarely planted, but for ornament; the oak, elm, beech, and Spanish chestnut, are the chief sorts used to fill up blanks in the natural forests.

Duhamel, in Louis XVth's time, first projected the idea of cultivating and naturalizing foreign trees in France: he procured many seeds from America, raised them in the royal nurseries, and distributed them among his friends. A vast plantation of exotic trees was made at St. Germain's en Laye by the Mareschal de Noailles, in Louis the XVth's time. Lamoignon naturalised on his estate at Mulsherbes a great number of these trees, and at the age of eighty-four, Deleuze observes, saw every where in France plants of his own introduction.

Hedges are not in general use in France; the plants employed in field-hedges, in the northern parts, are the hawthorn, birch, or a mixture of native shrubs, as hazel, briar, laburnum, &c. In Languedoc the most common plant is the wild pomegranate. In ornamental hedges they have attained great perfection, and for these the favorite plants are the yew, the horn-beam, and the box; for tall hedges, the lime and elm.

SUBSECT. 5. *French Gardening, as empirically practised.*

59. The use of gardens is very general in France. Few cottagers are without them, and in the northern districts, they commonly display a considerable degree of neatness, and some fruit-trees and flowers. The southern parts of the country are the least civilised; there the gardens of the laboring-class are less attended to, and gourds or melons, and Indian-corn, as in Italy, are the chief articles grown. The gardens of the ordinary citizens and private gentlemen in France, are greatly inferior to those of the same class in Holland, or Britain; they are seldom walled round, and rarely contain any arrangements for foreign or tender exotics. A green-house, indeed, is a rare sight, and there does not seem to exist the slightest desire for enjoying any vegetable production either earlier or later than their natural seasons. There are few wealthy men in France at present, and consequently few first-rate gardens; the best are in the northern districts, and belong to princes of the blood, bankers, and other opulent citizens. Those of the Dukes of Orleans and Bourbon, of Perigord, Laffite, and Delaborde may be included in this class; though they are far inferior to many citizens' seats and gardens in England.

There are excellent market gardens in the neighbourhood of Paris, where, by force of manure and daily waterings, the oleraceous tribe are brought to a large size and very succulent quality. Figs, for the market, are grown by a particular class of fruit-growers at Angenteuil; grapes at Fontainbleau, peaches at Montreuil, and cherries at various villages to the east of Paris. There are numerous florists who devote themselves exclusively to the culture of flowers, and supply the market with roses, lilies, stocks, and the more common greenhouse plants and orange trees. The latter are very neatly grafted, and otherwise well managed.

There are few nurseries in France; the best are at Paris, and are chiefly occupied with the culture of fruit-trees and ornamental shrubs. They excel in the culture of the rose, of which they have about 300 sorts, which form, to a small extent, articles of foreign commerce. The two best provincial nurseries are those of Audibert at Tonelle in Languedoc, and M. Sedi at Lyons. Noisette is the Lee, and Cels of Mont Rouge the Loddidge of Paris.

The operative gardeners in France are, in general, very ignorant. Few of them have learned their art by regular application, or the customary engagement of apprenticeship. At Paris they are poorly paid, and work much harder than the same class in England. Evelyn, in 1644, informs us that the work of the royal gardens was all done in the night-time, and finished by six or seven in the morning, in order, no doubt, that nothing offensive might meet the eyes of the great of these times. Happily such a chasm does not now exist between the rich and the poor; but still, partly for the same reason, but principally to avoid the mid-day sun, the great part of the work, in most private gardens, is performed from three to nine o'clock in the morning, and again from six to nine in the evening.

Of artists in gardening (*des artistes jardiniers et architects des jardins,*) there are a number in France, chiefly resident in Paris. Blaikey, an Englishman, already mentioned, and Gab. Thouin, brother to the professor, and author of *Plans Raisonnes des Jardins,* &c. (1818,) may be reckoned the most eminent.

Subsect. 6. *French Gardening, as a Science, and as to the Authors it has produced.*

60. The science of gardening is better understood in France among the eminent gardeners and professors than in any other country. Quintinye and Duhamel applied all the physiological knowledge of their day to the treatment of fruit and forest-trees; and the theory of grafting, of healing wounds, and of artificial excitements to fruitfulness was explained in their works. Buffon, Magnal, Parent, and Rosier, have brought the whole science of chemistry and of botany to bear on the various parts of gardening and rural economy, which they have treated in various works, but especially in the *Nouveau Cours d'Agriculture,* (14 vols. 8vo.) published in 1810.

The court and national gardeners have, for the last thirty years, been men eminent for scientific and practical knowledge; who have received a regular education, and rank with other crown officers. It is to be regretted, that in England, the royal situations have always been occupied by mere empirical practitioners, recommended by some court favorite, or succeeding by the common chances of life.

While we bestow this tribute to the science of the royal and other principal gardeners of France, it is our duty to add, that the great mass of operators, both as masters and labourers, are incomparably more ignorant both of gardening, as a science, and of knowledge in general, than the gardeners of this country; and the reason, which is as evident as in the other case, is, that there is no demand for good master gardeners. The pupils and apprentices of the *Jardin des Plants* are mostly sent to manage the provincial botanic gardens, or to the few proprietors who have first-rate gardens. Indeed, where there is no forcing, and few plants in pots, scientific gardeners are less necessary; the management of fruit-trees in France being reduced to mere routine.

Girardin, Morel and De Lille may be considered as having established the principles of gardening in France, as an art of design and taste; but it does not appear clear that the present artists have caught their principles. As to the practical gardeners, they cannot even read (so as to understand) the books which contain them.

The French authors on gardening are very numerous, but Quintinye is their most original and meritorious writer on horticulture, Duhamel on planting, and Girardin and D'Argenville on landscape gardening. Their works on flowers are chiefly translations from the Dutch.

Sect. IV. *Of the Rise, Progress, and present State of Gardening in Germany, Switzerland, and Sweden.*

Under Germany we mean to include the whole of the Germanic confederation, as arranged in 1815, excepting the Netherlands, already noticed in a former section, but including Switzerland, as being more nearly allied to Germany in respect to gardening than to Italy or France; and Sweden, as more nearly allied to Germany than to Russia. The materials which we have been able to collect for this section are exceedingly scanty; and, indeed, it appears from Hirschfield that gardening made little progress in Germany till the seventeenth century. At present, the taste for our art there is very considerable, and seems to have received a new stimulus from the recent peace.

Subsect. 1. *German Gardening, as an Art of Design and Taste.*

61. The gardens of Germany, observes Hirschfield, in 1777, have been a long time submitted to the symmetrical style of the French; and our architects, in making themselves masters of the gardens, as well as of the houses, tended to spread and perpetuate

the prejudice. "A singular and deplorable Gallomania pervaded Germany from the prince to the peasant, which neither irony, patriotism, nor productions which show the force of our natural genius could destroy; '*ainsi font les françois, voila ce que j'ai vû en France;*' these words were sufficient to reduce the German to a mere copyist, and in consequence, we had French gardens, as we had Parisian fashions." Our nobles gave the first example of imitation, and executed on their estates little miniatures of Versailles, Marly, and Trianon.

But now, he adds, the Aurora of judgment and good taste begins to arise in our country, and the recitals of the happy changes made in England in the gardens, has prepared the way for the same revolution in Germany. However, we cannot complain of the suddenness of that revolution, and that the imitation of the English taste spreads too rapidly; it appears on the contrary, that we begin to think for ourselves, and reflection proceeds much slower than mere imitation. We may meet perhaps here and there several copies of the British manner, perhaps even of the Chinese style; but we expect to see the Germans inventing and combining for themselves, and producing gardens stamped with the impression of national genius. *Theorie des Jardins*, tom. i. 83.

As a contrast to the opinion of Hirschfield, may be mentioned that of his countryman and cotemporary Meyer, (*Pomona Franconia*, 1776,) a scientific practical gardener and author, who studied his art in the royal gardens at Paris, and afterwards spent some time in England viewing the principal country seats. He considers grounds laid out in the ancient style, as "insipid and monotonous, from their regularity, and only calculated to produce sadness and *ennui*. If their aspect strikes at the first glance, it fatigues and tires at the second, and certainly is revolting and disgusting at the third." He admires English gardens in England, but states three objections to their introduction in Germany. The inferiority of the pasturage, the expence and want of space, and the necessity and advantage of attending to the culture of legumes and fruits. A mixed style is what he prefers, and what he has adopted in the episcopal gardens, he laid out and managed at Wurzburg.

According to Reichard (*Reise durch Deutschland*, &c.) the first example of an English garden in Germany, was a small one (*Garten der Schwobber*,) in Westphalia, in the neighbourhood of Pyrmont. It was laid out about the year 1750, with winding walks and clumps, and a rich collection of rare trees and plants. Hinuber's English garden at Hanover, and that of Marienwerder in its neighbourhood, were begun about the same time; and soon after was commenced the splendid example exhibited by field-marshal Lacy at Dornbach, near Vienna, and which, it is said, originated in the family connections of that warrior with England. It was finished in part by an English gardener, in 1770, at an expence of half a million of florins. Its picturesque views and distant prospects are much and deservedly admired; but on the whole, as an English garden, it owes much more to nature than to art. After this, the new taste, as Hirschfield remarks, became general in the empire, in Russia, Switzerland, and Denmark. The most noble example of a garden in the ancient style in Germany is that of Schoenbrunn at Vienna; and of an English garden, according to our idea of what that ought to be, at Dronningard, near Copenhagen.

Having given a general idea of the history of this branch of gardening in Germany, we shall now submit some slight notices of the art under the different governments of the empire.

62. *Austria.* We are informed by Dodoens and L'Ecluse, that a grand effort was made in gardening by the emperor Maximilian, chiefly with a view to encourage botany. Francis the first, about the middle of the seventeenth century, laid out or greatly enlarged the gardens of Schoenbrunn, after the plans of Steckhoven, a Dutch artist. These gardens occupy a plain and a long ridge or hill near the capital, and are much admired for their extent and simple, though formal grandeur. They are inferior to those of Peterhoff and Versailles in respect to fountains, and to those of *Sans Souci* and *Lodovisi* for statues and antiques; but for simple massive grandeur, for shade and verdure, and all the characteristic beauties of the ancient style, they are, we believe, superior to any gardens now existing in Europe.

The *Augarten* (eye-garden, or garden of pleasure) is a public promenade in the suburbs of Vienna. It is a square spot of ten acres, surrounded by an elevated broad terrace-walk, commanding extensive views; and the area is planted and subdivided by walks. At the entrance is a magnificent coffee-house. It was formed during the reign of the benevolent emperor Joseph, whose particular wish it was, that it should be open to every class of citizens.

The *Prater*, or meadow, is an extensive public promenade of a different description, and suited both for promenades *en cheval* and *au pied*. It forms part of an island in the Danube, and consists of an artificial grove used as a tea-garden; an avenue as a course for carriages, but chiefly the scattered remains of an ancient forest of oaks and thorns used for walking, and for exhibiting all manner of fêtes. We consider it the most agreeable scene of the kind on the continent. Here, in the summer evenings, all Vienna is assembled; the imperial family mix familiarly with the people, and Francis the Third, unattended, and in the plainest garb, selects his table and rush-bottomed chair, and calls for his coffee and segar, like any other citizen. Economical in his administration, frugal in his personal expences, and exemplary in his morals, he has nothing to fear from a personal familiarity with his subjects. The imperial gardens of Luxembourg, are extensive, avowedly English, and display a good deal of our manner; but more, as we have elsewhere observed (*Ed. Encyc.* art. *Landscape G.*) in the taste of Brown than of Kent.

63. In *Hungary*, Hirschfield in 1783, says there are only the gardens of Esterhaz (Prince Esterhazy) worthy of notice, and that they were chiefly indebted to the beauty of the palace for their attractions. Bright (Travels, 1815) mentions Kormond, the property of Prince Ballhyani as "containing a very handsome garden in the French taste, with considerable hot-houses and conservatories." Graaf Brunswick of Marton Vassar, had passed some time in England, and his garden was laid out in the English style.

The favourite mansion of Prince Esterhazy is Eisenstadt; the palace has lately been improved, and the gardens, which were laid out in 1754 in the French taste, are now, (1814,) transforming in the English manner. *Travels in Hungary,* 346.

64. The royal and principal private gardens at *Dresden,* exhibit nothing remarkable in the way of art. They were formed chiefly during the Electorate of Frederick Augustus, King of Poland, and are remarkably confined, and by no means interesting in detail. The situation and environs of Dresden, every one feels to be delightful; but there is perhaps no city of the same rank on the continent equally deficient both in ancient and modern gardens. *Ed. Encyc.* art. *Landscape G.*

65. *Prussia.* Almost all the geometric gardens of Prussia were formed during the propitious reign of Frederick II. The Thiergarten at Berlin is the most extensive. It is a sort of public park or promenade, on a flat surface, and loose arenaceous soil, intersected by avenues and alleys, pierced by stars and *pates d'oye,* varied by obelisks and statues; and accommodated with public coffee-houses, sheds for music and rural fetes, and open areas for exercising troops.

The ancient gardens of Sans Souci, at Potsdam, are in the mixed style of Switzer, with every appendage and ornament of the French, Italian, and Dutch taste. Various artists, but chiefly Manger, a German architect, and Salzmann, the royal gardener, (each of whom has published a voluminous description of his works there,) were employed in their design and execution; and a detailed topographical history of the whole, accompanied by plans, elevations, and views, has been published by the late celebrated Nicolai of Berlin, at once an author, printer, bookbinder, and bookseller. The gardens consist of, 1. The hill, on the summit of which Sans Souci is placed. The slope in front of this palace is laid out in six terraces, each ten feet high, and its supporting wall covered with glass, for peaches and vines. 2. A hill to the east, devoted to hot-houses, culinary vegetables, and slopes or terraces for fruit-trees. 3. A plain at the bottom of the slope, laid out in Switzer's manner, leading to the new palace; and, 4. A reserve of hot-houses, and chiefly large orangeries, and pits for pines to the west, and near the celebrated windmill, of which Frederick could not get possession.

These gardens are more curious and varied, than simple and grand. The hill of glazed terraces crowned by Sans Souci, has indeed a singular appearance; but the woods, cabinets, and innumerable statues in the grounds below, are on too small a scale for the effect intended to be produced; and on the whole distract and divide the attention on the first view. Potsdam, with its environs, forms a crowded scene of architectural and gardening efforts; a sort of royal magazine, in which an immense number of expensive articles, pillared scenery, screens of columns, empty palaces, churches, and public buildings, as Eustache and Wilson observe, crowd on our eyes, and distract our attention.

Hirschfield, who does not appear to have been a great admirer of Frederick, and who, as the Prince de Ligne has remarked, was touched with the *Anglomania,* in respect to gardening, says, in 1785, of these gardens, "according to the last news from Prussia, the taste for gardens is not yet perfect in that country. A recent author vaunts a palace *champetre,* which presents as many windows as there are days in the year: he praises the high hedges, mountains of periwincle, regular parterres of flowers, ponds, artificial grottoes, jets d'eau, and designs traced on a plain." *Theorie, &c. tom.* 5. 366.

The principal examples of the new style in Prussia, are the royal gardens at the summer residence of Charlottenburg, near Berlin, begun by Frederick the Great, but chiefly laid out during the reign of Frederick William II. They are not extensive, and are situated on a dull sandy flat, washed by the Spree; under which unfavorable circumstances, it would be wonderful if they were very attractive. In one part of these gardens, a Doric mausoleum, of great beauty, contains the ashes of the much-lamented queen. A dark avenue of Scotch firs leads to a circle of the same tree, 150 feet in diameter. Interior circles are formed of cypresses and weeping-willows; and within these, a border of white roses and white lilies (*Lilium candidum*). The form of the mausoleum is oblong, and its end projects from this interior circle, directly opposite the covered avenue. A few steps descend from the entrance to a platform, in which, on a sarcophagus, is a reclining figure of the queen: a stair at one side, leads to the door of a vault containing her remains.

The garden of the palace of the Heiligensee, is avowedly English, and is in much better taste than that at Charlottenburg. The palace is cased externally with marble: it is in a chaste style of Grecian architecture, and praised by Wilson (*Tours on the Continent*, 1820) as one of the best pieces of architecture in Prussia. It is built close to the lake, and the kitchen is placed in an island, disguised as a temple, and connected by a subaquarian passage. Those sumptuous works were the joint productions of the counsellor Langhans, professor Hirschfield, and the architect Gontard, during Frederick William II.'s reign.

Harris, author of *Hermes*, and then envoy at Berlin, is said, by Hirschfield, to have assisted Count Schulenburg in forming a very agreeable English garden, near Freyenwalde; but so transient were these things, that we were unable (in 1813) to find out its scite.

66. *Denmark.* The gardens of *Marienlust*, near Elsineur, which occupy the same space as those in which Hamlet's father was murdered; and those of the Prince Frederick, near the city, may be considered the Greenwich and Hyde Parks of Copenhagen. Hirschfield mentions Ashberg, on the lake Pleon, as one of the finest residences in Denmark in his time, and enumerates nearly a dozen others as seats of great beauty.

Dronningard may be considered as one of the best examples of the English style. It is an extensive park, the residence of an eminent Danish banker, De Conninck, about sixteen miles from Copenhagen. The grounds are situated on a declivity, which descends to a natural lake of great extent, whose circuitous shores are verged with rich woody scenery, and country-houses. The soil here approaches more to a clayey loam than is general on the Continent; and the climate being cold, the turf is happily of a deep tone of green, and close texture. The oak and beech abound in these grounds, as well as firs, and a number of exotics. Buildings are not too frequent; but there are several, and among them a hermitage, to which one of the family actually retired, on occasion of a matrimonial disappointment, and lived there for several years, till roused and restored to active life by the dangers of his country. There are numbers of small spots round Copenhagen, of considerable beauty, in which something of the English style has been imitated; but in none of the gardens of the court has it been avowedly introduced.

There are celebrated gardens in what is called the English style at Munich, Stuttgard, Hanover, Baden, Hesse Cassel, Hesse Darmstadt, Saxe Gotha, and other places, which, we regret, want of room obliges us to pass over unnoticed. Many of them will be found described in Hirschfield's work, or noticed in the *Lettres et Pensées*, of the Prince de Ligne; and the most modern are described in the *Almanach du Jardinage*, a periodical work, published in Leipsic; or, in the Gardener's Magazine, a quarterly periodical work in the German language. Indeed there are specimens of English gardening, more or less extensive, in the capital towns of every state in Germany; but, with a very few exceptions, they are of a very inferior description, and such as, when the novelty of the style has passed away, are not at all likely to perpetuate this taste in these countries. From the arid soil and limited extent, result bad turf, and an air of constraint; and from too many buildings and walks, a distracting bustle and confusion. They are crowded with winding sanded paths, continually intersecting each other, little clumps, and useless seats or temples, and very frequently resemble more the attempts of mimics or caricaturists, than imitators of our taste. In short, the defects of the English style in every country, are more frequently copied than the beauties; which, we presume, arises from the circumstances of few of those who lay out such gardens, having had a proper idea of the end in view in forming them, viz. a painter-like effect in every case, where it does not interfere with utility, or some other preferable beauty; and, in many cases, an entire allusion to natural scenery. It is difficult for a person of limited education and travel to form a distinct idea of what English gardens really are. The foreigner can seldom divest himself of the idea of a very limited and compact space as requisite for this purpose; the reverse of which is the case with all our best scenes, of ornamental, horticulture, and picturesque beauty. The English gardens in the vicinity of Dresden, Brunswick, Hamburgh, Prague, Teplitz, Leipsic, and other places, have given rise to those remarks, in which even those professedly English in Prussia, might be included. There are some exceptions which might be pointed out at Cassel, Stutgard, (for views of these gardens, see *l'Almanach du Jardinage*,) Weimar, (see *Description du Parc de Weimar, et du*

Jardin de Tieffurth, Erfurt, 1797,) the park of Fürstenstein near Breslaw, Mergentheim, Wörlitz, praised by the Prince de Ligne, and the walk at Munich, laid out by Count Rumford, may be referred to as less obnoxious to our general remark. *Ed. Enc.* art. *Landscape G.*

67. *Switzerland.* "Nature," Hirschfield observes, "has been liberal to the inhabitants of this country, and they have wisely profited from it. Almost all the gardens are theatres of true beauty, without vain ornaments or artificial decorations. Convenience, not magnificence, reigns in the country-houses; and the villas are distinguished more by their romantic and picturesque situations, than by their architecture." He mentions several gardens near Geneva and Lausanne; Delices is chiefly remarkable because it was inhabited by Voltaire before he purchased Ferney, and La Grange and La Boissier are to this day well known places. Ferney is still eagerly visited by every stranger, but with the chatteau of the Neckar family, that of the Empress Josephine, of Beauharnois, and others, eulogised in the local guides, present nothing in the way of our art particularly deserving of notice; though their situations, looking down on so magnificent a lake, the simplicity of their architecture, and the romantic scenery by which they are surrounded, render them delightful retirements, and such as but few countries can boast. The public promenades at Berne are most beautiful, and kept with all the care of an English flower-garden. Switserland has the peculiar advantage of producing a close turf, which in most places, and particularly at Lausanne and Berne, is as verdant as in England. Harte says, great part of the *Pays de Vaud* is like the best part of Berkshire, and indeed every one feels that this is the country most congenial to an Englishman's feelings.

68. *Sweden and Norway.* "All the Swedes with whom I have ever met," observes Hirschfield, "whether elevated by birth, or enlightened by education, were estimable friends of beautiful nature and of gardens." Sir J. E. Smith (*Lin Trans.* vol. i.) expresses an equally high opinion of this people. Mediocrity of circumstances, a poor court, political liberty, and a varied and comparatively unproductive country, seem to have contributed to give a more thinking turn to the Swedish nobles than in countries naturally prolific. Their immense public works, canals, harbors, and excellent roads, careful agriculture, extensively marked mines, botanic gardens, literary institutions, and scientific authors, are proofs of what we assert. The ancient style of gardening appears to have been introduced to Sweden, at least previously to 1671; for Hermand, who published his *Regnum Suecia* in that year, mentions the gardens of the palace as well as the *Vivarium*, or park. The gardens, he says, were used for delight and recreation. They lay between the *Palatium* and *Vivarium*, and the latter contained some wooden buildings, in which were kept lions, leopards, and bears. This garden and park appear to have been formed by Gustavus Adolphus, about 1620. Charles the Twelfth procured plans from Le Notre, and had the trees and plants sent from Paris. It is remarked by Dr. Walker, as a curious fact, that though the yew-tree is a native of Sweden, those plants of this species sent from Paris, to plant Le Notre's designs, died at Stockholm the first winter.

Gustavus III. with the assistance of Masretier, formed Haga, in a mixed style, on a rocky situation, about the middle of the eighteenth century. It is the Trianon of Sweden. The approach is a winding walk through rocks and luxuriant verdure. Drottningholm is a royal palace, formed by the same prince on the island of that name. The gardens are in a sort of *Anglo-Chinois* manner, but as far as art is concerned, in no respect remarkable. Both these gardens are surrounded or intermingled with water, rocks, Scotch pine, spruce fir, and buildings, forming a picturesque assemblage of saxatile and verdant beauty. There are some confined spots laid out in the English taste, chiefly by British merchants in the neighbourhood of Gottenburg, as there are also near Christiansand, in Norway; but it may be remarked, that this style is not likely to be generally adopted in either country, because they already possess much greater beauties of the same kind which it is our aim to create, and with which those created would not bear a comparison.

Subsect. 2. *German Gardening in respect to the Culture of Flowers and Plants of Ornament.*

69. It does not appear that this department was much attended to in Germany or Sweden, previously to the introduction of botanic gardens; but on the establishment of these, plants of ornament were eagerly sought after in most of them: that of Altorf was famous for orange-trees, and that of Copenhagen, for bulbous roots.

The earliest private botanic garden in Europe next to those of Italy, is said (*Keith's Botany*, p. 18.) to have been one formed by William Landgrave of Hesse, early in the sixteenth century. According to Deleuze (*Annales du Musée*, tom. 8.), the first public botanic garden in Germany, was established by the Elector of Saxony, at Leipsic, in 1580; this magistrate having undertaken the reform of public instruction throughout his dominions. In 1605, Jungerman, a celebrated botanist, obtained one for the university, which the Landgrave had just founded at Giessen. After having disposed of it he went to Altorf, and solicited the same favour for this city. The senate of Nuremberg agreed to his wishes in 1620, although the country, was then a prey to the disasters of war. Jungerman, named Professor, gloried in the prosperity of an university which he looked upon as his work, and in 1635, he published the catalogue of the plants he had collected. Ten years afterwards they constructed a green-house, and the garden of Altorf (*Pref. to the Nuremberg Hesperides*), was then the most beautiful of Germany. That which Ernest, Count of Shawenbourg, established in 1621 at Rintel, in Westphalia, also acquired much celebrity. Those of Ratisbon and Ulm are of the same epoch.

From 1555 when the university of Jenna was founded, the professors of botany, during the summer season, took the students to the country to herbalize. They soon found it would be much more advantageous to collect in one place the plants they wished them to be acquainted with, and the government constructed a garden in 1629. The direction of it was given to Rolfine, who has left a curious work on Plants, containing a History of the principal Gardens of Europe, of his time.

At Leipsic, towards the end of the seventeenth century, the garden of Gaspard Bose was celebrated. He introduced many American plants, and among others the dwarf almond.

At Carlsrouhe, the Prince of Baden Dourlach formed a botanic garden in 1715, in which, in 1737, there were 154 varieties of oranges and lemons.

70. At Vienna and Frankfort, L'Ecluse prosecuted the study of botany, and enriched the gardens at these places with an immense number of plants. Maximilian II. who occupied the Imperial throne from 1564 to 1576, seconded his views, and caused a magnificent garden to be constructed at Vienna for the plants which he collected, charging his ambassadors at Constantinople and other countries, to procure new plants; and giving the care of the garden to l'Ecluse. Rodolph II. who succeeded Maximilian, also enriched this garden, of which Sweert published a catalogue, (*Florilegium*) in 1612.

The palace of Schœnbrunn was scarcely begun, when in 1753, the Emperor Francis I. devoted a portion of the garden to the culture of exotics. He willed that that establishment should be worthy of the Imperial magnificence, and that it should extend the domain of botany, in bringing together vegetables then unknown in Europe. By the advice of Van Swieten, he procured two celebrated florists, the one from Leyden and the other from Delft. The first, Adrian Steckhoven, directed the construction of the hot-houses; and the second, Van der Schott, brought all the plants which he could collect, in the gardens and nurseries of Holland. Thus the first year they were in possession of many curious species, but this was only a step towards the end they had in view. The Emperor proposed to the celebrated Jacquin to go to the Antilles. This botanist parted in 1754, accompanied by Van der Schott, and two Italian zoologists, employed to procure animals for the menagerie and the museum. These travellers visited Martinique, Grenada, St. Vincent, St. Eustace, St. Christopher, Jamaica, Cuba, Curaccao, and other places. In 1755 they sent home their first packages, and in 1756, Van der Schott arrived with a collection of trees and shrubs almost all in good condition. The trees were five or six feet high, and many had already borne fruit; they were taken up with balls, and the earth enveloped with leaves of bananas, tied by cords of *Hibiscus tiliaceus*. Thus packed, one with another they weighed 100 lbs. These vegetables and the water necessary to water them, formed the greater part of the cargo of a vessel which had been forwarded from Martinique for Leghorn. From Leghorn the plants were transported on the backs of mules, and placed in the plain ground in the hothouses built to receive them. The third and the fourth quantities came in the same manner. The fifth and sixth arrived from Caraccas, by Amsterdam. At last Jacquin left Havannah, and conducted to Schœnbrunn the last collection in 1759. During this time presents and purchases were received from other countries, and in proportion as the plants increased, they built hothouses and orangeries, of a grandeur suitable to the plants destined to grow in them. Some of these are from forty to fifty fathoms in length, and thirty feet in height.

In 1780 an accident caused the loss of most of the plants of the great hothouse. Van der Schott being sick, the gardener who supplied his place, forgot, during a very cold night, to light the stoves. Perceiving it in the morning, he thought to remedy the evil in making a very brisk fire. This sudden change of temperature caused many of the trees to perish, whose trunks were of the thickness of the arm. To repair this loss, Joseph II. engaged the naturalists to undertake a new voyage. Professor Matter was named chief of the expedition, with Dr. Stupiez, for a companion; the gardeners Bose and Bredemyer, and the draftsman Mol. They went direct to Philadelphia, visited the United States, Florida, and New Providence, sent home a large collection, and Bose afterwards got charge of the garden of Schœnbrunn.

The hothouses of Schœnbrunn, Townson observes, (*Voyage in Hungary,*) are the most spacious that have yet been constructed in Europe; the trees of the tropics there develope their branches in full liberty, and bear flowers and fruits. The most rare palms, the *Coccus nucifera*, the *caryota urens*, the *Elais guinensis*, grow there with vigour. The *corypha umbraculifera* extends its large leaves for twelve feet round, and birds of Africa and America there fly from branch to branch among the trees of their country. Jacquin published successively three great works, illustrating the plants of these gardens, viz. *Hortus Schœn. Icones plant. rariorum, and Fragmenta Botanica.* We found these gardens in 1814 in suitable order; but the edifices requiring renovation. It is difficult for a mere European traveller to form any idea of the grandeur of the palms sending out their immense leaves from the capitals of their column-like trunks.

Besides these gardens at Schœnbrunn, there are at Vienna two other botanic gardens: the one formed in what was a large gravel-pit exclusively devoted to the plants of Austria; and the other of smaller extent, attached to the university, and devoted to a small general collection. Considerable compartments in the gardens of Princes Lichtenstein and Schwartzenberg, in Leopoldstadt, are devoted to the culture of ornamental plants systematically arranged.

71. A botanic garden had been established at Pesth in 1812, but was enlarged in 1815, and placed under the direction of the Professor Kitaibel, known in the scientific world as the author of *Plantæ rariores Hungariæ.*

The botanic garden of Dresden is small; but is rich in exotics lately procured from England, and carefully managed by Traugott Seidel.

The botanic garden of Berlin was established in the time of Frederick II. and is one of the few gardens in which the arrangement of the plants is according to their native *habitations.* It has lately been greatly enriched by F. Link and F. Otto; as have those of Munich, Stuttgard, Baden, Hesse, and most others in Germany, by their respective directors and gardeners.

The botanic garden of Kőnigsberg, was enlarged and re-arranged in 1812, and deserves notice for its singularly varied surface, and agreeable recluse walks.

72. The garden of *Copenhagen* was established before 1640. It was rich in hardy plants and trees, about the end of the last century, but is at present rather neglected. Sperling in 1642, and Pauli in 1653, published catalogues of this garden.

On the whole, the taste for plants in Germany is very considerable among the higher classes; and not only public bodies but private gentlemen, and princes of every degree, spend a much greater proportion of their income, in the encouragement of this branch of gardening, than is done by the wealthy of England. Since the restoration of tranquillity, this taste has received a new stimulus by the opportunity afforded of procuring plants from England. Among the lower classes, however, a taste for flowers is less popular in Germany than in Italy, Holland, and France; probably owing to their frugal habits, and comparatively sober enjoyments.

73. *Switzerland.* The first botanic-garden which appeared in this country was that of the celebrated Conrad Gesner, at Zurich, founded before the middle of the sixteenth century. He had not, Deleuze observes, sufficient fortune to obtain much ground or to maintain many gardeners; but his activity supplied every thing, and he assembled in a small spot what he had been able to procure by his numerous travels and extensive correspondence. Public gardens were, in the end of this century, established at Geneva, Basil, and Berne, and subsequently in most of the cantons. The first of these gardens at present is that of Geneva, lately enlarged; and newly arranged under the direction of that active and highly valued botanist, Decandolle. The garden of Basil is rich in the plants of all the mountainous regions which lie around it, including the Tyrol and Piedmont. A taste for flowers is perhaps more popular in Switzerland than in Germany; for though frugality is not less an object in every branch of rural economy, yet real independence is more general; a poor man here, as Burns used to say, has generally some other estate than that of *sin and misery;* some little spot that he can call his own, and which he delights to cultivate and ornament. As in Germany, however, flowers are rarely brought to market, little used in female dress, and seldom to be seen in churches.

74. *Sweden.* It was difficult, Deleuze observes, to form vegetable collections in the northern countries; but industry can conquer obstacles, and the more precautions necessary to secure the plants from the vigour of the climate, the more will culture be perfected. The garden of Upsal was founded in 1657, under the auspices of king Charles Gustavus, and by the attention of Olaus Rudbeck. This learned man, seconded by the credit of the count of Gardie, chancellor of the academy of Upsal, and who had himself a fine botanic-garden at Jacobsdahl, obtained funds necessary for the construction of a garden and greenhouse, and to collect foreign plants; and he augmented its riches by the gift he made of his own garden in 1662. The progress of this establishment may be seen in comparing the three catalogues given by Rudbeck in 1658, 1666, 1685.

The latter enumerates 1870 plants, among which may be seen 630 distinct species of exotics. The titles of these, and all the botanical catalogues published in Europe up to 1820, may be found in the library copy of *Bib. Banksiana.*

In 1702, the fire which consumed the half of the city of Upsal, reduced the greenhouse to ashes, and the garden was in a deplorable condition till 1740, when its walls were rebuilt. Two years afterwards the botanical chair and the direction of the garden were given to Linnæus; and the university, undoubtedly excited by that reformer of natural history, took charge of all the necessary expenses for the acquisition and preservation of plants. Linnæus, feeling how essential it was to be assisted in all the details of culture, obtained Diderich Nützel, a clever gardener, who had visited attentively the gardens of Germany, Holland and England, and who had then the charge of that of Cliffort, in Holland. He then constructed new greenhouses, intended for vegetables of the different climates; and he solicited successfully the principal botanic-gardens of Europe for plants. Soon after, several of his pupils, whom he had excited with enthusiasm for botany, went across the seas to collect seeds and specimens; and many tropical plants, sown first at Upsal, were sent from thence to the southern countries of Europe.

The description and plan of the garden of Upsal may be seen in the *Amœnitates Academicæ*, (*Dissert.* 7. t. 1. p. 172.) Linnæus, in 1748 and 1753, published the catalogue of the plants cultivated there, and since his time, others have appeared, containing the additions which have been made by his successors. In 1804, the large orangery built by Linnæus was found to be considerably out of repair, and was taken down and rebuilt. A magnificent lecture-room and museum was at the same time added. The ceilings of these rooms are supported by columns, which being hollow, are used as flues, and thus afford an elegant and effectual means of heating the air. On the whole, the garden is respectably kept up; and many hardy plants, natives of North America in particular, are found here in greater luxuriance than in France or Germany.

A taste for flowers is not popular in Sweden; if a farmer or cottager has any spare room in his garden, he prefers rearing a few plants of tobacco.

Subsect. 3. *German Gardening, in respect to Horticultural Productions.*

75. This department coming less under the notice of literary men than any of the others, books offer but little information of a historical nature. The German authors, who have given any historical notices of their gardening, have, like the English, confined themselves to the art as a subject of taste and design, and we can therefore do little more than submit some remarks on what we have seen in different districts of the empire.

Agriculture, Harte considers to have been, at an early period, brought from Italy to Basle, the economical society of that city being among the oldest in Europe, and the husbandry of its neighbourhood the most perfect on the continent. The more common culinary vegetables would, in all probability, be grown there from the time of the Romans. The native fruits and culinary plants of Germany are the same as those of France, already enumerated. (56). In the museum of the arsenal in Dresden, are still preserved, and shown to strangers, the gardening tools with which Augustus the second, elector of Saxony, worked with his own hands. This magistrate died in 1566. He is said to have planted the first vineyard in Saxony, and to have greatly encreased the varieties of the hardy fruits.

The more common fruits have no doubt existed in Germany from the time of the Romans; the cherry, the pear, the plum, and the apple, are natives, or naturalized in the woods. Good varieties would no doubt be brought from Italy by the monks, who established themselves in Germany in the dark ages, and from the convents be introduced to the gardens of the nobles, as the latter became somewhat civilized. This would more especially be the case with those provinces situated on the Rhine, where the general soil and climate would bring them to greater perfection, and, in time, render them more common than in the northern districts. Diel, however, a native of the best part of this tract of country (*Nassau Dietz,*) complains, (*Obst. Orangerie in Scherben*, 1*st band.*) so late as 1804, that apples, pears, and cherries were most commonly raised from seeds, and planted in orchards, without being grafted.

The apricot appears to have been some time introduced in Austria and Hungary, and produces well as a standard in the neighbourhood of Vienna. The peach is most commonly grown against walls. The mulberry produces leaves for the silk-worm as far north as Franckfort on the Oder, but ripens its fruit with difficulty, unless planted against walls. The vine is cultivated as far north as the fifty-second degree of latitude, in vineyards, and somewhat farther against garden-walls. The fig, to nearly the same extent, against walls, its branches being every where protected in winter; it is, however, a rare fruit in Germany. At Vienna it is kept in large tubs and boxes, and housed during winter, in the wine cellars.

76. The pine-apple, Beckman informs us, was first brought to maturity by baron

Munchausen at Schwobber, near Hamelin. The large buildings erected by the baron for this fruit, are described in the Nuremberg Hesperides for 1714. It was ripened also by Dr. Kaltschmidt at Breslaw, in 1702, who sent some fruit to the imperial court. At present there are very few pineries to be found throughout the whole empire, and scarcely any in Switzerland and Sweden.

The best varieties of fruit-trees and culinary vegetables are said (*Bright's Travels,*) to have been introduced to Austria from Holland, by *Van der Schott,* about the middle of the seventeenth century; but many of them must have been in the imperial gardens long before this period, from the connection of Austria with the Netherlands; yet Meyer, in 1776, speaking of fruits, says, that "the age of Schoenbrunn will be for Franconia what that of Louis the fourteenth was for France."

Horticulture is perhaps more neglected in Hungary than in any other part of Germany; but fruit-tree nurseries were established there in 1808.

The Rev. J. V. Sickler, in Saxegotha, counsellor Diel, at Nassau Dietz, and counsellor Ransleben, at Berlin, have established, within the last fifty years, fruit-tree nurseries, where all the best Dutch, French, and English varieties may be purchased. Diel and Ransleben prove the sorts, by fruiting the original specimens in pots in a greenhouse. Sickler has fruited an immense number of sorts in the open air, and published descriptions of them in *Der Teutsche Obst. Gartner;* a work of which 48 volumes have already appeared.

George the second, of England, after establishing an agricultural society in Hanover, is said to have introduced the best English fruits to his Hanoverian dominions about 1751.

The Earl of Findlater resided many years near Dresden, and planted a vineyard at his country seat in the neighbourhood, said to be the most northerly in Saxony. He introduced flued walls, and trained the best sorts of English peaches and apricots on them. The whole of his horticultural efforts and his chateau were destroyed by the French army in 1813, for no other reason than his being an Englishman. A public walk and seat at Carlsbad remain to commemorate his taste and public spirit.

Frederick the second was passionately fond of fruits, and cultivated, at Potsdam, all the best Dutch varieties on walls, espaliers, under glass, and in the open garden. He was particularly fond of pine-apples, of which he grew a great number in pits; and is censured by an English traveller (Burnett) because, on his death-bed, he made enquiries after the ripening of one of them, of which he expected to make a last *bonne-bouche.* Potsdam and Schwobber are the only parts of Germany where forcing has ever been practised to any extent. We are not aware that it is now practised at all in any of the court gardens in the empire.

77. Horticulture is generally understood to be carefully practised in *Denmark,* and notwithstanding the severity of the climate, they succeed in bringing to a tolerable degree of perfection most of the best sorts of fruits and culinary vegetables. Glass frames, portable canvass covers, and mats are used to protect the blossom of the more tender trees against walls; and the hardier sorts, as the apple and cherry are, in spring, before the blossom expands, watered every night, in order at once to protect and retard it by an envelope of ice. This ice is again thawed off before sun-rise by copious waterings.

The cabbage tribe and the borecoles are the popular culinary vegetables throughout Germany; they are used newly gathered, and boiled and eaten with meat, in broths or soups, and pickled in the form of *sour kraut* for winter use. The potatoe, kidney-bean, onion, and lettuce, are also in general use; and the first gardens possess all the oleraceous and acetaceous vegetables grown in France and Holland.

78. *Switzerland.* Horticulture is carefully practised in this country; vineyards are formed as far north as Lausanne; and the apple, pear, plum, cherry, and walnut are common on every farm; the three first are in every cottage-garden. The filbert, gooseberry, currant, raspberry, and strawberry are natives; but only the filbert, raspberry, and strawberry are common in the woods and copses. In the sheltered valleys of this country the apple and the pear are most prolific. Stewed pears is a common dish among the cottagers in autumn; the fruit is also dried, and in winter forms an excellent soup ingredient.

The cabbage, the potatoe, the white beet grown for the leaves as spinach, and their foot stalks as chard, and the kidney-bean for haricots and soups, are the popular vegetables.

79. *Sweden.* The Swedes have the reputation of being excellent gardeners; but their short summers are adverse to the culture of many sorts of fruits and culinary vegetables in the open air; and there is not yet sufficient wealth to admit of forcing or forming artificial climates to any extent. The apple, pear, and plum ripen their fruits in the best districts, especially in warm situations; but where the better varieties are grown, they are always planted against walls, and protected, as in Denmark. There are a few forcing-houses near Gottenburg and Stockholm for peaches and vines; and one or two instances of pines being attempted in pits near the capital and in East Gothland,

The borecoles, red and green, the rutabaga, and potatoe are the popular vegetables, but the best gardens have most of the Dutch and English varieties of the culinary tribe.

The towns and cities of Norway, Dr. Clarke informs us, (*Scandinavia*, ch. 2. 1806,) were formerly supplied with culinary herbs from England and Holland; but gardening became more general after the publication by Christian Gartner of a manual, adapted to Sweden. Now all sorts of vegetables are common round Tronijem.

SUBSECT. 4. *German Gardening, as to planting Timber Trees and Hedges.*

80. National forests are too numerous and extensive in Germany to have rendered much attention necessary to planting as a matter of profit. In some districts, however, Pomerania for example, barren sandy tracts are sown with acorns and Scotch fir-seeds, chiefly for the sake of fuel and common husbandry timber.

Much attention, as Emmerich informs us, (*Culture of Forests*,) is in general paid to the management of forests already existing; as far as we have been able to observe, this extends to filling up vacancies by sowing, and occasionally draining and enclosing; thinning and pruning are little attended to in most districts. The oak, the beech, and the Scotch pine are the prevailing native trees of Germany.

In Prussia great attention is paid to the establishment and preservation of rows of trees along the public roads. The mulberry is the tree used in some of the warmer districts, and in other places the lime and the elm; the Lombardy poplar is also common near most towns of Germany, especially Berlin, Dresden, and Leipzic. Some attention is every where paid to public avenues, and the highways being, as in France, generally kept up by the government, improvements can be executed promptly and with effect. There being, in general, no accompanying hedges, and the trees being trained with naked stems to ten or fifteen feet high, according to the lowness or exposure of the situation, little injury is done to the materials of the road in wet weather. The breeze passes freely between the stems of the trees. The traveller and his horses or cattle are shaded during sunshine and sheltered during storms; and the man of taste is furnished with a continued frame and foreground to the lateral landscapes.

Hedges, though not general in Germany, are used on the Rhine and in Holstein, the plants generally hawthorn, but sometimes hornbeam or a mixture of native shrubs. *Hungary* is the most backward province in respect to planting and hedges, as well as to every thing else. A hedge there is rare; and there are scarcely any public avenues beyond Presburg. Existing woods are subjected to a sort of management for the sake of the fuel they afford, and for their produce in timber and charcoal for the mines.

There is little or no forest planting in *Switzerland*, but hedges of hawthorn are not uncommon. The walnut is there a very common high-road tree in the autumnal months, and furnishes the pauper traveller with the principal part of his food. Poor Italians have been known to travel from Naples and Venice to Geneva on this sort of fare. They begin with Indian corn and grapes, which they steal from the fields till they arrive at Milan, and the rest of the road they depend on walnuts, filberts, and apples. Planting is little wanted in *Sweden*, for seedling Scotch pines, spruce firs, and birch, rise up in abundance wherever old ones have been cut down. Enclosures in Sweden, as in Switzerland, are most frequently made of stone or of wood. Trees are planted along the roads in several places, and especially near Stockholm. The lime, the birch, and the ash, or trembling poplar, are the species used.

SECT. V. *German Gardening, as empirically practised.*

81. In the best districts of Germany the use of gardens is nearly as general as in England; but in Hungary and some parts of Bohemia, Gallicia, and Prussia, many of the lower orders are without them, or if permitted to enclose a few yards of ground near their wooden hovels, they seem too indolent and indifferent to do so.

The cabbage tribe, and chiefly red greens, and the potatoe, are the universal plants of the cottage gardens of Germany; lettuce, pease, onions, and turnips, with some other sorts, and the common fruit trees, are introduced in some districts. Flowers are not very general, but the rose, thyme, and mint are to be seen in many places, and a variety of ornamental plants in the better sort of cottage gardens.

Farmers' Gardens, as in most countries, are a little larger than those of the lowest class of cottagers; but inferior in point of order and neatness to that of the man who lives in his own cottage.

The gardens of the hereditary families are not, in general, much attended to; their appearance is too frequently that of neglect and disorder. Cabbage, potatoes, apples, and pears, and perhaps a few onions, are the produce expected from them; these are cultivated by a servant, not always a gardener, and who has generally domestic occupations to perform for the family.

It will readily be imagined that, in such an extensive country, there are innumerable exceptions; in these, the gardens are better arranged, and the produce of a more varied description. Next to the gardens of the princes or rulers, the best are those of the wealthy bankers and citizens. These are richly stocked with fruit-trees, generally contain hot-houses, and are liberally kept up. Some of them contain collections of exotics. The best private gardens in Denmark belong to this class, and the remark will apply in the vicinity of all towns and cities in proportion to their rank as commercial places.

There are very few good gardens in Hungary; that of Prince Esterhazy, the greatest proprietor of that country, is extensive, abounds in hot-houses, and contains a very full collection of plants. The Prince has an English gardener, whom he sends frequently to this country to collect whatever is new.

The German princes and rulers are in general attached to gardens, and have very considerable ones at their principal residences; some of these have been mentioned, and various others might be added. These gardens are under the direction of intelligent men, who, in general, have spent part of their time in botanic gardens; and, in many cases, have studied or practised in Holland, or in the Paris gardens.

There are market-gardens near most large towns, but nurseries are much less common. There are extensive gardens of both sorts at Hamburg; but the best fruit-tree nurseries are supposed to be those of Sickler and Diel already mentioned. There is a good nursery at Wurtzburg in Franconia, established by Meyer; one at Frankfort on the Oder, and three at Vienna. In most places, the principal market-gardeners propagate a few fruit-trees for sale.

82. The operative part of gardening, in the better classes of gardens, is performed by men, who have, agreeably to the general custom in Germany, not only served an apprenticeship, but travelled and worked for a certain time in different parts of the country, or of other countries.

The term of apprenticeship is three years and a half, and for travel three years, unless the apprentice is the son of a master-gardener; in which case, the term for travel is reduced to one year. All apprentices must be able at least to read and write, and are taught to draw, and furnished with written secrets in gardening by their master, during the term of apprenticeship. When that is completed, the youth is initiated into what may be called the free-masonry of gardening, and, furnished with a pass-word, proceeds from one town to another till he can get work. Till this happens, his pass-word, and also a pass-port from the gardeners' society of the place where he was initiated, procures for him at every *Gärtner herberge*, or gardener's lodging-house, lodging and food, and as much money as will supply his wants till he arrives at the next inn of a similar description. In this way he may walk over the whole of the German empire, Denmark, and a part of Holland, at the general expense; the numerous ramifications of the society extending over the whole of this immense tract. Such institutions exist for every trade in Germany, but being disliked by the governments, and being politically considered of an arbitrary and injurious nature, are now on the decline.

On his return from probation, the travelled journeyman is entitled to take a master's place; and very commonly he continues travelling till he hears of one.

The regular German gardener is a careful, neat-handed, and skilful workman; and, if allowed sufficient time, or assistance, will keep a garden in good order, and produce all the crops required of him in their proper seasons.

The artists, or architects of gardens, in Germany, are generally the *Land baumeister*, or those architects who have directed their attention chiefly to country buildings. Where only a kitchen or flower-garden is to be formed, an approved practical gardener is commonly reckoned sufficient. It occasionally happens, that a nobleman, who wishes to lay out an extensive garden, after fixing on what he considers a good gardener of some education, and capable of taking plans, sends him for a year or two to visit the best gardens of England, Holland, or France. On his return, he is deemed qualified to lay out the garden required; which he does, and afterwards attends to their culture, and acts as a garden-architect (*Garten baumeister*) to the minor gentry of his neighbourhood.

SUBSECT. 6. *German Gardening as a Science; and as to the Authors it has produced.*

83. The Germans are a reading people, and the science of every art, in so far as developed in books, is more generally known in Germany than in any other country. Some may wish to except Scotland, but, though the Scotch artisan reads a great deal, he takes up prejudices at an early period, and with difficulty admits new ideas from books. On the other hand, the Germans of every rank are remarkable for liberality of opinion.

There are professorships of rural economy in many of the universities, some horticultural societies; one or two gardeners' magazines, and almanacks of gardening; and some eminent vegetable physiologists are Germans. Even in Hungary it appears (Bright's *Travels*) a *Georgicon*, or college of rural economy, has been established by Graff Festetits at Keszthely, in which gardening, including the culture and management of woods and copses, forms a distinct professorship.

The science of France may be, and we believe is, greater than that of Germany in this art, but it is accumulated in the capital; whereas here it emanates from a great number of points distributed over the country, and is consequently rendered more available by practical men. The minds of the gardeners of France are, from general ignorance, less fitted to receive instruction than those of Germany; their personal habits admit of less time for reading; their climate and soil require less artificial agency. The German gardener is generally a thinking, steady person; the climate, in most places, requires his vigilant attention to culture, and his travels have enlarged his views. Hence he becomes a more scientific artisan than the Frenchman, and is in more general demand in other countries. Some of the best gardens in Poland, Russia, and Italy, are under the care of Germans.

The Germans have produced few original authors on gardening, and none that can be compared to Quinteney or Miller. They have translations of all the best European books; and so vigilant are they in this respect, that even a recent and most useful work on exotic gardening by Cushing, hardly known in England, has not escaped the Leipsic book-makers. Hirschfield and Grohman have compiled a number of works chiefly on landscape gardening; Kirchner has written on the vine and the grape; Sickler and Diel extensively on the hardy fruits; and Volkamer on the orange, and the subject generally, in the Nuremberg Hesperides. See Sulzer's *Theory of the Fine Arts*, and the *Leipsig Catalogue*.

Of the horticultural literature of Denmark and Sweden we know little more than the names of a few of their most popular works, which will be found in the catalogue of the Banksian library.

Sect. V. *Of the Rise, Progress, and present State of Gardening in Russia and Poland.*

Very different is the history of gardening in Russia from that of any of those countries which have yet come under review. Peter the Great sought, by one giant-stride, to raise the character of his nation to a level with that of other countries, and, by extraordinary efforts, introduced excessive refinement amidst excessive barbarism; assembled magnificent piles of architecture in a marsh, and created the most sumptuous palaces and extensive parks and gardens, in the bleak pine and birch forests which surrounded it. As a Cronstadt poet sings,

> "Built a city in a bog,
> And made a Christian of a hog."

Nothing can be more extraordinary in the way of gardening than these well-known facts, that a century ago there was scarcely such a thing, in any part of Russia, as a garden, and, for the last fifty years, there have been more pines grown in the neighbourhood of Petersburg than in all the other countries of the continent put together.

Subsect. 1. *Russian Gardening as an Art of Design and Taste.*

84. Peter's first effort in the way of gardening was made in 1714, when the garden of the summer-palace, on the banks of the Neva in Petersburg, was laid out in the Dutch taste. But the grandest and most superb garden, in the geometric manner, is that which he constructed soon afterwards, about thirty wersts from the city, on the shores of the gulf. This imperial residence, as far as respects the gardens, has been justly called the Versailles of Russia; and the Prince de Ligne, an excellent judge, gives the preference to its water-works. The whole was originally designed and laid out by Le Blond, the pupil of Le Notre, and for some time court architect of St. Petersburg. They have been minutely described by Georgi, and more generally by Storch, from whom we select the following outline. "The situation of Peterhof is perhaps unrivalled. About five hundred fathoms from the sea-shore this region has a second cliff, almost perpendicular, near twelve fathoms high. Bordering on this precipice stands the palace, thereby acquiring a certain peculiar prospect over the gardens and the gulf, to the shores of Carelia and St. Petersburg, and to Cronstadt. It was built in the reign of Peter the Great by the architect Le Blond, but has received, under the succeeding monarchs, such a variety of improvements, that it has become a sort of specimen of the several tastes that prevailed in each of these eras, the influence whereof is visible in the numerous architectural ornaments, which are all highly gilt. The inside is correspondent with the destination of this palace; throughout are perceptible the remains of antiquated splendor, to which is contrasted the better taste of modern times. The gardens are more interesting by their peculiar beauties. The upper parts of them, before the land-side of the palace, are disposed into walks, plantations, and flower-beds, which acquire additional elegance by a large basin and canal plentifully furnished with fountains of various designs and forms. The declivity before the back-front of the palace towards the sea has two magnificent cascades, rolling their streams over the terraces into large basins, and beneath which vast sheets of water we walk as under a vault, without receiving wet, into

a beautiful grotto. The whole space in front of this declivity, down to the sea-shore, is one large stately garden, in the old-fashioned style, and famous for its jets-d'eau, and artificial water-works. Some of them throw up columns of water a foot and a half in diameter to a height of two and a half or three fathoms. A pellucid canal, lined with stone, ten fathoms wide, running from the centre of the palace-façade into the gulf of Finland, divides these gardens in two. In a solitary wood stands the summer-house called Monplaisir, which, among other things, is remarkable for its elegant kitchen, wherein the Empress Elizabeth occasionally amused herself in dressing her own dinner. In another portion of the gardens, close to the shore of the gulf, stands a neat wooden building, formely a favorite retreat of Peter the Great, as he could here have a view of Cronstadt and the fleet. The bath is likewise worthy of observation, situated in the midst of a thicket. We enter a large oval space inclosed by a wooden wall, without a covering at top, but open to the sky, and shaded by the surrounding trees. In this wall are chambers and recesses furnished with all that conveniency or luxury can require to that end. In the centre of this area is a large basin, surrounded by a gallery, and provided with steps, rafts, and gondolas: the water is conducted hither by pipes which fill the basin only to a certain height."

These gardens still exist, and the water-works are kept in tolerable repair. There is adjoining a small specimen of English gardening, laid out by Meader, once gardener at Alnwick castle in Northumberland, and who is author of "*The Planter's Guide.*"

"The principal private ancient garden in Russia is that at Petrowsky Razumowsky, near Moscow. The hedges and alleys are chiefly formed of spruce fir, which are shorn, and seem to flourish under the sheers. It contains also a labyrinth, and a turf amphitheatre, on which the Count at one time had operas performed by his domestic slaves.

" Sophiowski, in Podolia, is a magnificent residence of the Countess Potocki, laid out by a Polish architect, M. Metzel, in the manner of Switzer. It has a magnificent terrace or promenade, and extensive avenues, conservatories, and gardens."

85. The first attempt at the modern style in Russia was made by Catherine about1778, at Zarskoje-selo, at that time enlarged and re-laid out. The gardener employed, was Busch a German, and father of their present superintendant. The gorgeous magnificence of this residence is well known. A natural birch forest, on ground somewhat varied, forms the ground-work of the park and gardens. The gate by which they are approached, is an immense arch of artificial rock-work, over which is a lofty Chinese watch-tower. The first group of objects is a Chinese town, through which the approach leads to the palace; a building, which, with its enclosed entrance, court, offices, baths, conservatories, church, theatre, and other appendages, it would seem like exaggeration to describe. The rest of the garden scenery consists of walks, numerous garden buildings, with bridges of marble and wood, a large lake, and extensive kitchen-gardens and hot-houses."

The following more detailed description is from the pen of Storch already mentioned.

" Zarskoje-selo, the famous summer residence of Catherine the Second, is situated in an open pleasant region, diversified by little hills, meads, and woodlands. The space of the whole domain contains four hundred and twenty thousand square fathoms. This princely seat owes its origin to Catherine the First, and its enlargement and embellishment to Elizabeth; but it is indebted for its completion in elegance and taste, and the greater part of its present magnificence, to the creative reign of Catherine the Second.

" We are now in a small wood within sight of the palace. On the left we have the park wall, and before us the entrance on the Petersburg side. It consists of two portals composed of blocks of sand stone in the form of rocky fragments, over one of which is a Chinese watch-house. By this passage we enter the foregrounds of the palace, having the gardens to the right, and a Chinese village to the left, through which the way leads over a Chinese bridge to the park. Before us lies the road to the little neighbouring town Sophia, which goes through a colossal gate of cast-iron. The court of the palace forms an amphitheatre of buildings opposite the grand parade, closed on each side by an iron palisade."

He next describes the palace, and then continues: " the gardens are laid out in the English manner: among their curiosities, that admit of a description, the following objects may principally be recorded. A small temple containing a collection of antique and modern statues; a solitude for dinner parties like that in the hermitage; a magnificent bath; a coach hill, similar to that at Oranianbaum; picturesque ruins; a small town to commemorate the taking of Taurida, &c. Two artificial lakes are connected by a running stream, crossed by an arched bridge, covered at the top by a roof resting on two rows of marble columns, on the model of the bridge at Stowe.

On one of the islands on these lakes stands a Turkish mosque, on another a spacious hall for musical entertainments. In a thick shrubbery we come upon a pyramid in the Egyptian form, in the vicinity whereof are two obelisks.

Zarskoje-selo, the majestic sanctuary of art and nature, is at the same time a magnificent temple of merit. Formed of the rocky foundations of the earth, here the monuments of great achievements tower towards the skies, fearless of the destructive vicissitudes of time. A marble obelisk reminds us of the victory near Kagul, and of the victor Romanzof Zudunaisky. To the Dey of Tschesmi, and the hero Orlof Tschesmenskoy, a marble column on a pedestal of granite is devoted. A grand triumphal arch proclaims the patriotic ardor of Prince Orlof, with which he faced rebellion and the plague in the capital, and quelled them both. The victory in the Morea, and the name of Feador Orlof, are handed down to posterity by a rostral column.—Plain and gigantic as the sentiments of the heroes whose memories are perpetuated in these masses of rocks, they stand surrounded by the charms of Nature, who softens her majesty through the veil of artless graces.

86. Around Petersburg are several public gardens and various private ones, which their owners, with great liberality, convert into places of public entertainment, to which all the people of decent appearance are at liberty to come. The country-seats of the two brothers Nariskkin deserve our particular notice, as being frequented on Sundays by great numbers of the higher classes. A friendly invitation, in four different languages, inscribed over the entrance to the grounds, authorises every one, of decent appearance and behaviour, to amuse himself there in whatever way he pleases, without fear of molestation. In several pavilions are musicians, for the benefit of those who choose to dance; in others are chairs and sophas, ready for the reception of any party who wish to recreate themselves by sedate conversation, after roaming about with the great throng: some parties take to the swings, the bowling-green, and other diversions; on the canals and lakes are gondolas, some constructed for rowing, others for sailing; and if this be not enough, refreshments are spread on tables, in particular alcoves, and are handed about by persons in livery. This noble hospitality is by no means unenjoyed; the concourse of persons of all descriptions, from the star and ribband, to the plain well-dressed burgher, forms such a party-coloured collection, and sometimes groupes so humorously contrasted, that for this reason alone it is well worth the pains of partaking once in the amusement. *Storch's Petersburgh, p.* 441.

87. But the best specimens of the English style, in the neighbourhood of the Russian capital, or indeed in the empire, are the grounds of Paulowsky, begun during the reign of Catherine, in 1780, from a design said to have been furnished by the celebrated Brown, from a description sent him by Gould, an Englishman, the gardener of Potemkin, and finished afterwards during the reign of Paul. This place possesses considerable variety of surface, and a varied clothing of wood, the Scotch fir and aspen being natural to these grounds, as well as the birch. Near the palace, there is a profusion of exotics of every description, including a numerous collection of standard roses, which, with some of the American shrubs, require to be protected with straw and mats during winter. The Chevalier Storch has given a very interesting description of these gardens, in his *Briefe über Paulowsky, &c.* 1802. We pass over several imperial and private English gardens to notice those of Potemkin, a man whose mind, as the Prince de Ligne has observed, contained mines of gold and steppes, and one of the most extravagant encouragers of our art that modern times can boast. The most extensive gardens of this prince are in the Ukraine; but the most celebrated were those belonging to the palace of Taurida, now an imperial residence in St. Petersburg. The grounds are level, with several winding and straight canals, and walks, adorned with numerous buildings, a rich collection of exotics, and most extensive hot-houses of every description. Their grand feature, in Potemkin's time, was the conservatory, or winter-garden, attached to the palace. The plan of this part of the building is that of a semicircle, embracing the end of a saloon, nearly 300 feet long. They are lighted by immense windows, between columns, with an opaque ceiling, and at present heated by common German stoves. They are too gloomy for the growth of plants, but those grown in the glass sheds of the kitchen-garden are carried there, sunk in the ground, and gravel-walks, turf, and every article added to render an illusion to a romantic scene in the open air as complete as possible. Their effect was, after all, it is said, never satisfactory, but when illuminated. This palace, the original exterior of which was in a very simple style, and the interior most magnificent, is said to have been the design of Potemkin, but it was entirely re-modelled at his death by Catherine, used as barracks by Paul, and is now very imperfectly restored. *Ed. Encyc.* art. *Landscape Gard.*

This garden, so much spoken of, is thus described by Storch: "Along one side of the vestibule is the winter-garden, an enormous structure, disposed into a garden, only separated from the grand hall by a colonnade. As, from the size of the roof, it could not be supported without pillars, they are disguised under the form of palm-trees. The heat is maintained by concealed flues placed in the walls and pillars, and even under the earth leaden-pipes are arranged, incessantly filled with boiling water. The walks of this garden meander amidst flowery hedges and fruit-bearing shrubs, winding over little hills, and producing, at every step, fresh occasions for surprise. The eye of the beholder, when weary of the luxuriant variety of the vegetable world, finds recreation in contemplating some exquisite production of art: here a head, from the chissel of a Grecian sculptor, invites to admiration; there a motley collection of curious fish, in crystal vases, suddenly fixes our attention. We presently quit these objects, in order to go into a grotto of looking-glass, which gives a multiplied reflection of all these wonders, or to indulge our astonishment at the most extraordinary mixture of colours in the faces of an obelisk of mirrors. The genial warmth, the fragrance and brilliant colours of the nobler plants, the voluptuous stillness that prevails in this enchanted spot, lull the fancy into sweet romantic dreams; we imagine ourselves in the blooming groves of Italy; while nature, sunk into a death-like torpor, announces the severity of a northern winter through the windows of the pavilion. In the centre of this bold creation, on a lofty pedestal, stood the statue of Catharine II., surrounded by the emblems of legislature, cut in Carrara marble. It has been thrown out of the building, on its being made into barracks."

"The gardens at Potemkin's other residences, as well as many imperial and private gardens in Russia, were laid out by Gould, a pupil of Brown. Sir John Carr relates an anecdote on Gould's authority, which was confirmed to us, in 1813, by the present gardener, Call, his successor, and deserves a place here. In one of the prince's journeys to the Ukraine, Gould attended him with several hundred assistants, destined as operators, in laying out the grounds of Potemkin's residence in the Crimea. Wherever the prince halted, if only for a day, his travelling pavilion was erected, and surrounded by a garden in the English taste, composed of trees and shrubs, divided by gravel-walks, and ornamented with seats and statues, all carried forward with the cavalcade." This reminds us of what is said of him on another occasion; having accidentally discovered the ruins of a castle of Charles XII. of Sweden, he immediately not only caused it to be repaired, but surrounded by gardens, in the English taste.

88. "The most extensive seats laid out in the modern style, in the neighbourhood of Moscow, are those of Gorinka, a seat of Count Alexy Razumowsky, and Petrowka, a seat of Petrowsky Razumowsky. The former is remarkable for its botanical riches, and an immense extent of glass. The grounds are of great extent, but the surface flat, and the soil a dry sand. A natural forest of birch and wild cherry clothes the park, and harmonizes the artificial scenes. The mansion, built by an Englishman, is highly elegant; and the attached conservatories and stoves, and decorated lawn, form a splendid and delightful scene, unequalled in Russia.

"Petrowsky Razumowsky contains both an ancient garden, already referred to, and a large extent of ground, laid out in the modern style, and adorned with buildings, from designs by Signior Camporezi. There is some variety of surface, abundance of birch and fir-woods, with some oaks and aspens interspersed, and a large piece of water. Among the ornamental buildings is a cotton manufactory, in actual use as such. The practice of introducing manufactories as garden-buildings, is very general in Russia, and almost peculiar to that country. The palace and gardens of Count Alexy Razumowsky, and of Paschow, in Moscow; of Zaritzina, a singular Turkish palace, built by Potemkin for Catherine; of Astankina Count Chérémétow, Peckra, Prince Galitzin, and various others, would well bear description, but we are necessarily precluded from doing this by our limits, and conclude by observing, that extent, exotics, and magnificent artificial objects, is more the object of the modern style in Russia, than scenes merely of picturesque beauty. We think this may be accounted for, partly from the general want of refinement of taste in that country, and partly from its inaptitude for that style.

"The nobles of Russia, suddenly rendered aware of being distanced in point of civilization by those of most other European countries, are resolved not merely to imitate, but even to surpass them in the display of wealth. The most obvious marks of these, in the most refined countries, are necessarily first singled out by rude and ambitious minds, and large magnificent houses and gardens are desired, rather than comfortable and elegant apartments, and beautiful or picturesque scenes; since, as every one knows, it is much more easy to display riches than to possess taste, to strike by what is grand, than to charm by what is beautiful."

There are many royal and other gardens to be seen round Petersburg and Moscow; but in the country hundreds, or even thousands, of miles may be gone over without meeting with any thing worth mentioning. The nearest to Moscow, southwards, which we have seen, is that of Sophiewski, in Podolia, 1000 wersts distant.

89. *Poland*, being a country somewhat more civilized than Russia, gardening was more early introduced. The first efforts, in respect to design and taste, seem to have been made under the reign of Stanislaus Augustus, third elector of Saxony, in the end of the seventeenth century, who succeeded to Augustus, the second elector, a prince, as we have seen, remarkably attached to gardening.

One of the most ancient gardens in Warsaw is still known as the *Jardin Electoral de Saxe*. It was never completed, and is now a public garden. *Le Jardin Krasxinski* is another public garden; but by far the most remarkable is that of Lazenki, or the Bath, formed by the last king, on the scite of an ancient park, at Ujasdow, within the suburbs of the city. At the beginning of the reign of Stanislaus, in 1764, it was a marshy wood, planted with alders, with some canals and other stagnated pieces of water, near which was a grotesque edifice, called the Bath, and from which this park takes its name.

The palace, a beautiful piece of Roman architecture, from the designs of Camsitzer, a German artist, is placed on an island in a considerable piece of water. It consists of a centre and two wings. The centre is placed in the middle of a narrow part of the lake, and the wings are on opposite shores, and joined to the centre by arches with orangeries over. The entrance is by a carriage-portico, in one of the wings to which you arrive, without seeing the lake; and on entering the orangery, its first effect is surprising and delightful. On the north shore of this lake is an open amphitheatre of stone with its orchestra on the brink of the water; and near the margin an island of trees, which served as the proscenium. This theatre was at all times open to the public; and in addition to the ordinary exhibitions, ships and naval engagements were occasionally exhibited. The gaiety which reigned here during the first years of the reign of Stanislaus, the singular effect of the illuminations, the ships, and the resounding of the music in the woods, are still recollected by some of the oldest inhabitants of Warsaw, and spoken of with feelings of regret. The grounds were not extensive, nor, excepting near the palace, much ornamented: they consisted of a number of broad green alleys, crossing each other at right angles; of smaller covered paths, leading to open circles of turf for dances and music, and for tents and booths on extraordinary occasions. In several places coffee-rooms and ice-cellars were established, and still remain; and there are two pavilions for the king's mistresses; and another, which served as a seraglio, for strangers or visitors of the king: the three being connected with the palace by arbor-like paths, or arcades of trellis-work, covered by creepers.

One thing deserves to be remarked as to these gardens, which is, perhaps, not to be found in any others in Europe. Pedestals, as if for placing statues, were ranged in different parts of the grounds, particularly along the broad walk leading from the palace to the amphitheatre. On these pedestals, on extraordinary occasions, selected living figures, male and female, dressed in character, were placed and taught to maintain certain attitudes, after the manner of the representations called *Tableaux*, and which are sometimes, though rarely, produced in private circles at Paris and Vienna on days when theatrical amusements are forbidden. It is not to be wondered at that so luxurious a king should have wanted decision of character, lost his honor, kingdom, and, in short, every thing worth having.

In 1813 this seat was nearly in the state in which it was left by Stanislaus; but we understand it has since undergone several changes.

The principal private garden in the ancient style was that of Villaneuve, the property of Count Stanislaus Pototcky, a few miles from the capital, but now modernized. Judging from the excellent views of these gardens, painted by B. Cannaletti, and now in the zamosk, or castle in Warsaw, they must have been elegant of the kind.

At Cracovie there are the remains of a garden, of a few acres, laid out by marshal Loudon, when Austrian governor of that city; one of a convent of some extent, and a small public garden. But in the south of Poland, and especially in Gallicia, the only thing remarkable as to design in gardens is the powerfully walled enclosures of the convents and religious houses, in some of which are venerable orchards, broad grass-walks, mossy trees, and curious sun-dials.

90. " English gardening was introduced into Poland by the Princess Isabella Czartoryska, at Pulhawa. This lady, highly accomplished, of great taste, and much good sense, had been a considerable time in England. She carried to Poland, Savage, a gardener, and with his assistance, and that of Vogel and Frey, artists of Warsaw, she laid out Pulhawa, between 1780 and 1784, and published in Polish (*Mysli Rozne o Sposobie Zakladania Ogrodow*) a work with plates, on English gardening, in 1801. The situation, like almost every other with which we are acquainted in Poland or Russia, is flat and sandy; but is somewhat relieved by the Vistula. On the brink of this river, on a wooded bank, stands the house, a plain Grecian building, which with the grounds

are described by Burnet, in his view of Poland (chap. xi.). Independent clumps of shrubs are more frequent in these gardens than would be admitted by a good taste in England; but all Poland is a natural forest; and as the grand object of improvement in every country, is to obtain applause by the employment of art and expence, artificial forms, from their rarity, are better calculated for this purpose than such as are more universally beautiful, but so common locally as to want the charm of novelty; — or whose beauties are too refined to be generally understood. Thus clumps in Poland, may be as much esteemed as groups are in England, on the same principle, that, in a wild country, butcher-meat is more esteemed than game, because the latter is the common food.

"The other eminent examples of the modern style are those of Count Zamoski, at Zamoyst, and Count Potocki, at Villaneuve. The first are of limited extent, but the latter, near Warsaw, are very extensive, and were laid out chiefly from the designs of Princess Czartoryska. The gardens of General Benningsen, near Wilna, were in a mixed style, surrounded by oak and pine-forests. They were destroyed during the retreat of the French army in 1812. Those of Colonel Lachanitzki, at Poniemenia, on the banks of the Niemen, at Grodno, are not extensive, but contain more romantic and picturesque scenery than any we have seen in Poland." *Ed. Encyc.*

The *amor patriæ*, from superior education and recent intercourse with every country in Europe, is of a much more active and intelligent nature in Poland than in Russia, and will, we are persuaded, within a moderate period, place the former kingdom on a level with any of the continental states, more especially if her individuality shall be preserved.

Subsect. 2. *Russian Gardening, in respect to the Culture of Flowers, and Plants of Ornament.*

91. The culture of ornamental plants, and especially of Dutch roots, would doubtless be introduced in the imperial gardens with the Dutch taste in design; and soon after copied by such of the nobility as could afford to copy in matters of this kind. It was reserved, however, for Catherine the second to give the first impulse to this taste by establishing, at Petersburg, the first public botanic-garden in 1785, for the use of the academy of sciences. Another was soon after formed for the medical college.

The botanic-garden of the university of Moscow was founded by the present Emperor, in 1801, but was unfortunately destroyed by the French in 1812; at which time the university was burned down. Both, however, are now restored to their original splendor.

The first private botanic-garden formed in Russia, was that of Count Dimidow, began during Peter the Great's reign. It was chiefly devoted to native plants; but still the hot-houses for exotics occupied more than one acre of ground. Two botanists were sent to travel over the whole of Asiatic Russia. In 1786 a catalogue was published, when the collection amounted to 4363 species or varieties, exclusive of 572 varieties of fruit trees, 600 varieties of florists' flowers, and 2000 species which had not flowered.

"*Une seule anecdote,*" says Deleuze, "will prove how eager Dimidow was to enrich his garden. Being at Rome, in 1773, he found in the garden of the *Petits Augustins del corso*, the handsomest orange-tree he had ever seen. The monks did not wish to part with it, and he was obliged to employ a good deal of money and influence to overcome their scruples. Having succeeded, he caused the tree, which was planted in the open air, to be taken up with an immense ball, put in a large box, set on a carriage made on purpose, and transported to Moscow." *Annales, &c.* tom. ix. 174.

But the most extensive private botanic-garden, not only in Russia but in the world, is that of Count Romanzow, at Gorinka, near Moscow. The great extent of glass has been already mentioned (88). When we saw these hot-houses, in 1814, they were much injured by the French; but the whole garden is now, we understand, completely reinstated. Dr. Fisher, its director, is a well known botanist, and corresponds with most botanical cultivators in Europe. A catalogue of this garden was published by Dr. Redowsky, in 1804. See *Bib. Banks.*

There are other private botanic gardens near Petersburg and Moscow; and good collections of ornamental plants at Pawlowsky and Gatschina, both imperial residences. The Baron Rahl has an extensive range of hot-houses, devoted chiefly to orange-trees and tender plants; and many of the Dutch and German merchants cultivate flowers in the gardens of their summer residences, on the Strelna road, at Petersburg. Excepting however among the first of the nobility, and the wealthy foreign merchants, ornamental culture of every description is quite unknown in Russia. The taste of the ordinary noblemen is too gross, the peasant is out of the question, and there is no middle class in the empire of the Tzars.

Dr. Howison remarks (*Caled. Mem.* iii.), "that there is scarcely any plant, or flowering shrub, which can resist the intense frost and cold of the winter in Britain, to be found out of doors in Russia; and at times, even the hardy whin-bush is destroyed. He says, "The gardener, in the Tauridon palace, Cole showed him "lilac trees, laburnums, different varieties of thorn, whin-bushes, &c. growing in large wooden tubs, filled with earth, and which were preserved there all winter, with the intention of being sunk in the borders of the garden, as soon as the weather should grow warm enough to admit of it."

"In the gardens of the villas and country houses, of the higher classes of Russians, and foreigners settled in the country, in the short period of a week from the disappearance of the winter, a beautiful and rich display of shrubs and flowers in full blow, consisting of hydrangea, various species of geranium and myrtle, wall-flower, carnation, &c. become visible. All these are, in like manner, reared in hot-houses. As their bloom fades, fresh plants are brought from the conservatory to replace them, thus keeping up an artificial garden, as it may be called, during the whole warm season; and when the cold weather begins again, the whole are removed and replaced in the green-house."

The Russians, of all ranks, Dr. Howison, contrary to our observation, considers as so remarkably fond of flowers, that even the poorest house, he says, is filled with them. The streets of St. Petersburg, Moscow, and other large towns throughout the empire, at the commencement of the summer, are crowded with people carrying full blown flowers for sale, reared in the public green-houses, and they find no difficulty in procuring buyers at exorbitant prices. The hydrangea, from its showy appearance, the great durability of its flower, and variety of colour which it presents, is a great favorite amongst them. By watering it with a solution of alum, they greatly increase the splendour, beauty, and the variety of colour of its flower. The different varieties of cherry balsam appear also to be great favourites of the lower classes, as they are to be met with in the windows of almost every village isba.

92. *Poland.* The oldest botanic-garden in Poland, is that of Wilna, founded by Catherine, soon after the dismemberment of that country; the most thriving is that of Cracovie, placed in 1812 under the direction of Professor Oestricher, a zealous botanist. A garden was also began about 1810, in Warsaw, on the steep banks of the Vistula. Of the original Warsaw garden, of which a catalogue was published towards the middle of the last century, we could, in 1813, procure no account.

Count Benningsen had an excellent botanic garden at his seat near Wilna, which, as already observed (90.), was destroyed and the chateau burned down in 1812. It was rich in hardy plants. At Pulhawa the Princess Isabella Czartoryska has a considerable collection, and used frequently to send her gardener (Savage), lately deceased, to England to procure the newest exotics.

A few flowers are cultivated in some of the wealthier citizens' gardens, around Warsaw, and a few in gardens of the conventual institutions; but in a general point of view, they are as uncommon in Poland as in Russia. In both countries a few may, occasionally be seen on market days, which have been gathered in the fields, and brought in by the peasants; these are purchased by the minor nobles to decorate their rooms; by the monks, to display on their altars, or by devotees to present to the virgin, or the image of their patron saint. The floors of the higher classes, in Poland, are often strewed with the leaves of the *acorus calamus*, which abounds in the marshes of that country. In some districts, towards Courland, the spray of the spruce fir is used for this purpose; a practice, as Mary Woolstoncraft has remarked, common in Sweden.

Subsect. 3. *Russian Gardening, in respect to its Horticultural Productions.*

93. With the Dutch and French taste in gardening, Peter the Great introduced Dutch and German gardeners; these would doubtless bring with them the culinary vegetables of their respective countries. With the English style, Catherine introduced English gardeners, of whom the same remark may be made. Before this period, the wild pear, the wild cherry, the black currant, the cranberry, and the strawberry, must have been almost the only fruits seen in aboriginal Russia; all these may be gathered in the woods. The apple is abundant in the Polish provinces, in the Ukraine, and a century ago, as at present, may have been sent to Moscow, and the higher classes of that city might then also procure other fruits from foreign countries. At present, the imperial family, and a few, perhaps six or eight of the first nobility, enjoy almost all the European fruits in tolerable perfection, chiefly by the influence of glass and fire heat. The quantity of pines and grapes grown in the neighbourhood of Petersburg, is indeed an astonishing feature in its horticulture. Pines, grapes, and peaches, being grown so as to ripen in August and September, enjoy, in these months, abundance of sun, and nearly equal in flavor those grown in England or Holland; but the apple, pear, cherry, and plum, being in that part of the empire considered as only half hardy fruits, rarely ripen in the open air so as to be fit for the desert; and are generally planted in houses, or against walls, and brought forward by glass. The branches of the cherry-tree are protected by burying in the soil, as the French do those of the fig-tree, in the fruit-gardens of Argenteuil.

The climate being less severe, about Moscow, the hardier fruits ripen somewhat better in the open air, but still far inferior to what they do at Edinburgh, which is in the same parallel of latitude. We have seen apples, pears, cherries, &c. ripe in the hot-houses of the imperial gardens at Tzaritzina, in April, but without flavor.

Almost all the horticulture of Russia is contained in Moscow and around Petersburg; elsewhere, scarcely any sort of fruit-tree is to be found but the wild pear. Kitchen gardens are rare, even in Podolia, a very fine Polish province in the Ukraine, with a deep rich soil, level surface, and climate nearly equal to that of England. The only fruits a Russian peasant or minor Russian nobleman can taste, are the wild pear (*groutchky*) dried or green, the strawberry, and the cranberry. Of the last, a cooling acid beverage is made by infusion in water.

If any culinary vegetable was known in Russia, before the beginning of the last century, it could only have been the dwarf, ragged-leaved brown kale; the potatoe is but lately introduced, and that only in a few places. Many of the peasants refuse to eat or cultivate this root, from mere prejudice, and from an idea very natural to a people in a state of slavery, that any thing proposed by their lords, must be for the lord's advantage, and not for theirs; thus the first handful of food thrown to untamed animals operates as a scare.

The example of the court, and the number of foreigners employed in the Russian service, both civil and military, in their literary institutions, and established as medical or commercial men in the towns, will, no doubt, gradually introduce a variety of culinary plants. The late war may also have had some influence, by giving the untravelled noble a taste for the comforts of Germany and France; but, unfortunately, the Russians are averse to a country life, and will continue to be so till they acquire a taste for domestic enjoyments and rural recreations. Dr. Howison (*Mem. of Caled. Hort. Soc.* vol. iii. 77.) has given "an account of the most important culinary vegetables cultivated in the interior of the Russian empire." Of these the cucumber, melon, yellow turnip, radish, and bulbous celery, were introduced from Germany, and are known but to a few. The remaining sorts mentioned are, the variegated cabbage, from the South Sea Islands; mustard, from Sarepta, near the Chinese wall; and an onion from Chinese Tartary. These were introduced by Hasenkampf, of the late Russian embassy to China. The English and German court gardeners grow abundance of all our best vegetables, and contrive to prolong the season of some of them, as cauliflowers, celery, cabbage, &c. by earthing them in cellars. A succession of salading is kept up in hot-houses, during winter, and even the first crops of all the common oleraceous and acetaceous plants are reared under glass and by fire heat in some of the best gardens.

In Storch's Petersburg, (chap. iv.) the dependence of Russia on foreign countries for her culinary vegetables and fruits is amply detailed.

94. In speaking of the gardening of Russia, we must always be understood as excepting those provinces which formerly belonged to the kingdom of *Poland*. In these the population are Catholics, and conventual establishments being very numerous, the inhabitants are therefore more civilized, (though consisting in great part of slaves, lords, and priests, without a middling class,) and the nobles, who probably borrowed from the monks, have some varieties of fruits and culinary plants in their gardens. This applies particularly to Lithuania, a fertile and populous province. The potatoe is in more general use in Poland than in Russia, which is an important feature in her horticulture, though a slight prejudice still exists against it, from its having been introduced by the Germans.

The cucumber is cultivated in many places for salting, or preserving by barrelling and sinking the barrel in their wells. In some places, the common carnation poppy is grown for the seed, which taken, when beginning to ripen, and strewed on a sort of milk-porridge, or milk-paste, made from the meal of buck-wheat, is reckoned a delicacy. Bees are kept by some of the freed men or minor nobles. The Polish hives and mode of taking the honey, to be afterwards described, are exceedingly simple, and never requiring the death of the insects, seems preferable to any mode of bee-culture yet devised by the bee-masters of other countries.

Hirschfield mentions, that the gardens of Prince Casimir Poniatowski, elder brother of the last king, contained at one time 5000 annanas, in a range of hot-houses 600 feet long. In 1813, the only pines grown in Poland, were a few at Pulhawa, and some grown by a German, who rented the hot-houses belonging to the late king's establishment at Warsaw. Only one or two instances then existed of vines and peaches, being grown near the capital, but there were abundance of these and other fruits at Pulhawa, and Zamoyst, and some few at Villeneuve.

The Polish noblemen are much more enlightened than those of Russia; they have gained in every kind of knowledge from having been so long a period in the French service; and since the re-establishment of peace, they have set about agricultural and gardening improvements, with a considerable degree of energy.

Subsect. 4. *Russian Gardening in respect to the Culture of Timber-trees and Hedges.*

95. We are aware of scarcely any thing done in this way in Russia. There are yet abundance of natural forests for timber and fuel, and in the northern parts where no system of pasturage can take place, inclosures are not now, and probably never will be, of any use. Hedges are in use in the gardens of the capital, and of the city of residence.

The time is not yet come for planting the sides of the high-roads, though that would be a grand feature of improvement, and suitable to the taste of the present benevolent monarch. In some governments, towards the south, this has been partially done in a few places, by stakes of the silvery-leaved, or Huntingdon-willow, (*Salix alba*,) but the trembling-poplar, birch, and lime, are the proper trees for the northern parts, and the cherry, alder, sycamore, oak, elm, walnut, &c. may be introduced in advancing southwards.

In Poland, some public avenues have been planted near Warsaw and Posen; and the elm, one of the best avenue trees, thrives at both places. There are scarcely any hedges in the country, excepting in gardens and near towns.

Subsect. 5. *Russian Gardening as empirically practised.*

96. The very limited use of gardens in this country, has been already noticed. Few are to be seen attached to the isbas, or log-houses, of the boors, and not many to the rich privileged slaves, or the native freedmen of the towns.

There is no such thing as a Russian farmer; every proprietor farms the whole of his own estate by means of his slaves and an agent. The greater part of these proprietors have no gardens, or if they have, they are wretched spots, containing a few borecoles, and but rarely potatoes or legumes.

The use of gardens is, therefore, almost entirely confined to the imperial family, the highest class of nobles, and a few foreigners, who have settled in the principal cities.

The head operative gardeners of Russia, are almost all foreigners, or sons of foreigners. Sometimes a nobleman sends a slave as an apprentice to a gardener, for his own future use; but generally the assistant laborers are mere Russian boors, slaves of the lord; or other slaves, who have obtained permission to travel and work on their own account for a few years. These boors make very tractable laborers; for the Russian is imitative and docile, to a high degree.

The artists of Russia, are the English or German head gardeners attached to the establishment of the emperor, or of some eminent noble. Gould, Potemkin's gardener, was the Brown of Russia, in Catherine's time. This man had a character in some degree analogous to that of his master; he lived in splendor, and gave occasionally entertainments to the nobility. A few years ago, he returned to England, and died at an advanced age in 1816, at Ormskirk in Lancashire, his native town.

A foreigner once established as head gardener to the emperor, or any of the first nobility in Russia, becomes in some degree a despot, like his master, and unless he commits very gross errors indeed, his conduct is never enquired into, nor does he lose his place but with life, or return home. He is not very liberally paid, but he enjoys every comfort the state of society there affords; lives in a house that would be reckoned a considerable mansion in England, and has abundance of servants, and a carriage and horses, at his command. His country, and its broad cloth, procure him the respect of the nobles, and the dread of the slaves; the former he may render tributary by presents of seeds, and the latter he may kick and beat at pleasure. If at any time he goes too far, a few radishes to the police-bailiffs, or a few peaches, or a melon, to the chevaliers their masters, will restore every thing to harmony.

Subsect. 6. *Russian Gardening, in respect to Science, and the Authors it has produced.*

97. However adroit the foreign gardeners in Russia may be, in adapting practices to the climate, it can hardly be expected, in the circumstances in which they are placed, that they should increase the science brought with them. Separated from their friends, surrounded by strangers using a language with which they never become familiar, without the means of procuring new books, and rarely coming in contact with intelligent gardeners or naturalists; much of the knowledge they carried with them, is unavoidably forgotten or neglected. We regret to add, that it has been remarked by various travellers, that even the moral sense of Englishmen, who settle in Russia, becomes in time contaminated by the baneful influence of Russian manners. For the want of common honor and honesty which pervades all ranks in Russia, from the first minister to the meanest slave, is incredible. One wonders at first, how such an immoral state of society can exist; but the refined moral habits of civilized nations, like their refinements in cookery and dress, may all be traced to the simple principle of self-preservation. And

as a savage can put up with homely fare and a coarse garb, so it would appear a barbarous people may hang together by a sort of tattered moral principle.

We know of no original work on gardening published in Russia, excepting a poem, "On Gardens," by Samboursky, translated into the French language by Masson de Blamont. There is also a poem on glass, by the Russian poet Lomanosow, which, as containing an eulogium on hot-houses, may be considered as belonging to this subject. Some translations have been published in German; and various papers on botanical, physiological, and agricultural subjects, appear from time to time, in the Transactions of the Imperial Œconomical Society. Translations of various works on rural economy, were pointed out to us in the library of the Dominicans, at Grodno; but the only Polish work on gardening, which may be considered as original, we believe to be *Mysli Rozne o Sposobie Zakladania Ogrodow*, &c. 1808; or, "Various Thoughts on the Manner of planting Gardens," by Princess Isabella Czartoryska.

Sect. VI. *Of the Rise, Progress, and present State of Gardening in Spain and Portugal.*

98. We learn from Columella, that in the days of the republic, Spain was as well cultivated as any of the Roman provinces, and the dairies of Andalusia were noted in his time; but Harte in 1670, found only goats'-milk in use in Madrid, and saw them scratch their land, instead of plowing it; they are too lasy and proud, he says, to work. The Spaniard, observes Hirschfield, does not love the country; not, however, either from lightness of character or bad taste, but from a sort of indolence that one cannot better describe, than by calling it Spanish, and which appears to result from the natural temperament and prejudices of the people. A people on which the attractions of nature have so little effect, that the nobles know no other pleasures than those of the capital, and the lower classes, those of the village fair, or the *fandango*. This supineness is the more incomprehensible, as the country, though desart and uncultivated in many places, is yet full of natural charms in others, thus indicating as it were a field of exertions for the hand of man. In many provinces, Puente informs us, one may travel several leagues without seeing a tree, and according to the same author, the environs of Madrid neither present pavilions nor country-houses, and it was not till towards the end of the eighteenth century, that they began to repair the roads around the capital, and border them with trees.

Spain, first desolated by incursions from the north, was destined to be restored and ameliorated by incursions from the south.

The Arabs, Deleuze informs us, divided into two colonies in the eighth century, under the guidance of the caliphs, extended their conquests in Europe and Asia. They built in Persia the city of Bagdad, and founded in Spain, that celebrated empire, where they rekindled the flame of science. The Arabs of Spain attended to agriculture, translated and commented on the ancient authors, and though they occupied themselves particularly in the study of medicine and botany, they did not neglect the culture of gardens. Many of them travelled to their brethren in Asia, to pursue natural history, and bring plants to Europe. Ebn-Alwan has left us a list of plants in the garden of Seville, in the eleventh century, which are more numerous than those which were cultivated by the Greeks and Romans.

The recent substitution of a representative for a despotic government, so happily brought about (1820), can hardly fail of acting as a stimulus to exertion in our art, in common with every other. Freedom from political slavery ends sooner or later in freedom from the slavery of religion, and man then learns, for the first time, to pursue with vigour the small but certain enjoyments presented to him in this life, rather than sit down in idleness, contenting himself with the hopes of unspeakable enjoyment in the next.

Subsect. 1. *Spanish Gardening as an Art of Design and Taste.*

99. The oldest garden in Spain, is said to be that of the Moorish palace of Alcazar, near Seville; the greater part of this palace was constructed by Peter the Cruel, between the years 1353 and 1364, who exactly copied the Arabian style of the ancient part of the edifice; and the remainder was erected by Charles V. There is one Arabic inscription, with the date of the Hegira, corresponding to the year 1181, of the Christian æra; and the name of the architect who built, and of the king under whom it was erected, are in the same place.

The outside of the Alcazar is miserable in its appearance, but the first court after entering the gate has a very grand effect; the part looking into that court is purely Arabic in its style, though ascertained to have been constructed since the conquest by the Christians. The courts are ornamented with marble fountains, and are well shaded with corridors, supported by marble pillars.

"The garden of the Alcazar is said to have been laid out by the Moors, and is preserved in its original state. It contains walks paved with marble, parterres laid out with ever-greens, and shaded with orange-trees. In many parts of it there are baths, supplied by marble fountains from an aqueduct, and they have a contrivance for rendering the walks one continued fountain by forcing up small streams of water from minute pipes in the joinings of the slabs, which in this climate produces a most grateful effect. As a specimen of an Arabian garden in its original state, this is an interesting object, and we naturally associate with it recollections gathered from the Eastern writers; especially from the song of Solomon, in which the descriptions very well agree with this garden; for, in addition to the other circumstances, it is completely walled round, and is secluded from every one, except the inhabitants of one part of the palace." *Jacob's Travels in the South of Spain.*

The remains of a reputed Moorish garden still exist at Grenada, another residence of the Arabian kings. It is situated on the *Serra del sol*, or mountain of the sun, occupies above twenty acres, is covered with wood cut into quarters by straight and winding walks, and interspersed with fountains; the latter sometimes ostentatiously displayed, and at other times secreted so as to escape notice till they are brought to play on the spectator, and raise a laugh at his expence. Sir John Carr mentions that they take a particular delight in playing off these reversed showers which rise from the principal walks and places of repose, against the ladies. Several of these fountains, and many of the walks were formed by Charles V. so that excepting certain venerable cypresses, and the old palace, no other part can with certainty be traced to the days of the Moorish kings.

In the beginning of the 15th century, soon after the union of Spain under one monarch, Charles V. made considerable improvements, and formed gardens and fountains at different palaces, of which little now remain.

The gardens which have been known as the finest in Spain, were laid out in the beginning of the 17th century, under the reign of Philip IV. These are the gardens of the Escurial in Madrid, of Ildephonso in its neghbourhood, and of Aranjuez near Toledo. The first, and the last of these gardens, are said to have been laid out from a design by Le Notre: Of the latter, the designer is not known. Evelyn in 1667, being anxious to receive some account of them, writes to the Earl of Sandwich, then the English ambassador at Madrid, who answers him in such a way that Evelyn was "exceedingly affected with the descriptions, and greatly instructed in many particulars." Unfortunately he has left none of these descriptions in his journal, mentioning only the *Sembrador*, or drill, which Harte informs us was invented by an Austrian mechanic, and first offered to the king of Spain about the beginning of the 17th century.

It is from Caimo an Italian priest, and Baretti a language master and a friend, who travelled once or twice through Spain to visit his native country, Italy, that we must collect some ideas as to the gardens of St. Ildephonso and Aranjuez. An account of the palace and gardens of the Escurial has been published, and illustrated by numerous plates by Dr. J. Thompson.

From the palace of the Escurial, we descend to the gardens by vast terraces varied by fountains, and joined by stairs of marble. The garden, or rather park below, is of great extent, and the quarters formed by the intersection of the alleys, are filled with different sorts of fruit-trees. This is the general outline, and for the details of the statues, fountains, trellis-work, basins, &c. we must refer the reader to Thompson's work, or the *Encyc. Brit.* art. *Escurial.*

The garden of Ildephonso is situated around a summer-house or, *Chateau de plaisance* of that name, and here nature and art, says P. Caimo, (*Lettres d'un vago Italiano*, &c.) combine to spread their respective beauties, and render this garden as magnificent as agreeable. Fountains, jets d'eau canals, temples, covered seats, cabinets, bowers, grottoes, labyrinths, pastures, hedges of myrtle and laurel are so distributed as to produce the best effect. The water is collected in streams from the surrounding mountains, and made to unite in a torrent which precipitates itself into an immense reservoir. Hence, from this abundant source, the fountains are as powerful as numerous, and no species of artificial ornament is omitted that can embellish a garden. The alleys are very long, some of them three-fourths of a league. Most of them are kept shorn on the sides forming a thick close surface from the ground to the summits of the trees, and statues, are placed at regular distances.

Of Aranjuez, Baretti observes, (*Tour in* 1776, vol. ii.) "that a poet would say, that Venus and Love had here consulted with Catullus and Petrarch, in order to construct a country residence worthy of Psyche of Lesbia, of Laura, or of some Infanta of Spain."

The park, which is several leagues in circumference, is intersected by alleys, three, and even four miles in length; these alleys are formed of double rows of elms, and are sufficiently wide for four carriages to drive abreast. On each side between the rows of trees, is a canal kept clear by a continual stream which passes through it. This water has contributed to render the trees of an enormous size, and thick verdure from top to bottom. The compartments, or islands formed by the alleys and the canals, are covered with copse, and occupied with deer, wild boars, hares, rabbits, pheasants, partridges, and other wild animals, and birds, which are regularly fed by certain shepherds or attendants, and have incredibly multiplied. This park, like the garden of Eden, is divided by a river (the Tagus), and what is remarkable, and prince-like, it is without surrounding walls, but verges into an open hilly country.

The palace is near the centre of the park, on the margin of the river, and both banks are united by a bridge of five arches. In front of the palace is an immense circular level lawn, ornamented with four trees in its centre. On the whole, according to Baretti's description, this must have been the finest park in the old style in the world. We regret to state, from recent information, that this and the other royal gardens were materially injured by the French in 1808, and since almost entirely neglected by the Spaniards themselves.

Of private gardens, a few are mentioned by Townsend, and Sir John Carr, some as belonging to British merchants, and situated round the principal sea-ports, and a few to Spanish nobles in the interior. At the Retiro, near Malaga, a seat of Count Villacasa, and formerly a royal residence, are gardens in the Moorish style with straight cypress walks, and excellent water-works. The archbishop of Valencia has a country-house and beautiful gardens at Puzol, near the city. The hermitages of Montserrat, near Tarragona, abound in oak, olives, ash, elm, box, myrtle, eglantine, jessamine, rosemary, lavender, thyme, and other aromatic shrubs and plants, tastefully disposed among the rocks and declivities, by the hand of nature, with very little assistance from man.

Granjas, the seat of Don Ramon Fortuny, near Tarragona, appears to be in good taste, combining the ancient style with the cultivation of the orange, fig, vine, olive, and other fruits, and with an accidental mixture of rocks and picturesque scenery. A very interesting engraving of this peculiar and beautiful residence is given by Sir John Carr, in his travels in Spain; the doors of the dining-room, he informs us, open into a small garden, the walls of which are covered with myrtles, jessamines, and roses, and the view is over an orchard of olives, oranges, and pomegranates. In the centre of the garden are grotesque water-works. We are not aware of any attempt to introduce the modern style of landscape gardening in this country.

100. Very little appears ever to have been done in our art in *Portugal.* Travellers mention a few villas belonging to merchants in the neighbourhood of Lisbon; and, as usual, there are some avenues or public walks near the town. Montserrat, near Cintra, a seat of the late eminent merchant, Beckford, was formed at immense expense by a native of Cornwall for M. de Vismes, and further improved by the former gentleman. It is laid out in the geometric style; abounds in inequalities, stairs, terraces, statues, and orange trees. Of late, we are informed, it has been much neglected.

H. Repton (*Frag. on Lands. Gard.* 1815,) gives an engraving of a plan which he had sent out to Lisbon, for laying out a small garden in the modern style.

Subsect. 2. *Spanish and Portuguese Gardening, in respect to Flowers and Plants of Ornament.*

101. The Arabs, as we have seen (§ 98), introduced the study of medicine and botany into Spain; there was a considerable collection of plants at Seville early in the eleventh century; and half the common plants of the country, Harte informs us, have names derived from the Arabic. The succeeding seven centuries present a blank in this branch of history. According to Deleuze, the taste shown for botany in Spain and Portugal at the beginning of the sixteenth century, declined with the sciences; and that country, where they had been cultivated when Europe was barbarous, appeared to sink into the greatest apathy, after having shone with the greatest eclât under Charles the Fifth and Emanuel of Portugal.

It was only in 1753 that the public garden of Madrid, and in 1773 that that of Coimbra, were established. Ferdinand the Sixth gave the direction of the former to his first physician, Don Joseph Sagnol. He bought the private garden of Don Joseph Queer, who cultivated at home a great number of foreign plants: he named this botanist professor, and added Don Jean Minuart. At the same time, he arranged instructions for travellers going to America, and ordered them to bring home seeds, and to add the indication of the climate, and the nature of the soil where they collected them. They also sent travellers with particular orders to make collections of vegetables. It is from these treasures that the royal garden of Madrid has become the nursery of the plants of Peru, Mexico, and Chili; and from thence they have been sent to other gardens of Europe.

Not having visited this country, we are unable to gather, from the scanty observations of travellers, how far a taste for flowers and plants of ornament is general in Spain. At the present day odoriferous flowers, as the jessamine, the orange, &c. are said to be in repute by the ladies; and various sorts are grown in the conventual gardens of the priests, for official decorations in churches and oratories.

Subsect. 3. *Spanish and Portuguese Gardening, in respect to its Horticultural Productions.*

102. The earliest of the few Spanish authors who have written on gardens, is Herrera, whose book on rural economy appeared early in the seventeenth century. It contains a treatise on gardens, (*De las Huertas*,) in which he distinguishes only two sorts; one for "delight and provision for the house," and the other for supplying the public market. Private gardens, he says, need not be extensive; those for selling vegetables and fruits should be near a town or village, and well supplied with water. He gives directions for cultivating the vine, fig, olive, apple, pear, and the common culinary plants. Of these, the soil and climate are peculiarly favorable to the alliaceous and cucurbitacious tribes, some sorts of which, as the onion and winter melon, form articles of foreign commerce.

Spain possesses, native or naturalized, all the fruits of Italy, and, like that country, can boast an immense variety of the melon, the grape, the fig, and the orange; the three last forming important articles of commerce, may be considered as belonging to the general economy of the country rather than to gardening. D. Roxas Clemente has published a work describing 120 varieties of the grape, as grown in one province only. We do not know that the pine-apple has been cultivated in Spain. Hot-houses are only to be found in the botanic garden at Madrid, and in some merchants' gardens near Lisbon.

Planting. The Spaniards, Harte observes, plant no timber, and make few or no enclosures.

Subsect. 4. *Of the Rise, Progress, and present State of Gardening in European Turkey.*

103. The Roman taste in gardening would pass to Byzantium when the seat of empire was removed there in the fourteenth century by Constantine; but as to its history when the rest of Europe was enveloped in ignorance and superstition, very little is known. The numerous Greek authors on rural matters, (Geoponici,) who wrote between the fourth and fourteenth centuries, do little more than copy Columella and other Latin georgical writers; they mention very few plants as ornamental, and treat chiefly of agriculture, vineyards, and poultry.

For some miles round Adrianople, Lady M. W. Montague, in 1717, observes, one sees nothing but gardens. The rivers are bordered with fruit-trees, under which the citizens divert themselves in the evenings; not in walking, which is not a Turkish pleasure, but in seating themselves on a carpet spread on the turf, under the thick shade of a tree; there they take coffee, smoke, amidst vocal or instrumental music, groups of dancing females, and other sports.

The gardens of the sultan at Constantinople acquired a degree of celebrity through the letters of Lady M. W. Montague, to which, it appears from subsequent authors who have examined them, they are by no means entitled. These gardens were visited by Dr. Pouqueville in 1798, and it is generally allowed that he has described them with as little imagination and as much accuracy as any writer.

The grand seignior's gardener was then a German, a native of Rastadt, by name Jaques, whose salary was 6000 piastres a-year. He conducted Dr. Pouqueville and his companion between the first and second ramparts of the town, which form the natural fortifications of the seraglio on the side to the sea. The palace is, properly speaking, a town within itself, having its walls crowned with battlements, and its bastions, and its gates, like an old fortified place. Dr. Clarke says that the seraglio occupies the whole site of the ancient Byzantium, and Pouqueville, that the present manége is placed where there was a hippodrome at the time of the lower empire; so that the destination of the place has not been much altered for the last fifteen hundred years. The first garden they saw was a place inclosed on three sides, with a palisade, the fourth side being formed by the rampart. It was filled with shrubs; such as early roses, heliotropes, and others, distributed in clumps, with several beams, and a great deal of rubbish lying about. At last they arrived at the entrance of the sultan's garden. The gateway is of white marble, about fifteen feet high, by four wide, decorated with columns, in a very bad taste.

A treillage, twenty-five feet high and fifteen wide, extremely massy, forms a cross, running each way, from one side to the other of the garden, dividing it into four equal divisions. In the centre of the cross, it forms a dome over a small basin of white marble, in which is a jet d'eau. Jaques ordered some of the men to make it play, but the water did not rise above six feet. It was, indeed, an exhibition much below mediocrity. The four squares formed by this cross are planted with flowers, and in the middle of each are basins again, with jets d'eau quite in miniature. That to the left, as we entered, appeared the most singular of them. After the water has risen to the height of about four feet, it divides like a parasol, and each stream falls upon a shell, upon the circuit of the basin, which again divides it into an infinite number of still smaller streams, scarcely bigger than threads. We contemplated this chef d'oeuvre for some minutes, and thought it very pretty for amusing children. The treillage, a work truly German, seems, from its solidity, calculated to brave the injuries of time for a long series of years. It is covered with jessamine, which perfumes the whole garden; and, to say the truth, it has no difficult task to perform, for the inclosure is so small, that there can hardly be said to be sufficient space for the air to circulate freely. To the right, which is the side towards the sea, the treillage leads to the kiosque of the grand seignior, called Jeni-kiosque, the new pavilion. Three circular steps lead up to it, which occupy, in the semicircle they form, the portion of the kiosque that projects into the garden. A number of cages, with canary birds, were hanging about; these little creatures sung charmingly, and had been taught to draw water. About fifteen paces from this kiosque, running along the same rampart, is a terrace of about fifty feet in length, and twelve in breadth, adorned with flowers, which has lately been turned into a conservatory.

Another garden, to which they descended from the terrace, is the largest of those that belong to the grand seignior, a hundred and twenty paces long and fifty broad. At the eastern extremity is a hot-house, where Jaques was cultivating a number of foreign plants and flowers with great care. The hot-house was little better than a shed; under it were a number of benches, rising in a stage one above the other, with the flower-pots ranged upon them. Among the plants, some from Abyssinia and the Cape, held a distinguished rank for their superior fragrance. Another garden, or rather a terrace, raised five-and-twenty feet high, which looks down upon the garden just quitted, contained nothing but a red and parched soil, with a few withered plants. An aviary had been made by order of the sultana Valide; and this, according to the ideas of the Turks, is the most curious thing upon the terrace. " I quitted this dismal garden," says Dr. Pouqueville, " this kiosque of Hassan Pasha, perfectly freed from the chimeras with which my imagination had been previously filled. I had formerly read the letters of Lady Montague, and I seriously believed that I was to find walls incrusted with emeralds and sapphires; parterres enameled with flowers; in short, the voluptuous palace of Armida, but her account is drawn from the sources furnished by her own brilliant imagination." — We quitted the burning garden to visit the haram. The haram of the sultan—the promised paradise. Lady Montague was now about to triumph.

The garden of the haram is a square very ill kept; it is divided from east to west by a terrace. It was here that the feast of tulips was formerly held; but this has been long abolished. According to all appearance it must have been a very poor thing; but the pens of romance writers can embellish objects the most ordinary, and make them appear of prodigious importance. Some clumps of lilacs and jessamine, some weeping willows hanging over a basin, and some silk-trees, are the only ornaments of this imaginary Eden; and these the women take a pleasure in destroying as soon as the flower appears, by which their curiosity is excited.

T. Thornton, author of a late work on Turkey, arraigns Dr. Pouqueville for not being more dazzled with the magnificence of the haram, and for thinking that Lady Mary Wortley Montague has rather, in her descriptions of eastern luxury and splendor, painted from a model formed by her own brilliant imagination, than from reality. But it is certain, H. M. Williams observes, that Dr. Clarke's testimony is a strong confirmation of Dr. Pouqueville's. Indeed there is so striking a similarity in the accounts given by the two doctors, that each strongly supports the truth of the other, and both lessen extremely the ideas we have hitherto been led to entertain of the luxury and magnificence that reigns in the grand seignior's seraglio. *Pouqueville's Travels translated by H. M. Williams.*

104. *Flower Gardening.* When the Turks, observes Deleuze, by the taking of Constantinople, had given stability to their empire, they devoted themselves particularly to the culture of flowers. Belon, in 1558, speaks with admiration of the gardens which he saw among them. " There are no people," he says, " who delight more to ornament themselves with beautiful flowers, nor who praise them more, than the Turks. They think little of their smell, but delight most in their appearance. They wear several sorts singly in the folds of their turban; and the artisans have often several flowers of different colours before them, in vessels of water. Hence gardening is in as great repute with them as with us; and they grudge no expense in procuring foreign trees and plants, especially such as have fine flowers." Busby, ambassador at Constantinople in 1550, has the same remarks, and adds, that they frequently give flowers in presents; and that, though very avaricious in other things, they do not hesitate to pay dear for them.

105. We know little of the state of *horticulture* in Turkey, or how far the use of gardens is general. The capital of the Turkish empire, T. Thornton observes, (*Present State of Turkey*, 22,) though the soil in its immediate vicinity is barren and ungrateful, receives from the neighbouring villages and from the surrounding coasts of both the seas which it commands, all the culinary herbs and fruits of exquisite flavour which the most fastidious appetite can require. On the shores on both sides of the Bosphorus the ground forms a chain of schistous hills, covered with vineyards and gardens, and beautiful trees and shrubs; and the villas, which are exceedingly fertile, are in the highest state of cultivation.

Dr. Pouqueville (*Travels in* 1798,) gives some account of the botany and gardening of the Morea. " This country, formerly a part of Greece, is rich in vegetable productions, but at present proportionably poor in cultivation. There is no great variety cultivated in the gardens; the ground in general is ill prepared; the Greeks are unacquainted with the spade, and only use a mattock for turning it. Spinach and artichokes, which will even grow naturally without cultivation, are among the best culinary vegetables. Cabbages and cauliflowers grow to a prodigious size; they have also very good carrots. Beans and French beans are produced in such abundance that they might become an object of exportation; but the seeds of both are much smaller than ours in France. The lettuces are small; and the celery never will be good while, as at present, they do not earth it up. The tomatoes are very fine, as is the fruit yielded by the melongena. The melons, water-melons, and gourds, are not to be exceeded in any part of the world. Mint, balm, fennel, parsley, and other herbs, abound in the gardens. The orchards are well furnished with almonds, oranges, lemons, citrons, peaches, pears, apricots, quinces, cherries, pomegranates, medlars; they have also the arbutus, the service-tree, and the corob- tree; all these might be improved, if more pains were taken in cultivating them." p. 204.

The account which this author gives of the plants, the timber, and the fruit-trees, natives of the Morea, is highly interesting; he regrets that he could not occupy himself more with the subject, adding, that a botanist might compose a work worthy of the age in which we live, in undertaking a complete *Flora Peloponnesica*.

Sect. VIII. *Of the Rise, Progress, and present State of Gardening in Britain.*

106. From the number of Roman villas, which antiquaries, from time to time, discover to have existed in Britain; and especially from the extent of some that have been recently disinterred, there can be little doubt that the Romans introduced their gardening in this country. Pliny expressly mentions, that cherries were introduced in Britain, about the middle of the first century. In all probability the fruits and legumes of Italy would be cultivated by the Roman soldiers, for their own use as well as to supply the tables of the luxurious generals, who successively governed this country. That we received our agriculture from this people, there is not the slightest doubt; since, independently of historical evidence, we have that of the existing and not yet exploded practice in arable lands, of taking two crops of corn, with a succeeding fallow. This mode of culture is recommended by the Roman georgical writers, was practised in Italy two thousand years ago, and is still followed in many parts of the Continent, as it is in the commonable lands of Britain, at the present day.

According to Miller (*Dict.* 1724, *pref.*), who may be esteemed an excellent judge, gardening never arrived to any degree of perfection, in England, till the latter end of the seventeenth century. His own writings have no doubt contributed much to its progress, and, with the introduction of the modern style of laying out grounds, may be considered as forming an era (1750) in the art; a previous era was that formed by Evelyn (1670), and a subsequent one, that of the establishment of the horticultural society (1805).

Subsect. 1. *British Gardening, in respect to Design and Taste.*

107. The Romans abandoned England to the Saxons, in the beginning of the fifth century; and nothing of consequence is known of the country till the descent of William the Conqueror, in 1066. Gardening, which had been revived in France, under Charlemagne, would probably be introduced into England with the Norman Conqueror, in the end of the eleventh century.

Henry I. (1100), the third king after William the Conqueror, had, according to Henry of Huntingdon, (*History*, lib. 7.) a park (*habitationem ferarum*,) at Woodstock, and it may not be too much to conjecture, that this park was the same which would be appropriated by the owner of the magnificent Roman villa, whose extensive ruins, occupying nearly six acres, have been recently dug up on the Duke of Marlborough's estates in that neighbourhood. Blenheim, the first residence in Britain, or perhaps Europe, in respect to general grandeur, may in this view be considered as the most interesting, in point of its relation to antiquity.

Fitzsteven, it is observed by Daines Barrington, states, that the citizens of London, at the time of Henry II. (1154), had gardens to their villas, "large, beautiful, and planted with trees." In *De Cerceau's Architecture*, published in the time of Henry III. there is scarcely a ground-plot not laid out as a parterre or a labyrinth.

King James I. of Scotland, a prisoner in Windsor castle during several years in Henry V.'s reign, in the beginning of the fifteenth century, gives the following account of a royal garden there, which appears to have occupied a small plot now entirely turf.

> Now was there maide fast by the touris wall
> A garden faire, and in the corneris set
> Ane herbere grene, with wandis long and small
> Railit about, and so with treeis set
> Was all the place and hawthorn hedges knet,
> That lyfe was non, walkyng there for bye
> That myght within scarce any wight espye.
> So thick the bewis and the leves grene
> Beschudit all the alleyes that there were,
> And myddis every herebere might be sene
> The scharp grene swete jenepere,
> Growing so fair with branches here and there,
> That as it semyt to a lyfe without,
> The bewis spred the herbere all about.

The Quair, by King James I. of Scotland, published by Lord Woodhouselee.

Leland in his Itinerary, published towards the end of the fifteenth century, states, that at "Wresehill Castelle, in Yorkshire, the gardeins within the mote, and the orchardes without, were exceeding fair. And yn the orchardes, were mountes, *opere topiaris*, writhen about with degrees like cokil shelles, to com to the top without payn." (*Itinerary, &c.* p. 60.) Such a mount still exists in the castle inn at Marlborough, not ascended by steps or degrees, but by a winding path. It is covered with ancient yew-trees, no longer *opere topiaris*. Leland also mentions the gardens at Morli, in Derbyshire, and some others of less note in the northern counties.

During the century of disputes between the houses of York and Lancaster, little or no attention could be paid to the peaceful arts; and accordingly we find no other notice of a garden till the time of Henry VIII. when the royal gardens of Nonsuch were laid out and planted. These gardens are stated, in a survey taken in the year 1650, above a century after Henry's death, to have been cut and divided into several alleys, quarters, and rounds, set about with thorn hedges. On the north side was a kitchen-garden, very commodious, and surrounded with a wall fourteen fee high. On the west was a wilderness severed from the little park by a hedge, the whole containing ten acres. In the privy-gardens were pyramids, fountains, and basins of marble, one of which is "set round with six lilac trees, which trees bear no fruit, but only a very pleasant smell." In the privy-gardens were, besides the lilacs, 144 fruit-trees, two yews, and one juniper. In the kitchen garden were seventy-two fruit-trees and one lime tree. Lastly, before the palace, was a neat handsome bowling-green, surrounded with a balustrade of free-stone. "In this garden," observes Daines Barrington, "we find many such ornaments of old English gardening, as prevailed till the modern taste was introduced by Kent."

Hampton-court was laid out at the end of this reign, by Cardinal Wolsey. The labyrinth, one of the best which remains in England, occupies only a quarter of an acre, and contains nearly half a mile of winding walks. There is an adjacent stand, on which the gardener places himself, to extricate the adventuring stranger by his directions. Switzer condemns this labyrinth for having only four stops, and gives a plan for one with twenty. Daines Barrington says, that he got out by keeping close to the hedge.

Hatfield, Lord Treasurer Burleigh's, was laid out during Queen Elizabeth's reign. James I. formed or improved the gardens at Theobalds, which Mandelso, a traveller, who visited England about 1640, thus describes. "It is a large square, and having all its walls covered with fillery, (trellis work) and a beautiful jet d'eau in the centre. The parterre hath many pleasant walks, part of which are planted on the sides with espaliers, and others arched over. Some of the trees are limes and elms, and at the end is a small mount, called the Mount of Venus, which is placed in the midst of a labyrinth, and is upon the whole one of the most beautiful spots in the world." The same author mentions a royal garden, at Greenwich, improved by this monarch. *Voyages de Mandelso*, tom. i. p. 598. Lord Bacon attempted to reform the national taste during this reign, but apparently with little immediate success. He wished still to retain shorn trees and hedges; but proposed winter, or evergreen gardens, and rude or neglected spots, as specimens of wild nature. "As for the making of knots or figures," says he, "with divers colored earths — they be but toys. I do not like images cut out in juniper or other garden stuff — they are for children." (*Essay on Gardens.*) Sir Henry Wotton says, "the garden at Lord Verulam's was one of the best he had seen, either at home or abroad." The *Gardener's Labyrinth*, by Didymus Mountain, was published in the reign of Elizabeth; it contains plates exhibiting "knotts and mazes, cunningly handled for the beautifying of gardens." Lawson's *New Orchard* was published in 1626; he gives directions also for parterres and labyrinths. A curious idea is given of the taste of these times in what he says of the latter. "Mazes well framed a man's height may, perhaps, make your friend wander in gathering berries, till he cannot recover himself without your help."

In a *Janua Trilinguis*, published at Oxford during the commonwealth, we are informed, that "gardening is practised for food's sake in a kitchen-garden and orchard, or for pleasure's sake in a green-grass plat and an arbour." As to the formation of the latter, the author adds, "The pleacher (*topiarius*) prepares a green plat of the more choice flowers and rarer plants, and adorns the garden with pleach-work; that is, with pleasant walks and bowers, &c. to conclude with purling fountains, and water-works." Chap. 32.

We learn also from this comprehensive author (Commenius) the ancient use of parks. We are told, "the huntsman hunteth wild beasts, whilst he either allureth them into pitfalls, and killeth them, or forceth them into toils; and what he gets he puts into a park." Chap. 37.

We are informed by Daines Barrington, that Charles II. sent for Perault and Le Notre, that the former declined coming to England, but that the latter planted Greenwich and St. James's Parks. Charles planted the semicircle of Hampton Court; the beginning, as Switzer informs us, of a grand design never completed.

The magnificent seat of the Duke of Devonshire at Chatsworth was laid out in this reign; and it is conjectured, from a design by the same artist. (*Beauties of England and Wales. Derbyshire.*) Waller the poet formed his residence at Beaconsfield about the same time. The grounds there being very irregular, he has been at considerable labor in reducing the parts near the house and banquetting-room, to regular slopes and levels, harmonizing with an oblong basin or canal. It is but justice to the memory of this amateur, who was undoubtedly a man of taste in his day, that, in the more remote scenes, no appearance of art is discernible, or seems ever to have been intended. Their dry, ragged-edged paths, conducted through the natural woods, form a fine contrast to the artificial scenes at Prior's Park.

It is conjectured by Daines Barrington, that one of the first garden-buildings erected in England was built during this reign by Inigo Jones, at Beckett near Farringdon. This banquetting-room is placed on a point of land projecting into a lake, and is surrounded with a broad base, or platform, protected by a parapet wall, and shaded by the far-projecting eaves of the building. It consists of one apartment with a cellar below; and the covered platform, or base, is supposed to be for the purpose of angling. Lord Capel and the Earl of Essex are mentioned by Switzer as eminent encouragers of gardening during this reign. The latter sent his gardener, Rose, to study the much-celebrated beauties of Versailles; and, on his return, he was appointed royal gardener.

Evelyn (*Mem. by Bray*, 1818) describes Wooton, his father's residence, as in 1660, for woods and waters, among the most natural and magnificent examples which England afforded "till this late and universal luxury of the whole nation since abounding in such expenses." Vol. i. p. 3.

The following extracts from Evelyn's diary will furnish some ideas of the English gardens of his time.

1652. Wooton, (Surrey). "Gave his brother some directions about his garden, which he was desirous to put into some form, for which he was to remove a mountain overgrown with large trees and thickets, and a moat within ten yards of the house;" this his brother "succeeded in doing by digging down the mountain, and flinging it into a rapid stream (which carried away the sand,) filled up the moat, and levelled that noble area where now the garden and fountain is."

Groom's-bridge near Tunbridge, a pretty melancholy place.

1654. Lady Brook's garden at Hackney, one of the neatest and most celebrated in England.

Caversham, Lord Craven's, Berkshire. "Goodly woods felling by rebels."

Wilton, Lord Pembroke's, Wiltshire. "The garden, heretofore esteemed the noblest in England, is a large handsome plain, with a grotto and water-works, which might be made much more pleasant were the river that passes through cleansed and raised; for all is effected by mere force," &c.

1661. In the yacht, the King (Charles II.) discoursed to him on the improvement of gardens and buildings, now very rare in England comparatively to other countries.

Hampton Park, Middlesex, formerly a flat naked piece of ground, now planted with sweet rows of lime-trees, and the canal for water now near perfected; also the hare-park. In the garden is a rich and noble fountain, with syrens, statues, &c. cast in copper by Fanelli, but no plenty of water. The cradle-walk of Hornbeam in the garden is, for the perplexed twining of the trees very observable. There is a parterre which they call Paradise, in which is a pretty banquetting-house set over a cave or cellar.

1662. "One Loader, an anchorsmith in Greenwich, grew so rich as to build a house in the street, with gardens, orangeries, canals, and other magnificence, on a lease. His father was of the same trade, and an Anabaptist."

1664. Bushnell's Wells, at Enstone. This Bushnell had been secretary to Lord Verulam. It is an extraordinary solitude. There he had two mummies, a grot, where he lay in a hammoc like an Indian. Hence we went to Ditchley, an ancient seat of the Lees, &c. These gardens and water-works still exist, and are shewn as curiosities to strangers.

1678. "Ham House, and garden of the Duke of Lauderdale, Middlesex, inferior to few of the best villas of Italy itself, the house furnished like a great prince's; the parterres, flower-gardens, orangeries, groves, avenues, courts, statues, perspectives, fountains, aviaries, and all this at the banks of the sweetest river in the world, must needs be admirable."

1680. Cashiobury, Lord Essex, Hertfordshire. "No man has been more industrious than this noble lord (Essex) in planting about his seat, adorned with walks, ponds, and other rural elegancies." — The gardens are very rare, and cannot be otherwise, having so skilful an artist to govern them as Cooke, who is, as to the mechanical part, not ignorant in mathematics, and *pretends* to astrology. There is an excellent collection of the choicest fruit. My lord not illiterate beyond the rate of most noblemen of this age."

1683. Wansted House, Essex. "Sir Josiah Child's prodigious cost in planting walnut-trees about his seat, and making fish-ponds many miles in circuit in Epping-forest, in a barren spot, as oftentimes these suddenly monied-men for the most part seat themselves."

1688. "Sir Henry Capell's orangery and myrtillcum at Kew, most beautiful and perfectly well kept. He was contriving very high pallisadoes of reeds to shade his oranges during the summer, and painting these reeds in oil."

Althorp, Lord Northampton's, Northamptonshire. "The iron gate opening into the park of very good work, wrought in flowers, painted in blue, and gilded."

1700. Beddington, the seat of the Carews, Surrey, now decaying, "heretofore adorned with ample gardens, and the first orange-trees that had been seen in England, planted in the open ground, and secured in winter only by a tabernacle of boards and stoves, &c. standing a hundred and twenty years. Large and goodly trees, and laden with fruit, now in decay, as well as the grotto and fountains. The cabinets and other curiosities in the house and abroad being now fallen to a child under age, and only kept by a servant or two from further dilapidation. The estate and park about it also in decay."

Marsden, Surrey, "originally a barren warren, bought by Sir Robert Clayton, who built there a pretty house, and made such alteration by planting, not only an infinite store of the best fruit, but so changed the natural situation of the hills, valleys, and solitary mountains about it, that it rather represented some foreign country which could produce spontaneously pines, firs, cypress, yew, holly, and juniper; they were come to their perfect growth, with walks, &c. among them."

Alburie-Howards, Surry, "found the garden exactly done to the design and plot I had made with the crypt through the mountain in the park, 30 perches in length. Such a Pausilippe (alluding to the grot of Pausilippo at Naples) is no where in England besides. The canal was now digging, and the vineyard planted." This crypt was in part remaining in 1816, but stopped up at the further end.

Swallowfield, Lady Clarendon, Berkshire. Lady C. skilled in the flowery part, my Lord in diligence of planting. Water flagged with calamus, all that can render a country-seat delightful, and a well furnished library in the house." *Mem. by Bray*, i. 432.

A short account of several gardens near London, as viewed in 1691 by J. Gibson, is given in Archæologia Britannica, (vol. xii.) Many of those mentioned by Evelyn, are included and spoken of in nearly the same terms as by him. Terrace walks, hedges of evergreens, shorn shrubs in boxes, and orange and myrtle trees are mentioned as their chief excellencies. The parterre at Hampton court is said to resemble a set of lace patterns. Evelyn is said to have a "pleasant villa at Deptford, a fine garden for walks and hedges, and a pretty little green-house with an indifferent stock in it. He has four large round philareas, smooth clipped, raised on a single stalk from the ground, a fashion now much used. Part of his garden is very woody and shady for walking; but not being walled he has little of the best fruits.

During the reign of William and Mary, gardening, Switzer says, arrived at its highest perfection. King William, Daines Barrington informs us, gave vogue to clipt-yews, with magnificent gates and rails of iron, not unfrequent in Holland, and about this time (see *Huetiana*) introduced into France, and in reference to the opaque stone-walls which they supplanted, called there *clairs-voyée*. The more extensive iron screens of this sort in England, next to those of Hampton Court, were formed by Switzer, at Leeswold in Flintshire, laid out by that artist in a mixed style, or what is called Bridgeman's first manner. Hampton Court being at this time the actual residence of the royal family, the gardens underwent considerable improvements. An elegant alcove and arched trellis were added at the end of one of the alleys, and four urns placed before the principal part of the house, supposed by Daines Barrington (*Archæologiæ*) to be the first that were thus used in England. Towards the end of this century, vegetable sculptures, and embroidered parterres, were probably in their highest vogue, a conjecture confirmed by the works of Le Blond, James Switzer, &c. published during this and the following reign. Sir William Temple's Essay on the gardens of Epicurus appeared about the same time. His picture of a perfect garden, is that of a flat or gentle declivity, of an oblong shape, lying in front of the house, with a descent of steps from a terrace, extending the whole length of the house. The enclosure is to be cultivated as a kitchen-garden and orchard. Such a garden he found at Moor Park, Hertfordshire, laid out by the Countess of Bedford, celebrated by Dr. Donne, "the sweetest place, I think, that I have seen in my life, before or since, at home or abroad." Lord Walpole, in his enthusiasm for the modern style, observes on this description, that any man might form as sweet a garden, who had never been out of Holborn. It has long since been destroyed, and its place occupied by lawn and trees.

The principal alteration of the royal gardens, mentioned by Daines Barrington, as having taken place in Queen Ann's time, was that of covering the parterre before the great terrace at Windsor with turf. Switzer mentions, that her Majesty finished the old gardens at Kensington, begun by King William. Wise, who had been apprentice to Rose, and succeeded him as royal gardener, turned the gravel pits into a shrubbery, with winding walks, with which Addison was so struck, that he compares him to an epic poet, and these improved pits as episodes to the general effect of the garden. Wise and London afterwards turned Nurserymen, and designers of gardens, in which last capacity they were nearly in as great demand as was afterwards the celebrated Brown. To London and Wise, succeeded Bridgeman, who appears to have been a more chaste artist than any of his predecessors. He banished vegetable sculpture, and introduced wild scenes and cultivated fields in Richmond park; but he still clipt his alleys, though he left to their natural growth the central parts of the masses through which they were pierced. Blenheim, Castle Howard, Cranbourne, Bushy park, Edger, Althorpe, New-park, Bowden, Hackwood, Wrest, and indeed almost all the principal noblemen's seats in the ancient style, were laid out during this, the preceding, and part of the latter reigns, or between the years 1660, and 1713. Blenheim was laid out by Wise in three years; Wansted and Edger were the last of London's designs. *Switzer.*

Nothing of consequence appears to have been done to the royal gardens in the reign of George I.; though, near the end of it, Vanburgh was appointed surveyor of the waters and gardens of the crown. In the succeeding reign, Queen Caroline enlarged and planted Kensington gardens, and formed what is now called the serpentine river, by uniting a string of detached ponds. This was a bold step, and led the way to subsequent changes of taste. Lord Bathurst informed Daines Barrington, that *he* was the first who deviated from the straight line in pieces of made water, by following the natural lines of a valley, in widening a brook at Ryskins, near Colebrook; and that Lord Strafford thinking that it was done from poverty or economy, asked him to own fairly, how little more it would have cost him to have made it straight. From Lord Walpole's correspondence (published 1819) we learn that Queen Caroline proposed to shut up St. James's Park, and convert it into a noble garden for the palace of that name. When her Majesty asked Lord Walpole's father what it might probably cost, he answered "only three crowns."

Cannons, the magnificent seat of the Duke of Chandos, is one of the principal places laid out in the ancient style during this reign. We are ignorant of the name of the French artist who gave the design, but the execution was superintended by Dr. Blackwell, a physician and agriculturist of some note. The Duke is mentioned by Miller as one of the principal encouragers of gardening. As far as we have been able to learn, the last extensive residence laid out in the ancient style, in the south of England, was Exton Park, in Rutlandshire, then the property of the Earl of Gainsborough, the Mæcenas of his age. It was finished about the year 1730. Kent had already returned from Italy, and been employed as a painter and architect, and he began to display his genius a few years afterwards as a landscape gardener.

In this brief outline of the progress of the ancient style in England, we have not had room to notice numerous fine gardens formed by private individuals, preferring rather to notice what had been done in the gardens of the court, which, as they generally lead the fashion in every country, may be considered as a tolerably exact index of the state of a nation's taste. The reader who is desirous of tracing more minutely the progress of this branch of gardening among the landed proprietors of England, will find himself amply gratified by consulting "*The Beauties of England and Wales;*" a work in which is exhausted every source of antiquarian and topographical research, up nearly to the present time. The histories of Lord Walpole, Daines Barrington, and the prefaces of Miller and Switzer may also be referred to.

108. Some difference of opinion exists as to the origin of the modern, natural, or *English* style of gardening. The continental nations generally affirm that we borrowed it from the Chinese; or, with Gabriel Thouin and Mallacarne, deny us the merit of being the first either to borrow or invent it by presenting claims of originality (28. and 51.) for their respective countries. Our opinion is, that it was an almost necessary result of the progress of taste and refinement, which may have been aided or matured by the accounts of Chinese gardens, about the end of the seventeenth century; but not more by these accounts than by existing descriptions of classic scenes in the Roman authors, and by the writings of modern poets. But in order that the reader should form his own judgment, we shall state the various sentiments of others on this subject.

Warton in his *Essay on Pope*, and Lord Walpole, in his *History of Modern Gardening*, agree in referring the first ideas to Milton; and the former adds, that the *Seasons of Thomson* may have had a very considerable influence. Eustache is of opinion that we may, with greater propriety, refer to Tasso's celebrated description of the garden of Armida: Bœttinger, in his *Racemazionem zur Gartenkunst der Alten*, &c. carries us back to the descriptions of the grotto of Calypso by Homer, the vale of Tempe by Œlian, and of Vaucluse by Petrarch. Deleuze, the historian of botany and ornamental plants, (*Annales du Musée, tom.* viii. 1806,) endeavours, at some length, to prove that the new style of gardening arose from the necessity of finding room for the great number of ornamental shrubs and trees introduced from America, during the first half of the eighteenth century.

Gabriel Thouin asserts (*Plans Raisonnes*, preface, &c.) that the first example was given by Dufresnoy, (51.) a Parisian architect, in the Faubourg Saint Antoine, in the beginning of the eighteenth century. The claims of Mallacarne of Padua, in behalf of Charles I. Duke of Savoy, about the end of the sixteenth century, have been already adverted to (28). In as far as literature is concerned, we think that Tasso's claim to priority is indisputable. See *Dissertazione su i Giardini Inglese*, by Hippolyto Pindemonte, Verona, 1817, or a translation of part of it by us in the *New Monthly Magazine*, Feb. 1820.

To these opinions may be very properly added a remark of G. Mason, that "were only classical authorities consulted, it would hardly be supposed that even from the earliest ages any considerable variation in taste had ever prevailed." (*Essay on Design in Gardening*, p. 27.) Alison seems to consider the modern style as derived from our taste for the classic descriptions of the poets of antiquity. "In this view," (alluding to the progress of art from the expression of design to the expression of variety and natural beauty,) he observes, "I cannot help thinking that the modern taste in gardening, (or what Walpole very justly, and very emphatically, calls the art of creating landscape,) owes its origin to two circumstances, which may, at first, appear paradoxical, viz. to the accidental circumstance of our taste in natural beauty being founded upon foreign models; and to the difference or inferiority of the scenery of our own country to that which we were accustomed peculiarly to admire."

The poet Gray (*Life and Letters, &c. Letter to Mr. How, dated* 1763) is of opinion, that "our skill in gardening, or rather laying out grounds, is the only taste we can call our own; the only proof of original talent in matters of pleasure. This is no small honor to us; since neither France nor Italy have ever had the least notion of it."

Mason the poet states, in a note to the *English Garden*, that "Bacon was the prophet, Milton the herald of modern gardening; and Addison, Pope, and Kent, the champions of true taste." The efficacy of Bacon's ideas, G. Mason considers to have been "the introduction of classical landscapes," though this does not very clearly appear from his essay, the object of which seems to be, to banish certain littlenesses and puerilities, and to create more variety, by introducing enclosures of wild scenery, as well as of cultivation. The title of champion, applied to Addison, alludes to his excellent paper in the Spectator, No. 414, "on the causes of the pleasures of the imagination arising from the works of nature, and their superiority over those of art, published in 1712; and when applied to Pope, it refers to his celebrated *Guardian*, No. 173, published the following year. Bœttinger, however, affirms that the bishop of Avranches had thrown out similar ideas, previously to the appearance of the Spectator. (See *Huetiana*, Pensée 51. "Beautés naturelles preferables aux beautés de l'art;" and P. 72. "Des jardins à la mode.")

G. Mason, the third writer on the modern style, (Pope and Shenstone being the two first,) in reference to Sir William Temple's observations on the Chinese manner, observes, "little did Sir William Temple imagine, that in not much more than half a century, the Chinese would become the nominal taste of his country; or that so many adventurers in it would do great justice to his observation, and prove by their works, how difficult it is to succeed in the undertaking. Yet to this whimsical exercise of caprice, the modern improvements in gardening may chiefly be attributed." (*Essay on Design*, &c. p. 50.) No man could be a more enthusiastic admirer of the classics, a warmer patriot, or a more rigid critic, than this author; and it appears from another part of his work (*Discussion on Kent*, p. 105) that he was well aware, when he wrote the above passage, that the origin of the modern style was generally traced to Kent. That he should derive it from our attempt at the Chinese manner, we consider as a proof of candor and impartiality. Having now given the different views respecting the origin, we shall next advert to the improvement of the modern style, in which, happily, there is a greater unanimity of opinion.

It is allowed on all sides, that Addison and Pope "prepared for the new art of gardening the firm basis of philosophical principles." Addison had a small retirement at Bilton, near Rugby, laid out in what may be called a rural style, and which still exists with very little alteration besides that of time. Pope attacked the verdant sculpture, and formal groves of the ancient style, with the keenest shafts of ridicule; and in his epistle to Lord Burlington, laid down the justest principles of art; the study of nature, of the genius of the place, and never to lose sight of good sense. In so far as was practicable on a spot of little more than two acres, Pope practised what he wrote; and his well-known garden at Twickenham contained, so early as 1716, some highly picturesque and natural-like scenery; accurately described by various cotemporary writers. Only the soil of Pope's garden now remains. (See *Beauties of England and Wales.*)

109. But it was reserved for Kent, the friend of Lord Burlington, to carry Pope's ideas more extensively into execution. It was reserved for him, says Daines Barrington, "to realize the beautiful descriptions of the poets, for which he was peculiarly adapted, by being a painter; as the true test of perfection in modern gardening is, that a landscape painter would choose it for a composition. Bridgeman, the fashionable designer of gardens previously to Kent, Lord Walpole conjectures to have been "struck and reformed" by the *Guardian*, No. 173. He banished verdant sculpture, and introduced morsels of a forest appearance in the gardens at Richmond; "but not till other innovators had broke loose from rigid symmetry." The capital stroke was the destruction of walls for boundaries, and the introduction of ha-has—the harmony of the lawn with the park followed. Kent appeared at this moment, and saw that all nature was a garden; "painter enough to taste the charms of landscape, bold and opinionative enough to dare, and to dictate, and born with a genius to strike out a great system; from the twilight of imperfect essays, he realised the compositions of the greatest masters in painting." "Kent," continues his lordship, "was neither without assistance nor without faults. Pope contributed to form his taste; and the gardens at Carleton House were probably borrowed from the poet's at Twickenham."

The various deviations from rigid uniformity, or more correctly, the various attempts to succeed in the Chinese manner, appear thus to have taken a new and decisive character under the guidance of Kent, a circumstance, in our opinion, entirely owing to his having the ideas of a painter; for no mere gardener, occupied in imitating the Chinese, or even Italian manner, would ever have thought of studying to produce picturesque effect. Picturesque beauty, indeed, we consider to have been but little recognised in this country, excepting by painters, previously to the time of Pope, who was both a painter and a poet. The continued approbation of the modern style, as purified from the Chinese absurdities, originally more or less introduced with it, and continued in many places long after Kent's time, we consider to be chiefly owing to the circumstance of the study of drawing and landscape painting having become a part of the general system of education; and thus, as Alison observes, our taste for natural beauty was awakened; "the power of simple nature was felt and acknowledged, and the removal of the articles of acquired expression, led men only more strongly to attend to the natural expression of scenery, and to study the means by which it might be maintained or improved."

Kent was born in Yorkshire, and apprenticed to a coach painter in 1719. He soon afterwards came to London, discovered a genius for painting, was sent to Italy, patronised there by Lord Burlington, returned with his lordship, and lived with him in Burlington House till 1748, when he died at the age of 63 years. On his first return, he was chiefly employed to paint historical subjects and ceilings; and the Hall at Stowe is from his pencil. Soon afterwards he was employed as an architect, and lastly as a landscape gardener. It is not known where he first exercised his genius as a layer-out of grounds; probably at Claremont and Esher, two of his designs, both minutely described by Whateley, and, judging from the age of the trees, laid out some time between 1725 and 1735. Kent was also employed at Kensington gardens, where he is said to have introduced parts of dead trees to heighten the allusion to natural woods. Mason the poet mentions Kent's Elysian scenes in the highest style of panegyric, and observes in a note, that he prided himself in shading with evergreens in his more finished pieces, in the manner described in the 14th and 15th sections of Whateley's *Observations.*

Claremont has been celebrated by Garth, and Esher by Warton, (*Enthusiast, or Lover of Nature,* 1740,) and H. Walpole, with the authority of an eye-witness, has very accurately delineated Kent's manner of realizing landscapes, and has expatiated on his merits, without concealing his few demerits in his profession. "According to my own idea," adds G. Mason, "all that has since been done by the most deservedly admired designers, by Southcote, Hamilton, Lyttleton, Pitt, Shenstone, Morris, for themselves, and by Wright for others, all that has been written on the subject, even the gardening didactic poem, and the didactic essay on the picturesque, have proceeded from Kent. Had Kent never exterminated the bounds of regularity, never actually traversed the way to freedom of manner, would any of these celebrated artists have found it of themselves? Theoretical hints from the highest authorities had evidently long existed without sufficient effect. And had not these great masters actually executed what Kent's example first inspired them with the design of executing, would the subsequent writers on gardening have been enabled to collect materials for precepts, or stores for their imaginations?" *Essay, &c.* p. 112.

Lord Cobham seems to have been occupied in re-modelling the grounds at Stowe, about the same time that Pope was laying out his gardens at Twickenham. His lordship began these improvements in 1714, employing Bridgeman, whose plans and views for altering old Stowe from the most rigid character of the ancient style to a more open and irregular design, are still in existence. Kent was employed a few years afterwards, first to paint the hall, and afterwards in the double capacity of architect and landscape gardener; and the finest buildings and scenes there are his creation. The character of Stowe is well known: nature has done little; but art has created a number of magnificent buildings, by which it has been attempted to give a sort of emblematic character to scenes of little or no natural expression. The result is unique; but more, as expressed by Pope, "a work to wonder at," than one to charm the imagination. The friends of Lord Cobham seem to have considered him as the first who exhibited the new style to his country, if we may judge from the concluding lines of an epitaph to his memory, placed in the garden,—ET ELEGANTIORI HORTORUM CULTU HIS PRIMUM IN AGRIS ILLUSTRATO PATRIAM ORNAVIT, 1747.

Southcote is supposed to have been one of the first to follow the new system struck out by Kent, by improving his own domain at Woburn, in Surrey. He possessed a genius in many respects well suited to the purpose, says G. Mason, but was rather too lavish of his flowery decorations. The extent of the grounds was one hundred and fifty acres, thirty-five of which were ornamented to the highest degree, two-thirds of the remainder were in pasture on rising grounds, and the rest in tillage. The decorations consisted in having a broad margin of shrubbery, and gravel walk to almost every fence, but varied by difference of style, views, buildings, &c. It is minutely described in Whateley's *Observations*, as an example of an ornamented farm. G. Mason thinks the decorated strip often too narrow, and sometimes offensive, from the impossibility of concealing the fence. To this bordering walk, he thinks, may probably be attributed the introduction of the belt. His remarks refer to the year 1768. In 1803, it had repeatedly changed proprietors, and scarcely a vestige remained to distinguish it from a common farm.

Pains Hill, the creation of the Hon. Charles Hamilton, ninth son of James, sixth Earl of Abercorn, is supposed to have been one of the next specimens exhibited of the modern style. Hamilton is said to have studied pictures, with a view to the improvement of grounds. Pains Hill is a small park, surrounded on three sides by garden and picturesque scenery. Excepting from the house there is no distant prospect; but the surface being considerably undulated, the views from the walks across the park have some variety, and are always agreeable. This place is one of the few, described by Whateley, which is still in perfect preservation.

Hagley seems to have been improved about the same time as Pains Hill, in effecting which, Lord Lyttleton might probably receive some hints from the poet Thomson, who was then his guest. The grounds are much varied, and the distant prospects picturesque. A very small rill, which passed through the grounds in a sort of dell, was surrounded with shrubbery and walks, from which the park scenery formed a sort of fore-ground, and sometimes a middle distance to the offscape; thus, in the language of Whateley, "blending the excellencies of the park and the garden." The fine trees, the distant prospects, and the principal buildings, still remain; but the garden scenery has been long since choked by the growth of the forest-trees; and some years ago the fence was removed, and the whole thrown into the park.

Soon after the improvements of Hamilton and Lyttleton, "the great Pitt," G. Mason informs us, "turned his mind to the embellishment of rural nature," and exercised his talent at the South Lodge upon Enfield Chace. "The first ground surrounding the enclosure was then wild and woody, and is diversified with hill and dale. He entertained the idea (and admirably realized it) of making the interior correspond with the exterior scenery. His temple of Pan is mentioned in *Observations*. But the singular effort of his genius was a successful imitation of the picturesque appearance of a bye-lane, on the very principles U. Price supposes it might be practicable."

The Leasowes were improved about the same time. It was literally a grazing farm, with a walk, in imitation of a common field, conducted through the several enclosures. Much taste and ingenuity was displayed in forming so many points of view in so confined an extent, and with so few advantages in point of distance. But root-houses, seats, urns, and inscriptions, were too frequent for the whole to be classed with a common, or even an improved or ornamented English farm. It was, in fact, intended as an emblematical scene, in which constant allusion was made to pastoral poetry; and if we consider it in this light, in that of a sentimental farm, it was just what it ought to have been. We regret to find that H. Repton should attack the taste of this amiable man, from a misconception, as we presume, of his intentions, by blaming him for not "surrounding his house with such a quantity of ornamental lawn or park only, as might be consistent with the size of the mansion or the extent of the property." We fear that if Shenstone had adopted this mode of improvement, the Leasowes had never been distinguished from places *got up* by the common routine of professorship. Shenstone broke his heart through the infamous conduct of a Birmingham attorney, in whose hands he had placed the title-deeds of his estate. The farm is now much neglected, though the paths, and many of the seats, and root-houses, still remain.

Persfield was laid out so late as 1750. It is a small park, with an interesting walk, carried along the brow of a romantic rocky bank of the river Wye, perhaps as faultless as the nature of the place admits of. "I cannot recollect," says G. Mason, writing of this place in 1768, "that any of the scenes on the Wye are the least adulterated by the introduction of any puerile appendage whatever."

As Pope and Kent introduced English gardening, so these are the principal voluntary artists, whose works exhibited and established its character. We shall now enumerate the principal authors.

110. Pope's *Epistle* to Lord Burlington has been already referred to, as well as Shenstone's *Unconnected Thoughts*; the former published in 1716, the latter in 1764. G. Mason's *Essay on Design in Gardening*, from which we have so frequently quoted, was first published in 1768, and afterwards greatly enlarged in 1795. It is more a historical and critical work than a didactic performance.

The grand fundamental and standard work on English gardening is the well known *Observations on Modern Gardening*, published in 1770, by Whateley. It is entirely analytical, treating, first, of the materials, then of the scenes, and lastly, of the subjects of gardening. Its style has been pronounced by Ensor, inimitable; and the descriptions with which his investigations are accompanied, have been largely copied and amply praised by Alison, in his work on taste. The book was soon translated into the continental languages, and is judiciously praised in the *Mercure de France*, *Journal Encyclopedique*, and Wieland's *Journal*. G. Mason alone dissents from the general opinion, enlarging on the very few faults or peculiarities which are to be found in the book. Whateley held a situation in the treasury, and possessed a small picturesque place near Chertsey. He published only this work, soon after which he died. After his death, some remarks on Shakspeare, from his pen, were published in a small 12mo. volume.

The English Garden was published in four different books, the first of which appeared in 1772. With the exception of the fourth book, it was received with very great applause. The precepts for planting are particularly instructive. On the whole, the work may be classed with the *Observations* of Whateley; and these two books may be said to exhibit a clear view of the modern style, as first introduced and followed by liberal and cultivated minds; whilst the *Dissertation on Oriental Gardening*, by Sir William Chambers, published in 1772, holds up to ridicule the absurd imitations of uncultivated amateurs and professors, who had no other qualifications than those acquired in laboring with the spade under some celebrated artist.

111. We shall now proceed to notice the principal *professors* to which the demand for the new style gave rise; and by whom it was, in a short time, extended over the whole country; not, indeed, in so chaste, varied, and original a taste as is exhibited in the places and publications we have enumerated, but according to their different degrees of talent for imitating what, with one or two exceptions, it does not appear they understood.

The first of these is Wright, who seems to have been in some repute at the time of Kent's death. His birth and education, G. Mason informs us, "were above plebeian; he understood drawing, and sketched plans of his designs; but never contracted for work, which might occasion his not being applied to by those who consider nothing so much as having trouble taken off their hands." At Becket, the seat of Lord Barrington, he produced an admired effect on a lawn; and at Stoke, near Bristol, he is supposed to have decorated a copse wood with roses, in the manner advised in the fourth book of the *English Garden*, and extensively displayed at Fonthill Abbey. He also designed the terrace walk and river at Oatlands, both deservedly admired; the latter being not unfrequently mistaken for the Thames itself.

The next professor, in the order of time, is the celebrated Brown. He was bred a kitchen gardener at a small place near Woodstock, in Oxfordshire; and was afterwards head gardener at Stowe till 1750. He was confined (see *Beauties of England and*

Wales, Bucks) to the kitchen garden, by Lord Cobham, who, however, afterwards recommended him to the Duke of Grafton, at Wakefield Lodge, Northamptonshire, where he directed the formation of a large lake, which laid the foundation of his fame and fortune. Lord Cobham afterwards procured for him the situation of royal gardener at Hampton Court and Windsor. He was now consulted by the nobility, and among other places at Blenheim. There he threw a dam across the vale, and the first artificial lake in the world was completed in a week. By this he attained the summit of his popularity. The fashion of employing him continued, says G. Mason, not only to 1768, but to the time of his death, many years afterwards. Repton has given a list of his principal works, among which Croome and Fisherwick are the two largest new places which he formed, including at Croome the mansion and offices, as well as the grounds. The places he altered are beyond all reckoning. Improvement was the passion of the day; and there was scarcely a country gentleman who did not, on some occasion or other, consult the royal gardener. Mason, the poet, praises this artist, and Lord Walpole apologises for not praising him. Daines Barrington says, "Kent hath been succeeded by Brown, who hath undoubtedly great merit in laying out pleasure grounds; but I conceive that, in some of his plans, I see rather traces of the kitchen gardener of old Stowe, than of Poussin or Claude Lorrain. I could wish therefore that Gainsborough gave the design, and that Brown executed." The works and memory of Brown have been severely attacked by Knight and Price, and strenuously defended by Repton, who styles him "his great self-taught predecessor." "Brown," observes G. Mason, "always appeared to myself in the light of an egregious mannerist; who, from having acquired a facility in shaping surfaces, grew fond of exhibiting that talent, without due regard to nature, and left marks of his intrusion wherever he went. His new plantations were generally void of genius, taste, and propriety; but I have seen instances of his managing old ones much better. He made a view to Cheney's church, from Latimer, (Bucks,) as natural and picturesque as can well be imagined. Yet at the same place he had stuffed a very narrow vale, by the side of an artificial river, with those crowded circular clumps of firs alone, that Price attributes to him. The incongruity of this plan struck most of the neighbouring gentlemen, but was defended by the artist himself under shelter of the epithet playful, totally misapplied." *Essay on Design*, p. 130, 2d edit. 1795.

That Brown must have possessed considerable talents, the extent of his reputation abundantly proves; but that he was imbued with much of that taste for picturesque beauty which distinguished the works of Kent, Hamilton, and Shenstone, we think, will hardly be asserted by any one who has observed attentively such places as are known to be his creations. Whatever be the extent or character of the surface, they are all surrounded by a narrow belt, and the space within is distinguished by numbers of round or oval clumps, and a reach or two of a tame river on different levels. This description, in short, will apply to almost every place in Britain laid out from the time (about 1740) when the passion commenced for new-modelling country seats, to about 1785 or 1790, when it in a great measure ceased. The leading outline of this plan of improvement was easily recollected, and easily applied; the great demand produced abundance of artists; and the general appearance of the country so rapidly changed under their operations, that in 1772, Sir William Chambers declared, that if the mania were not checked, in a few years longer there would not be found three trees in a line from the Land's-end to the Tweed. Brown, it is said, never went out of England, but he sent pupils and plans to Scotland and Ireland; and Paulowsky, a seat of the late emperor Paul, near Petersburg, is said to be from his design. Brown, as far as we have learned, could not draw, but had assistants, who made out plans of what he intended. He generally contracted for the execution of the work. He amassed a handsome fortune, and his son Launcelot, has sat in several parliaments.

The immediate successor of Brown was his nephew, Holland, who was more employed as an architect than as a landscape gardener, though he generally directed the disposition of the grounds when he was employed in the former capacity. Holland, we believe, retired from business some years ago.

The next artist that deserves to be mentioned is Eames, of whom, however, we know little more than that he is mentioned in terms of respect by G. Mason.

Humphrey Repton, a highly respectable artist, from being an amateur, began his career as professor of landscape gardening about thirty years ago (1788); and till a sort of decline or inactivity of taste took place ten or twelve years since, he was extensively consulted. Though at first an avowed defender and follower of Brown, he has gradually veered round with the change effected in public opinion by the *Essays on the Picturesque*, so that now, comparing his earlier works of 1795 and 1805, with his *Fragments on Landscape Gardening*, published in 1817, he appears much more a disciple of Price than a defender of his "great predecessor." H. Repton was a beautiful draftsman, and gave besides plans and views, his written opinion in a regular form, generally combining the whole in a manuscript volume, which he called the *red book* of the place. He never, we believe, undertook the execution of his plans; nor has, as far as we are aware, been employed out of England, but Valleyfield, in Perthshire, was visited by his two sons, and arranged from the father's designs. The character of this artist's talent seems to be cultivation rather than genius, and he seems more anxious to follow than to lead, and to gratify the preconceived wishes of his employers, and improve on the fashion of the day, than to strike out grand and original beauties. This, indeed, is perhaps the most useful description of talent, both for the professor and his employers. Repton's taste in Gothic architecture, and in terraces, and architectural appendages to mansions, is particularly elegant. His published *Observations* on this subject are valuable; though we think otherwise of his remarks on landscape gardening, which we look upon as puerile, wanting depth, often at variance with each other, and abounding too much in affectation and arrogance. On the whole, however, we have no hesitation in asserting, that both by his splendid volumes, and extensive practice among the first classes, he has supported the credit of this country for taste in laying out grounds. See *Essays on the Changes of Taste in Landscape Gardening, &c.* 8vo. 1812. Repton was born near Felbrig, in Norfolk, and died at Harestreet, in Essex, in 1817.

112. Though it may be true, that "in all liberal arts, the merit of transcendent genius, not the herd of pretenders, characterises an æra;" yet in an art like that of laying out grounds, whose productions necessarily have such an influence on the general face of a country, it is impossible to judge otherwise of the actual state of the art, than from the effect which is produced. This effect, about forty years ago, when clumps and belts blotted every horizon, could never be mistaken for that intended by such professors as Kent, or such authors as Whateley and Mason. The truth is, as we have already hinted, such was the rage for improvement, that the demand for artists of genuine taste exceeded the regular supply; and, as it is usual in such cases, a false article was brought to market, and imposed on the public. This false taste, which may be said to have for the time reduced a liberal to a mechanic art, gave a new character to modern improvements, which, from consisting in a display of ease, elegance, and nature, according to the situation, became a system of set forms, indiscriminately applied in every case. This system was in fact more formal, and less varied, than the ancient style to which it succeeded, because it had fewer parts. An ancient garden had avenues, alleys, stars, patés d'oye, pelotons or platoons, (square clumps,) circular masses, rows, double and single, and strips, all from one material, *wood;* but the modern style, as now degraded, had only three forms, a clump, a belt, and a single tree. Place the belt in the circumference, and distribute the clumps and single trees within, and all that respects wood in one of these places is finished. The professor required no further examination of the ground than what was necessary to take the levels for forming a piece of water, which water uniformly assumed one shape and character, and differed no more in different situations, than did the belt or the clump. So entirely mechanical had the art become, that any one might have guessed what would be the plan given by the professor before he was called in; and Price actually gives an instance in which this was done. The activity of this false taste was abated in England before our time; but we have seen in Scotland, between the years 1795 and 1805, we believe, above a hundred of such plans, in part formed by local artists, but chiefly by an English professor, who was in the habit of making annual journeys in the north, taking orders for plans, which he got drawn on his return home, not one of which differed from the rest in any thing but magnitude. These plans were, in general, mounted on linen, which he regularly purchased in pieces of some hundreds of yards at a time, from a celebrated bleachfield adjoining Perth.

The good sense of the country soon revolted at such monotonous productions; and proprietors were ridiculed for expending immense sums in destroying old avenues and woods, and planting in their room young clumps, for no other reason than that it was the fashion to do so. Partly on this account, and partly because almost every place in England had been metamorphosed, and that lassitude had ensued which always succeeds over-exertion, the career of improvement slackened its pace in England about the year 1780. Various causes contributed to diminish its course, till an almost decisive blow was given by Knight and Price in 1794.

The first symptoms of disapprobation that were ventured to be uttered against the degradation of the new taste, appear to be contained in an epistolary novel, entitled "Village Memoirs," published in 1775, in which the professors of gardening are satirized under the name of Layout. A better taste, however, than that of Layout is acknowledged to exist, which the author states, "Shenstone and nature to have brought us acquainted with." Most of the large gardens are said to be laid out by some general undertaker, "who introduces the same objects at the same distances in all." P. 143. The translation of Girardin *De la Composition des Paysages, ou des Moyens d'embellir la Nature autour des Habitations, en joignant l'agreable a l'utile, &c.* accompanied with an excellent historical preface by Daniel Malthus, Esq. in 1783, must have had considerable influence in purifying the taste of its readers. A poem in

Dodsley's collection, entitled, "Some Thoughts on Building and Planting," addressed to Sir James Lowther, Bart. published in the same year, and in which the poet recommends, that

> "Fashion will not the works direct,
> But reason be the architect."

must have had some effect. But the *Essay on Prints*, and the various picturesque tours of Gilpin, published at different intervals from 1768 to 1790, had the principal influence on persons of taste. The beauties of light and shade, outline, grouping, and other ingredients of picturesque beauty, were never before exhibited to the English public in popular writings. These works were eagerly read, and brought about that general study of drawing and sketching landscape among the then rising generation, which has ever since prevailed; and will do more perhaps than any other class of studies, towards forming a taste for the harmony and connection of natural scenery, the only secure antidote to the revival of the distinctness and monotony which characterise that which we have been condemning. The *coup-de-main*, however, has been given to this system by the works of Knight and Price, above mentioned. Their effect has been gradual but certain; for, though at first they were violently opposed by professors and periodical critics, yet they have carried conviction to all men of taste; and even, as we have before stated, have converted Repton himself. The object of *The Landscape*, a didactic poem, is to teach the art of creating scenery, more congruous and picturesque than what is met with in that "tiresome and monotonous scene called Pleasure-ground." Price's *Essays on the Picturesque, and on the use of studying Pictures, with a view to the Improvement of real Landscape*, are written with the same intention; but, as might be expected from a prose work, enter on the subject much more at length. In order to discover "whether the present system of improving is founded on any just principles of taste," Price begins by enquiring, "whether there is any standard, to which, in point of grouping and of general composition, works of this sort can be referred: any authority higher than that of the persons, who have gained the most general and popular reputation by their works, and whose method of conducting them has had the most extensive influence on the general taste?" This standard (which it will be recollected by the candid reader, is desired only for what relates to grouping and composition, not to utility and convenience, as some have unfairly asserted) Price finds in the productions "of those great artists, who have most diligently studied the beauties of nature, both in their grandest and most general effects, and in their minutest detail; who have observed every variety of form and of color; have been able to select and combine; and then, by the magic of their art, to fix upon the canvas all these various beauties." Price recommends the study of the principles of painting, "not to the exclusion of nature, but as an assistant in the study of her works." He points out and illustrates two kinds of beauty in landscape; the one the picturesque, characterised by roughness, abruptness, and sudden variation; the other beauty in the more general acceptation, characterised by smoothness, undulations, intermixed with a certain degree of roughness and variation, producing intricacy and variety. Such beauty was made choice of by Claude in his landscapes, and such, he thinks, particularly adapted to the embellishment of artificial scenery. These principles are applied by Price in a very masterly manner, to wood, water, and buildings.

When the works of these gentlemen were published, they were opposed by professors, by a numerous class of mankind who hate innovation, and with whom "whatever is is right," including perhaps some men of taste, who had no feeling for the picturesque, or had mistaken the object of the book.

The first answer to Price's work, was a letter by Repton, in which candor obliges us to state, that the latter has misrepresented his antagonist's meaning, by confounding the study of pictures with that of the study of the principles of painting. Price published an able answer to this production, which, he informs us, was even more read than the original essays. Two anonymous poems of no merit made their appearance, as satires on *The Landscape*, and indirectly of the essays on the picturesque.

The *Review of the Landscape, and of an Essay on the Picturesque*, &c. by Marshall, was published in 1795. There can scarcely be any thing more violent than this publication. One reason for his not approving of the Essay on the Picturesque, he has made evident by his remarks on the same subject, and on painting; the fact being, as we have already more than once stated, and wish strongly to impress on the reader's mind, that a taste for the picturesque is not so natural as a taste for what is singular, grand, comic, or affecting, but requires a certain degree of previous study or preparation, — this preparation Marshall was evidently not furnished with.

Among the second class, or those with whom "whatever is is right," we shall just mention the periodical critics, who, in reviewing these works, brought forward all sorts of reasons against the use of the study of pictures, and deny (with truth perhaps as to themselves) the distinct character of the picturesque. Price they treat as "a mere visionary amateur," and Knight as "a Grub-street poet, who has probably no other garden than the pot of mint before his windows." We allude chiefly to the Monthly Review, a work at least ten years behind the age in every *improving* art or science.

The vague opinion of a great mass of country gentlemen, tourists, and temporary authors, may be here included, who, taking the word picturesque in its extreme sense, and supposing it intended to regulate what was useful, as well as what was ornamental, concluded that Price's object was to destroy all comfort and neatness in country seats, and reduce them to mere portions of dingle or jungle scenery. Such opinions we have frequently heard expressed by men, in other respects of good sense. Even continental authors have imbibed and disseminated similar exaggerations. "*Egarés par Gilpin, que a cherché par ses voyages en diverses parties de l'Angleterre et de l'Ecosse, à donner des regles, pour y assujeter le genre pittoresque et romantique, ils ont pris l'occasion pour demander que l'art fut totalement banni des jardins. Ils adoptent le pittoresque d'un Salvator Rosa dans les paysages, comme le vrai nature dans l'art de faire des jardins, et on rejette comme un asservissement à ce meme art, toutes les regles qu'un Bridgewater* (*Bridgeman*) *et un Brown avoient publiées dans ce genre.*" (*Description Pittoresque des Jardins, du goût le plus moderne*. Leipsig, 1802. See also Tubinger's *Taschenbuch, für nature und Gartenfreunde*, 1798, p. 194.) Of enlightened and liberal minds, who have in some degree opposed Price's principles, we can only instance the late W. Wyndham, who, in a letter to Repton, (Repton was at one period secretary to Wyndham, when that gentleman was in office,) written after the publication of his defence, combats, not the works of Price, but the popular objections to the supposed desire of subjecting every thing to the picturesque. "The writers of this school," he observes, "show evidently that they do not trace with any success the causes of their pleasure. Does the pleasure that we receive from the view of parks and gardens, result from their affording in their several parts, subjects that would appear to advantage in a picture? What is most beautiful in nature, is not always capable of being represented in a painting; as prospects, moving flocks of deer. Many are of a sort which have nothing to do with the purposes of habitation; as the subjects of Salvator Rosa. Are we therefore to live in caves? Gainsborough's *Country Girl* is more picturesque than a child neatly dressed. Are our children to go in rags? No one will stand by this doctrine; nor do they exhibit it in any distinct shape at all, but only take credit for their attachment to general principles, to which every one is attached as well as they. Is it contended, that in laying out a place, whatever is most picturesque is most conformable to true taste? If they say so, they must be led to consequences which they can never venture to avow. If they do not say so, the whole is a question of how much or how little, which, without the instances before you, can never be decided." "Places are not to be laid out with a view to their appearance in a picture, but to their use, and the enjoyment of them in real life; and their conformity to these purposes is that which constitutes their true beauty. With this view, gravel walks, and neat mown lawns, and, in some situations, straight alleys, fountains, terraces; and, for ought I know, parterres, and cut hedges, are in perfect good taste, and infinitely more conformable to the principles which form the basis of our pleasure in those instances, than the docks and thistles, and litter and disorder, that may make a much better figure in a picture." (Letter from Wyndham, published by Repton, in a note to his *Observations on the Theory and Practice of Landscape Gardening.*)

From the vein of excellent sense which pervades this letter, and particularly the latter part of it, which we have extracted entire, it is impossible to avoid suspecting, either that there is a culpable obscurity in the works referred to, or that Wyndham had not sufficiently, if at all, perused them. We are inclined to believe that there is some truth in both suppositions. We have no hesitation, however, both from a mature study of *all* the writings of these gentlemen, relating to this subject, as well as a careful inspection of their own residences, in saying, that there is not an opinion in the above extract, to which they would not at once assent. Knight's directions in regard to congruity and utility, are as distinct as can well be expected in a poem. Price never entered on that subject. His works say, "Your object is to produce beautiful landscapes; at least this is one great object of your exertions. But you produce very indifferent ones. The beauty of your scenes is not of so high a kind as that of nature. Examine her productions. To aid you in this examination, consult the opinions of those who have gone before you in the same study. Consult the works of painters, and learn the principles which guided them in their combinations of natural and artificial objects. Group your trees on the principles they do. Connect your masses as they do. In short, apply their principles of painting whenever you intend any imitation of nature, for the principles of nature and of painting are the same." "Are we to apply them in every case? Are we to neglect regular beauty and utility? Certainly not, that would be inconsistent with common sense."

We next present the opinion of D. Stewart on the same subject, as given incidentally in his philosophical disquisitions on the Beautiful. (*Essays*, 1810, p. 285.) "As to the application of the knowledge thus acquired from the study of paintings, to the improvement of natural landscape, I have no doubt, that to a superior understanding and taste, like those of Price, it may often suggest very useful hints; but if recognised as the standard to which the ultimate appeal is to be made, it would infallibly cover the face of the country with a new and systematical species of affectation, not less remote than that of Brown, from the style of gardening which he wishes to recommend; "let painting be allowed its due praise in quickening our attention to the beauties of nature; in multiplying our resources for their farther embellishment; and in holding up a standard, from age to age, to correct the caprices of fashionable innovations; but let our taste for these beauties be chiefly formed on the study of nature herself; nor let us ever forget so far what is due to her indisputable and salutary prerogative, as to attempt an encroachment upon it by laws, which derive the whole of their validity from her own sanction," 287.

We shall conclude by remarking, that, however individuals have differed as to the theory of Price and Knight, yet all agree in admiring their respective seats; Knight's entirely, and Price's in great part, improved by himself, without professional assistance. Nature has certainly done much for each, and especially for that of Knight; but in both the *genius loci* has been so happily humored, that the operations of art have greatly heightened the natural expression of each, while a strict attention to convenience and use has not been forgotten in either situation. See *a Description of these Seats in Repton on the approaching Changes of Taste in Landscape Gardening and Architecture.* 8vo. 1810.

If we have dwelt longer on the writings of these authors, it is because we consider a knowledge of them of the greatest importance, not only to the introduction of a better taste than has hitherto been displayed, even in the comparatively chaste periods of Kent, Shenstone, and Hamilton; but, as Stewart has expressed, as leading to studies which shall "hold up a standard from age to age, to correct the caprices of fashionable innovations."

The general taste for drawing, as already remarked, in the present generation, and the late frequent practice of making tours to the more picturesque parts of the island, have co-operated with Price's work, in refining the taste of the higher classes. Knight's learned and comprehensive *Analytical Enquiry into the Principles of Taste*; Alison's beautiful and profound essay on the same subject; and the philosophical Essays on Beauty by D. Stewart, have undoubtedly had considerable influence. The necessity of economising income has enforced the maxim, that "from truth and use all beauties flow;" so that, as Repton observes, the characteristic of the present improved taste may be said to be "a just sense of general utility."

As some of the finest counury residences in England at the present time for general effect, may be mentioned Blenheim, Fonthill Abbey, Ashridge Park, Knowle, and Harewood Hall, and White Knights.

"The grounds of White Knights," Mrs. Hofland observes, (*Historical Account of White Knights*, 1820,) "exhibit every specimen of gardening in the most extensive sense of the term, with all the peculiar characteristics and appropriate embellishments which belong to each. They were laid out solely by the fine taste, and under the immediate inspection of the Duke of Marlborough, whose principal residence was at White Knights for many years, where, under his fostering eye, they have grown into the perfection they now display," p. 14. We may add, that the grounds contain but little variety of surface, scarcely any distant prospect, and that their chief beauty as fully appears from the details in Mrs. Hofland's book, results from the artificial display of exotics and thatched huts. On a smaller scale, the number of places possessing equal merits, according to their extent, is very considerable.

113. Gardening was either introduced to Scotland, or preserved from the time of its introduction by the Romans, through the religious establishments of the dark ages. Dr. Walker, in his account of the Abbey of Icolmkill in the Hebrides, thus describes the remains of some gardening efforts of the sixth or seventh centuries.

"On a plain adjoining the gardens of the abbey, and surrounded by small hills, there are vestiges of a large piece of artificial water, which has consisted of several acres, and been contrived both for pleasure and utility. Its banks have been formed by art into walks, and though now a bog, you may perceive the remains of a broad green terrace passing through the middle of it, which has been raised considerably above the water. At the place where it had been dammed up, and where there are the marks of a sluice, the ruins of a mill are still to be seen, which served the inhabitants of the abbey for grinding the corn. "Pleasure-grounds of this kind," adds Dr. Walker, "and a method of dressing grain still unpractised in these remote islands, must, no doubt, have been considered in early times, as matters of very high refinement." Essays, II. 5.

Chalmers informs us, (*Caledonia Depicta*, vol. i. p. 801.) that David I. in the twelfth century, had a garden at the base of Edinburgh castle. This king," he adds, "had an opportunity of observing the gardens of England under Henry I. when Norman gardening would, no doubt, be prevalent;" and we may reasonably suppose that he was prompted by his genius to profit from the useful, and to adopt the elegant, in that agreeable art. During the greater part of the fourteenth century Scotland was in a state of intestine war, but in that succeeding, it is generally believed architecture and gardening were encouraged by the Jameses. James I., as we have seen (107.) admired the gardens of Windsor, in 1420, and having been in love there, and married an Englishwoman, would in all probability imitate them. James III., in the middle of the fifteenth century, is described by a Scottish Chronicler (Pitscottie, 1590) as "delighting more in music and policie, (probably from the French *polir*, to remove, level, or improve; or from a corruption of *se polir*, to improve one's self, levelling and smoothing the grounds about a house, being naturally the first step after it is built,) and building, than he did in the government of his realm." (Pitscottie's *Chronicles of Scotland*, 1590.) The general residence of this monarch was Stirling Castle; and a piece of waste surface in the vale below is said to have been the site of the royal gardens. Enough remains to justify a conjecture, that at this early period they displayed as much skill as those of any other country. We allude to a mound of earth resembling a table, surrounded by turf seats, the scene, no doubt, of rural festivities, and an existing proof of the royal attention to the subject.

At the palace of Falkland is a large square enclosure, on a dull flat, in which there exists only a few stunted ash-trees, though the boundary stone wall is still a formidable fence. The gardens of Holyrood-house appear to have been exceedingly confined; the boundary wall only remains, and there are some indications of the rows of trees which stood in the park, which seems to have extended to the base of the adjoining hill, Arthur's Seat. The palace of Scone, we learn from Adanson, a poet of the seventeenth century, was surrounded by "gardens and orchards, flowers and fruits;" and the park, in which are still some ancient trees, "abounded in the hart and fallow deer."

Generally a few old trees in rows adjoin the other royal residences, and oldest baronial castles; but they give no indications to what extent art was carried in their disposition, till about the end of the seventeenth century, when the grounds of the Duke of Hamilton were planted, in all probability by a French artist. The design of Chatelherault, an appendage to that palace, named after, and in imitation of, the residence of that illustrious family in France, there can be little doubt would be taken from the plan said to have been given by Le Notre, for the original residence near the town of that name, in the department of Vienne.

About the beginning of the eighteenth century, the Earl of Lauderdale is said to have sent plans, sections, and sacks of earth from his domain at Hatton, to London and Wise in London; and these artists, it is added, formed a plan, and sent down a gardener to superintend its execution.

Switzer, Laurence, and Langley, mention in their works, that they were frequently called into Scotland to give plans of improvement. Switzer appears to have resided a considerable time in Edinburgh, as he there published, in 1717, a tract on draining, and other useful and agricultural improvements.

The Earls of Stair and Haddington, (who wrote on trees,) both great planters, about this time, probably consulted them; as would, perhaps, Fletcher of Saltoun; the proprietors of Dundas Castle, Barnton, Saughton-hall, Gogar, and particularly Cragiehall, a residence laid out with much art and taste, and next in rank, in these respects, to Hatton. New Liston, Dalkeith House, Hopeton House, and various other places near Edinburgh, are also in Switzer's style. New Liston and Hopeton House, planted, we believe, from 1735 to 1740, were probably the last considerable seats laid out in the ancient style in Scotland.

114. The celebrated Lord Kames appears to have been the first who introduced the modern style into Scotland, some time between 1740 and 1750, by displaying it on his own residence at Blair Drummond. An irregular ridge, leading from the house, was laid out in walks, commanding a view over the shrubs on the declivity of portions of distant prospect. One part of this scene was composed entirely of evergreens, and formed an agreeable winter-garden. Lord Kames did not entirely reject the ancient style, either at Blair Drummond or in his *Essay on Gardening and Architecture*, published in the "*Elements of Criticism*." In that short but comprehensive essay, he shows an acquaintance with the Chinese style, and the practice of Kent; admits both of absolute and relative beauty as the objects of gardening and architecture, and from this complex destination, accounts for that difference and wavering of taste in these arts, "greater than in any art that has but a single destination." Vol. ii. p. 431. 4th edit. 1769.

Lord Kames's example in Scotland may be compared to that of Hamilton or Shenstone in England; it was not generally followed, because it was not generally understood. That the *Elements of Criticism*, though long since obsolete as such, tended much to purify the taste of the reading class, there can be no doubt. Every person also admired Blair Drummond; but as every country gentleman could not bestow sufficient time and attention to gardening to be able to lay out his own place, it became necessary to have recourse to artists; and, as it happened, those who were employed had acquired only that habit of mechanical imitation which copies the most obvious forms, without understanding the true merits of the original. In short, they were itinerant pupils of Brown, or professors in his school, who resided in Scotland; and thus it is, that after commencing in the best taste, Scotland continued, till within the last twenty years, to patronise the very worst.

As a contrast to the style of Blair Drummond, and a proof of what we have asserted in regard to the style introduced immediately afterwards, we next refer to the grounds at Duddingston House near Edinburgh, laid out about the year 1750. The architect of the house was Sir William Chambers; the name of the rural artist, whose original plans we have examined, was Robertson, sent down from London. We know of no example in any country of so perfect a specimen of Brown's manner, nor of one in which the effect of the whole, and the details of every particular part, are so consistent and co-operate so well together in producing a sort of tame, spiritless beauty, of which we cannot give a distinct idea. It does not resemble avowed art, nor yet natural scenery; it seems, indeed, as if nature had commenced the work and changed her plan, determining no longer to add to her productions those luxuriant and seemingly superfluous appendages which produce variety and grace. The trees here, all planted at the same time, and of the same age, seem to grow by rule. The clumps remind us of regularly tufted perukes. The waters of the tame river neither dare to sink within, nor to overflow its banks; the clumps keep at a respectful distance; and the serpentine turns of the roads and walks, seem to hint that every movement to be made here, must correspond.

The extent of this place, we suppose, may exceed 200 acres. The house is placed on an eminence in the centre, from which the grounds descend on three sides, and on the remaining side continue on a level till they reach the boundary belt. This belt completely encircles the whole; it is from 50 to 200 feet wide, with a turf drive in the middle. One part near the house is richly varied by shrubs and flowers, and kept as garden scenery; in the rest the turf is mown, but the ground untouched. A string of wavy canals, on different levels, joined by cascades, enter at one side of the grounds, and taking a circuitous sweep through the park, pass off at the other. This water creates occasion for Chinese bridges, islands, and cascades. The kitchen-garden and offices are placed behind the house, and concealed by a mass of plantation. Over the rest of the grounds are distributed numerous oval unconnected clumps, and some single trees. In the drive are several temples and covered seats, placed in situations where are caught views of the house, sometimes seen between two clumps, and at other times between so many as to form a perspective or avenue. There is also a temple on the top of a hill, partly artificial, which forms the object from several of these seats, and from other open glades or vistas left in the inside of the belt. The outer margin of this plantation is every where kept perfectly entire, so that there is not a single view but what is wholly the property of the owner; unless in one instance where the summit of Arthur's Seat, an adjoining hill, is caught by the eye from one part of the belt, over the tops of the trees in its opposite periphery.

That this place has, or had in 1790, great beauties, we do not deny; but they are beauties of a peculiar kind, not of general nature — not the beauties of Blair Drummond, or such as a liberal and enlightened mind would desire to render general; but in great part such as Sir William Chambers holds up to ridicule in his *Dissertation on Oriental Gardening*, (see his *Introduction*, p. 6. to 11.) and Price, in his *Essays on the Picturesque*. Yet Duddingston may be reckoned the model of all future improvements in Scotland, till within the last twenty years. The same artist laid out Livingston, effected some improvements at Hopeton-house, Dalkeith, Dalhousie, Niddry, the Whim, Moredun, various other places near Edinburgh, and others in Ayrshire.

One of these places called forth the genius of James Ramsay, who, from being a mason, became a landscape-gardener of considerable repute, and, at least, the best which apppeared in Scotland within the period alluded to. He gave ground-plans and drawings in perspective, both of the buildings and verdant scenery. Leith Head, a small place near Edinburgh, is entirely his creation. His style was that of Brown, in his waters and new plantations near the house; but he was less attached to the belt, his clumps were not always regular, and he endeavoured to introduce a portion of third distance into all his views. Ramsay died at Edinburgh in 1794, and this record of his taste is due to his memory.

Since Ramsay's time, no landscape gardener of any note has arisen in Scotland. The late Kyle, gardener at Moredun, Mawer, gardener at Duddingston, and afterwards nurseryman and planner at Dalry, and Nicol, well known for his horticultural writings, gave plans for policies as they used to be called; but it is as designers of kitchen-gardens and hot-houses, that we have to bestow our approbation of these and various other similarly produced living professors.

From nearly the first introduction of the new style in Scotland to the present time, annual journeys have been made into Scotland from the county of Durham by the late

White, and subsequently by his son. White, senior, we believe, was a pupil of Brown, of much information on country matters, and generally respected in Scotland. Of his professional talents we have said enough, when we have mentioned their source. Airthrie, near Stirling, and Bargany in Ayrshire, are the principal productions of this family. In what respects the talents of White, junior, differ from those of his father, or whether they differ at all, we are not aware; though we think it highly probable they will partake of the general improvement of the age.

We have already mentioned, that none of the eminent English artists had ever been in Scotland; but that Valleyfield was laid out from Repton's designs.

Soon after the publication of Price's *Essays*, a gentleman of much taste and science being about to plant extensively, consulted Nasmyth, an eminent landscape-painter in Edinburgh, as to the general effect of the proposed improvement. Nasmyth has since, we believe, been much employed in the same way by other proprietors, a circumstance which must have contributed in an eminent degree to improve the artificial scenery of Scotland. We recollect to have seen, in 1802, some sketches by this artist, for planting part of the range of Pentland-hills behind Dreghorn, and a part of the Ochil hills near Airthrie and Alva, which struck us, as in a grand and very superior taste. We believe they have only partially been carried into execution. Scotland has so many facilities for landscape scenery, that under the guidance of such an artist as Nasmyth, much beauty may be preserved and created.

There was lately residing in Scotland an English gentleman and amateur, who, we believe, was also employed professionally, G. Parkyns, author of an "*Essay on the different natural Situations of Gardens*," prefixed to the quarto edition of Whateley's work, of some designs published in a work on architecture, by Soane, in 1798, and of some plans and descriptions published in numbers in Edinburgh, since 1800. These works are, on the whole, of unexceptionable merit; the author appears to be a correct and elegant draftsman, and a man of general taste. We have not seen any specimen of his practical talents. Dalkeith, Scone, Dunkeld, Inverary, Blair, Drummond, Kulzean, and Eglinton Castle, may be mentioned as exhibiting grand specimens of landscape gardening in Scotland.

115. The sources of information respecting the ancient state of gardening in Ireland are extremely scanty, for very few books have been written by natives of that country on the subject of gardening. A short "*Essay on the Rise and Progress of Gardening in Ireland*," *by J. C. Walker*, is given in the transactions of the Royal Irish Academy (vol. xiv. part 3.) from which we shall glean what is available for our purpose.

The earliest notice of gardening in Ireland is of the time of Queen Elizabeth, when Fynnes Morrison, "a minute observer, "travelled through that kingdom. He does not once mention a garden as appertaining either to a castle or to a monastery; he only observes, "that the best sorts of flowers and fruits are much rarer in Ireland than in England; which, notwithstanding, is more to be attributed to the inhabitants than to the ayre." In an inedited account of a Tour in 1634, also quoted by Walker, (*Trans. R. I. A.*) Bishop Usher's palace is said to have a "pretty neat garden."

Some of the largest sculptured evergreens in Ireland are at Bangor, in the county of Down; and at Thomas-town, in the county of Tipperary, are the remains of a hanging garden, formed on the side of a hill, in one corner of which is a verdant amphitheatre, once the scene of occasional dramatic exhibitions.

Blissington gardens, if tradition may be relied on, were laid out during the reign of James II. by an English gentleman, who had left his estate at Byfleet in Sussex, to escape the persecution of Cromwell. In King William's time, knots of flowers, curious edgings of box, topiary works, grassy slopes, and other characteristics of the Dutch style, came into notice. Rowe and Bullein, Englishmen, who had successively nurseries at Dublin, were in these days the principal rural artists of Ireland; though Switzer and Laurence, as well as Batty Langley, occasionally visited these countries.

116. The first attempts to introduce the modern style in Ireland, are supposed to have been made by Dr. Delany at Delville near Glassnevin, about the year 1720. Swift has left a poetical description of these scenes. Pope, like Dr. Delany, Walker says, impressed a vast deal of beauty on a very small spot of ground; softened the obdurate straight line of the Dutch into a curve, melted the terrace into a sloping bank, and opened the walk to catch the vicinal country. Walsh (*History of Dublin*, 1820) says, these grounds retain all the stiffness of the old garden. As there existed an intimacy between Pope and Delany, it is supposed the former may have assisted his Irish friend. This example appears to have had the same sort of influence in Ireland, that the gardening of Lord Kames had in Scotland. It gave rise to a demand for artists of the new school; and the market was supplied by such as came in the way. Much less, however, was done in that country, partly from the abundance of picturesque scenery in many districts, and partly from other obvious causes. Mount Shannon, near Limerick, the seat of the late Chancellor Clare, is said to have been laid out from his lordship's designs, and the recent improvements at Charleville forest, where one of the most comfortable and magnificent castles in

Ireland has been executed by Johnson of Dublin, were the joint productions of Lord and Lady Charleville.

Walker mentions Marino, Castle-town, Carton, Curraghmore, the retreat of St. Woolstans, and Moyra, as exhibiting the finest garden scenery in Ireland. Powerscourt, and Mucross, near the lakes, are reckoned the most romantic residences, and are little indebted to art. St. Valori, Walker's own seat, is a beautiful little spot near the well-known village of Bray.

We are not aware, that any English artist of eminence has been employed as a landscape gardener in Ireland, the more common practice being to engage a good kitchen-gardener from England, and leave every thing to him. Sutherland was, in 1810, the native artist of greatest repute. A. M'Leish has since settled in this country, and, from what we know of this artist, we have little doubt he will contribute, in an eminent degree, to establish and extend a better taste than has yet appeared there. W. T. Mackay, curator of the Trinity college garden, is said by Niel (*Ed. Ency.* art. *Hort.*) to excel also in laying out grounds. Though landscape-gardeners from the capital have not been called to Ireland, yet it has happily become not an unfrequent practice to employ eminent English architects,—a practice, as far as taste is concerned, certain of being attended with the most salutary effects.

SUBSECT. 2. *British Gardening in respect to the Culture of Flowers and Plants of Ornament.*

117. The taste for what are called florists' flowers, in England, is generally supposed to have been brought over from Flanders with our worsted manufactures, during the persecutions of Philip II. about the middle of the sixteenth century. But some common flowers and flowering shrubs were known and prized even in Chaucer's time, as appears from a well-known passage. An Italian poet published, in 1586, a volume of poems, one of which is *On the Royal Garden;* from this poem it would appear that Queen Elizabeth was attached to the culture of flowers, but few are named either in these poems, or in the description of Theobald's. Parterres seem to have been introduced in the beginning of Queen Elizabeth's reign, probably from the *Maison Rustique*, then published in France. Carnations, it is said, were then cultivated at Norwich, by the emigrant Flemish manufacturers, and tulip-roots introduced from Vienna.

Platt's *Paradise of Flora*, which title was afterwards changed to that of the "*Garden of Eden*," was published in 1600, and is the first book which treats expressly on flowers.

Gerrard, who published his herbal three years before, mentions James Garnet, "a London apothecary, a principal collector and propagator of tulips, for twenty years bringing forth every season new plants of sundry colors not before seen, all which to describe particularly were to roll Sisyphus's stone, or number the sands."

Gerrard had a fine garden in Holborn, in the middle of the sixteenth century, of which there is a catalogue in the British Museum, dated 1590. This garden was eulogised by Dr. Boleyn and others his contemporaries.

Parkinson published his *Paradisus* in 1629. "A modern florist," observes Dr. Pulteney in 1795, "wholly unacquainted with the state of the art at the time Parkinson wrote, would perhaps be surprised to find that his predecessors could enumerate, besides 16 described as distinct species, 120 varieties of the tulip, 60 anemonies, more than 90 of the narcissus tribe, 50 hyacinths, 50 carnations, 20 pinks, 30 crocuses, and above 40 of the Iris genus." *Sketches*, &c. vol. ii. 123.

The laurel, or bay-cherry, was then very rare, and considered as a tender plant, being defended "from the bitterness of the winter by casting a blanket over the top thereof;" and the larch-tree was only reared up as a curiosity. Greenhouse-plants were placed in cellars, where they lost their leaves, but those of such as survived shot out again in spring when removed to the open air.

Sir J. E. Smith (*Linn. Trans.* vol. ii. p. 296.) mentions a play called Rhodon and Iris which was acted at the florists' feast at Norwich, in 1637; a proof that the culture of flowers was in great estimation there at that time; and in 1671 Evelyn mentions Sir Thomas Brown's garden there, as containing a paradise of rarities, and the gardens of all the inhabitants as full of excellent flowers.

From Norwich the love of flowers seems to have spread to other manufacturing establishments; and the taste still continues popular, not only there, but among the weavers in Spitalfields, Manchester, Bolton, and most of the commercial towns in Lancashire, and many in Cheshire, Derbyshire, and other adjoining counties. A florists' society is established in almost every town and village in the northern district. These societies have annual shows, as in London and Norwich; and a book, called "The Flower Book," is published annually in Manchester, containing an account of their transactions, the prizes which have been given, and the new flowers which have been originated.

Ham House, the Duke of Lauderdale's, had famous parterres and orangeries at this time. Sir Henry Capell had a very fine orangery and myrtilleum at Kew; and Lady

Clarendon, who, Evelyn informs us, was well skilled in flowers, had an ample collection at Swallowfield in Berkshire.

Sir William Temple, a great fruit-gardener, says of flowers, that he left their care to the ladies, and only pleased himself with seeing and smelling them.

Rea published his *Flora*, or, Complete System of Gardening, in 1665, in which he treats of the choicest plants, flowers, evergreens, and flowering shrubs that will endure our winters. London and Wise published their abridgement of Quintinye's complete Gardener in 1699, and their Retired Gardener in 1667. In the latter, one half of the book is occupied with the treatment of flowers and shrubs.

Bradley's numerous publications began in 1716 and continued to 1736; many of them treat of flowers and curious plants, native and exotic, and it was he who first brought the succulent tribe into notice.

118. About the beginning of the eighteenth century, the taste for florists' flowers, or what the French called the *Florimania* of the Dutch seems here, as in most parts of Europe, to have somewhat declined, and given way to more enlarged views of the vegetable creation introduced by the study of botany, the establishment of botanic gardens, and the introduction of various new plants from America and other quarters of the world.

One of the earliest notices which we have, of herbs and plants being cultivated as objects of recreation or taste in England, is that of the garden of the Duke of Somerset at Sion House, in the beginning of the sixteenth century, placed under the superintendance of Dr. Turner, whom Dr. Pulteney considers as the father of English botany. Turner had studied at Bologna and at Pisa, where, as we have already seen, botanic gardens were first formed. After being some years with the Duke of Somerset, he retired from Sion House to Wells, where he had a rich garden, and died there in 1560.

About this time existed the botanic gardens of Edward Saintloo, in Somersetshire, James Coel at Highgate, J. Nasmyth, surgeon to James I., and John de Franqueville, merchant in London. From the care of the latter, Parkinson observes, "is sprung the greatest store that is now flourishing in this kingdom."

William Coyte, of Stubbers in Essex, possessed a garden, in which the yucca blossomed in 1604, for the first time in England, (*Lobel, Hist. Plant.*) Gerrard mentions Nicholas Lete, a merchant in London, "greatly in love with rare and fair flowers, for which he doth carefully send into Syria, having a servant there, at Aleppo, and in many other countries; for which myself, and the whole land are much bound unto him." The same author also gives due honor to Sir Walter Raleigh, Lord Edward Zouch, the patron of Lobel, who brought plants and seeds from Constantinople, and to Lord Hudson, Lord High Chamberlain of England, who he says, "is worthy of triple honor for his care in getting, as also for his keeping such rare and curious things from the farthest parts of the world." *Pulteney's Sketches*, 125.

Charles I. created the office of herbalist, and appointed Parkinson to fill it. Queen Mary appointed Plunkenet to be his successor, "a man distinguished for botanical knowledge." Under this botanist's directions, collectors were dispatched to the Indies in search of plants.

Tradescant, a Dutchman, gardener to Charles I. established a botanic garden at Lambeth, previously to 1629. In 1656, his son published a catalogue of this garden and of the museum, which both of them had collected. Weston observes, (*Catalogue of Authors on Gardening*, 30.) that the garden having for some years laid waste, on the 1st of May 1749, William Watson, F.R.S. being on that spot, found many of the exotics remaining, having endured two great frosts in 1729 and 1740. A curious account of the garden is given by Sir W. Watson, in the Philosophical Transactions, vol. xl. Tradescant left his museum to E. Ashmoll, who lodged in his house. Mrs. Tradescant contested the will, and on losing the cause drowned herself.

In 1685 Evelyn visited Watts at Chelsea. "What was very ingenious, was the subterranean heat conveyed by means of a stove under the conservatory, all vaulted with brick, so as he has the door and windows open in the hardest frosts, secluding only the snow." (*Memoirs, &c.* vol. i. 606.) In Watts's garden was a tulip-tree, and in the hot-house, a tea-shrub. *Ray.*

A public botanic garden in England was first founded at Oxford, in 1632, nearly a century after that at Padua. This honor was reserved for Henry, Earl of Darnley, who gave for this purpose five acres of ground, built green-houses and stoves, and a house for the accommodation of the gardener, endowed the establishment, and placed in it, as a supervisor, Jacob Bobart, a German, from Brunswick, who lived, as Wood tells us, in the garden-house, and died there in 1697. The garden contained at his death above 1600 species. Bobart's descendants are still in Oxford, and known as coach-proprietors.

About the end of this century, the garden of the celebrated naturalist Ray, in Essex, Dr. Uvedale's at Enfield, and especially that of the Duchess of Beaufort, at

Badmington, were rich in plants; but that of Sir Hans Sloane at Chelsea, surpassed them all. This indefatigable and public-spirited man, gave the fee-simple of his botanic garden to the Company of Apothecaries in 1673, and the conditions on which it was granted to this body, were their "presenting fifty new plants to the Royal Society, annually, till the number should amount to 2000."

119. Philip Miller, the celebrated author of the Gardener's Dictionary, was superintendant of this garden for many years. Some idea may be formed of the progress of gardening, in respect to ornamental trees and shrubs, from the different editions of his dictionary.

In the first edition in 1724, the catalogue of evergreens amounts only to twelve. The Christmas-flower and aconite were then rare, and only to be obtained at Fairchild's at Hoxton: only seven species of geraniums were then known. Every edition of this work, contained fresh additions to the botany of the country. In the preface to the eighth and last edition, the number of plants cultivated in England is stated to be more than double those which were known in 1731. Miller, in the earlier editions of his dictionary, followed the system of Tournefort, but in the two last, that of Linnæus.

Miller was born in 1691; his father was gardener to the Company of Apothecaries, and he succeeded his father in that office in 1722, upon Sir Hans Sloane's liberal donation of near four acres to the Company. He resigned his office a short time before his decease, which took place in 1771, and was succeeded by Forsyth, who was succeeded by Fairbairn, and the last by Anderson the present curator.

120. The Cambridge botanic garden was founded about the middle of the eighteenth century, by Dr. Walker. It has chiefly become celebrated for the useful catalogue of plants (*Hortus Cantabrigiensis*,) published by Donn, its late curator. The garden is small, and never at any one time could contain all the plants, to the number of 9000 enumerated in that work. But if ever introduced there, that circumstance is supposed to justify their insertion in the catalogue. This work is now giving way to a much superior one, (the *Hortus Suburbanus Londonensis*,) by Sweet.

The encouragers of botany and ornamental culture, and the number of fine gardens that existed in England during the eighteenth century, are so numerous that we can only mention a few of them.

The Duke of Chandos, Compton speaker of the House of Commons, Dubois of Mitcham, Compton Bishop of London, Dr. Uvedale of Enfield, Dr. Lloyd of Sheen, are mentioned by Miller in 1724. Dr. James Sherrard, apothecary, had one of the richest gardens England ever possessed, at Eltham. His gardener, Knowlton, was a zealous botanist, and afterwards, when in the service of the earl of Burlington, at Lanesborough, discovered the globe *conferva*. Dr. Sherrard's brother was consul at Smyrna, and had a fine garden at Sedokio, near that town, where he collected the plants of Greece, and many others. The consul died in 1728, and the apothecary in 1737.

Fairchild and Gordon, two eminent nurserymen, introduced many plants during the first half of the century. The latter corresponded with Linnæus.

Collinson, a great promoter of gardening and botany, had a fine garden at Mill-hill. Richard Warner had a good botanic garden at Warnford-Green.

Dr., afterwards Sir John Hill, had a botanic garden at Bayswater; he began to publish in 1751, and produced numerous works on plants and flowers, which had considerable influence in rendering popular the system of Linnæus, and spreading the science of horticulture, and a taste for ornamental plants.

The Duke of Argyle, styled a tree-monger by Lord Walpole, had early in this century a garden at Hounslow, richly stocked with exotic trees.

121. The Royal gardens at Kew were begun about the middle of this century, under the auspices of Frederick, Prince of Wales, the father of George III. The exotic department of that garden was established chiefly through the influence of the Marquis of Bute, a great encourager of botany and gardening, who placed it under the care of W. Aiton, who had long been assistant to Miller, of the Chelsea garden. Sir John Hill published the first Hortus Kewensis in 1768, but subsequent editions have been published under the direction of Aiton, the father, and son; the last, in five volumes, the joint production of Dr. Dryander and R. Brown, is reckoned a standard work. A compendium in a pocket volume has been published, which enumerates about 10,000 species.

Sir Joseph Banks gave the immense collections of plants and seeds obtained in his voyages to this garden, and this example has been followed by most travellers, so that it is now the richest in England, as far as respects its catalogue, though it is generally believed a greater, or at least, an equal number of species are actually cultivated in the botanic garden of Liverpool.

122. The Liverpool garden, owes its origin to the celebrated W. Roscoe. It was begun in 1803, and a catalogue published in 1808, by Shepherd, the curator, containing above 6000 species. There is now a botanic garden at Hull, and another

in a state of forwardness at Bury St. Edmond's. It is much to be wished, that large public gardens, combining, as far as practicable, every branch of the art, were established near all our principal towns, as places of public resort, recreation, and instruction.

Hibbert, of Chalfont, and Thornton, of Clapham, opulent commercial men, may be mentioned as great encouragers of exotic botany, during the latter part of last century. The collection of Heaths, Banksias, and other Cape and Botany-Bay plants, in the Clapham garden, was most extensive; and the flower-garden one of the best round the metropolis. The Duke of Marlborough, while Marquis of Blandford, formed a collection of exotics at White Knights, surpassed by none in the kingdom. See *An historical Account of White Knights, &c.* 1820, quarto.

R. A. Salisbury, one of our first botanists, and a real lover of gardening, had a fine garden, and rich collection at Chapel Allerton, in Yorkshire. Subsequently, he possessed the garden formed by Colinson at Mill-Hill.

There are good collections of plants at the Earl of Tankerville's, at Walton, the Duke of Northumberland's, at Sion-House, at the Count de Vandes at Bayswater, N. Kent's, at Clapton, and Veres, at Knightsbridge.

Lee, Loddige, Knight, and many of the nurserymen, might be named as greatly promoting a taste for plants and flowers by their well-stocked nurseries and publications. Of these the "Heathery," the "Botanical Cabinet," and the "Genus Protea," are well known and esteemed works.

A grand stimulus to the culture of ornamental plants, was given by the publication of Curtis's Bot. Mag. begun in 1787, and still continued in monthly numbers. Here the most beautiful hardy and tender plants were figured and described, and useful hints as to their culture added. Other works by Sowerby, Edwards, Andrews, &c. of a similar nature, contributed to render very general a knowledge of, and taste for plants, and a desire of gardens and green-houses, to possess these plants in a living state.

Maddocks's Florists Directory, which appeared in 1792, revived a taste for florists' flowers, which taste has subsequently produced other works by Emmerton and Hogg, on the same subject.

The Exotic Gardener, by J. Cushing, foreman to the Hammersmith nursery, appeared in 1812, and is by far the best work which has appeared on the culture of ornamental exotics.

The establishment of the Linnæan Society in 1788, and of the Horticultural Society in 1805, has also considerably increased the taste for this department of gardening; and the numbers of botanic gardens formed in the colonies, and of Britons resident or travelling in every part of the world, supply food for its gratification by sending home seeds and plants.

123. A taste for florists' flowers, it is conjectured, was first introduced to Scotland by the French weavers, who took refuge in that country in the seventeenth century, and were established in a row of houses, called Picardy-row, in the suburbs of the city. It seems to have spread with the apprentices of these men to Dunfermline, Glasgow, Paisley, and other places; for in Scotland as in England, it may be remarked, that wherever the silk, linen, or cotton manufactures, are carried on by manual labor, the operators are found to possess a taste for, and to occupy part of their leisure time in the culture of flowers.

In the early part of the last century, this taste was introduced to the higher classes by James Justice, F. R. S., who had travelled on the continent, and spared no expense in procuring all the best sorts of florists' flowers from Holland, and many curious plants from London. Such was his passion for gardening, that he spent the greater part of his fortune at Crichton, near Edinburgh, where he had the first garden, and the only pine-stove in Scotland, and had the finest collection of auriculæ, as he informs us, in Europe. In 1755, he published "The Scots Gardeners Director," esteemed an original work, and containing full directions from his own experience, for the culture of choice flowers. About the end of last century, florists' societies which had existed before, but declined with the decline of gardeners' lodges, were revived in Edinburgh, and there are now several in Glasgow, Paisley, and other parts of the country. Those at Paisley are considered remarkable for the skill and intelligence of their members, and the fine pinks and other flowers produced at their shows. See *Gen. Rep. of Scot App. to Chap.* 2.

The Edinburgh Florists' Society, gave rise to the Caledonian Horticultural Society, which was established in 1809, and has greatly promoted this and other branches of gardening in Scotland.

124. The original botanic garden of Edinburgh took its rise, about the year 1680, from the following circumstances: "Patrick Murray, Baron of Livingston, a pupil of Dr. afterwards Sir Andrew Balfour in natural history, formed a collection of 1000 plants at Livingston, but soon afterwards dying abroad, Dr. Balfour had his collection transferred to Edinburgh, and there uniting it with his own, founded the botanic gar-

den. It had no fixed support for some time, but at length the city of Edinburgh allotted a piece of ground near the College-church, for a public garden, and appointed a salary for its support out of the revenues of the University. *Walker's Essays*, 358.

In 1767, the garden was removed to a more eligible situation, considerably enlarged, and a very magnificent range of hot-houses, erected under the direction of Dr. John Hope, who first taught the Linnæan system in Scotland. This garden, in general arrangement, and in the order in which it is kept, is inferior to none in the kingdom, though at Kew and Liverpool, the collection of plants is necessarily much greater. The collection in 1812, amounted to upwards of 4000 species, among which are some rare, hardy, and exotic trees which have attained a great size. The lectures delivered in this garden are much better attended than those of Oxford or Cambridge.

The late Marquis of Bute had a rich botanic garden in the island from which he takes his title, in the middle of last century, but it is now neglected.

125. There lately existed a botanic garden in Forfarshire, for the sale of plants, which belonged to George Donn, a well-known botanist; and there is still one in Ayrshire, at Monkwood, belonging to James Smith, containing about 3500 species, chiefly indigenous, for sale. A botanic garden has been lately formed at Glasgow, and W. J. Hooker, F. R. S. a distinguished botanist, appointed professor.

Notwithstanding the example of Justice in 1750, and the opening of the new botanic garden, with a tolerable collection in 1782, a taste for collections of plants can hardly be said to have existed among the higher classes in Scotland, previously to the present century. Flowers either gathered, or in pots, were rarely purchased by the inhabitants of the capital, and not at all by those of any of the provincial towns. One, or at most, two green-houses might be said to have supplied all the wants of Edinburgh till within the last twenty years, and the demand, though increased, is still of a very limited description among the middling classes.

Such flowers and exotics as were cultivated in the gardens of country gentlemen were, till within the last thirty years, grown in the borders of the kitchen-garden, or in the forcing-houses; but it has now become customary to have flower-gardens and hot-houses expressly for plants, as in England.

For general collections, Niel instances the Duke of Buccleugh's garden at Dalkeith, the Earl of Eglintoun's at Eglintoun castle, Campbell of Shawfield's at Woodhall, Gen. Ferguson's at Raith, the Hon. W. Maule's at Brechin castle. Many others, he adds, deserve particular mention. Those here named may indeed be accounted some of the first-rate gardens in every respect; and they are perhaps superior to those in England of the same rank. The collection of exotic heaths at Lord Douglas's at Bothwell castle, and at Lady Moncrieff's near Perth, and of curious plants in general, at Lady Elcho's near Haddington, Lady Callender's at Preston hall, and Lady Carnegie's at Kinnaird, must not be omitted. At Sir William Liston's seat, of Millburn tower, near Edinburgh, an American garden has been formed, in which every transatlantic plant which that gentleman (or his lady, who is a distinguished botanical amateur) could collect during his embassy to America, is carefully cultivated. At Dalbeth, near Glasgow, T. Hopkirk has formed nearly a complete collection of herbaceous plants, which are indigenous to Great Britain.

126. It is not known that this branch has ever been much attended to in *Ireland*, though J. C. Walker, in the essay already referred to, states that parterres came into notice in the time of King William.

If flower-gardening has been neglected in Ireland, botany has been still more so by her natives, her indigenous resources having been explored by the stranger. Dr. Caleb Thrilkeld was among the first of the few who formed private botanic gardens for their own use, and Sir Arthur Rawdon almost the only individual who displayed wealth and taste in collecting exotics. Upon visiting the splendid collection of Sir Hans Sloane, at Chelsea, Sir Arthur, delighted with the exotics there, sent James Harlow, a skilful gardener, to Jamaica, who returned with a ship almost laden with plants, in a vegetating state, for these a hot-house was built at Moyra, in the beginning of Charles the Second's reign, supposed to be the first erection of that kind in Ireland.

A small collection of plants was cultivated in the garden of the Dublin Medical College established in 1712, but to Dr. Walker Wade is due the honor of procuring the first botanic garden for Ireland in 1790. It is supported by the Dublin Society, and contains upwards of 30 acres laid out according to the ideas of the founder. The buildings and hot-houses were badly arranged, and have been in part taken down and altered; but on the whole, in respect to design, as well as extent, it is the first botanic garden in Britain. Dr. Walker, is the author of *Plantæ Rariores in Hibernia, &c.* and is expected to produce a complete *Irish Flora*.

The botanic garden of Trinity-college was established in 1786, and though small, as Niel observes, contains a richer and more varied collection than perhaps is to be found any where else within the same compass.

There are few private collections in Ireland, and in general it may be stated, that ornamental culture of every kind is in its infancy in that country.

Subsect. 3. *British Gardening in respect to Horticultural Productions.*

127. There can be little doubt that the knowledge of culinary vegetables would be first introduced to this country by the Romans, and it is highly probable that some of the sorts made use of by them, as the brassica, and onion tribe, would become popular among the civilised parts of the inhabitants, since *kale* and *leeks* are mentioned in some of the oldest records, and the Saxon month April was called *Sprout Kale.*

The following are the native fruits of Britain, and which, till the 13th or 14th century must have been the only sorts known to the common people: small purple plums, wild currants, brambles and raspberries, &c. sloes, wood-strawberries, cranberries, black-berries, red-berries, heather-berries, elder-berries, roan-berries, haws, holly-berries, hips, hazel-nuts, acorns, beech-mast. The wild apple or crab, and wild cherry, though now naturalized, would probably not be found wild, or be very rare in the early times of which we now speak.

The more delicate fruits and legumes, introduced by the Romans, would in all probability be lost after their retirement from the island, and we may trace with more certainty the origin of what we now possess to the ecclesiastical establishments of the dark ages, and during the reign in England of the Norman line, and the Plantagenets.

It may in general be asserted, that most of our best fruits, particularly apples and pears, were brought into the island by ecclesiastics in the days of monastic splendor and luxury, during the 12th, 13th, 14th, and 15th centuries. Gardens and orchards (" horti et pomaria") are frequently mentioned in the earliest chartularies extant; and of the orchards many traces still remain in different parts of the country, in the form, not only of enclosure-walls and prepared fruit-tree borders, but of venerable pear-trees, some of them still abundantly fruitful, and others in the last stage of decay. Of the state of horticulture previous to the beginning of the 16th century, however, no distinct record exists. Till then, it is generally said, that some of our most common pot-herbs, such as cabbages, were chiefly imported from the Netherlands, their culture not being properly understood in this country. During the reign of Henry VIII. rapid steps of improvement were made in Horticulture. According to some authors, apricots and musk-melons were introduced by that monarch's gardener; and different kinds of salad herbs and esculent roots were, about the same time, first brought into the country from Flanders. Henry had a fine garden at his favourite palace of Nonsuch, in the parish of Cheam in Surrey. Here Kentish cherries were first cultivated in England. The garden wall was fourteen feet high, and there were 212 fruit-trees. *Niel in Ed. Encyc.*

Leland, who wrote during this reign, informs us, (*Itinerary*, &c.) that at Morle in Derbyshire, " there is as much pleasure of orchards of great variety of fruit, as in any place of Lancashire. The castle of Thornbury in Glocestershire, had an orchard of four acres, and there were others at Wresehill on the Ouse."

The first treatise of husbandry which appeared in England, was a translation from the French, by Bishop Grosshead, in 1500. In 1521, appeared *Arnold's Chronicles*, in which is a chapter on " The crafte of graffynge, and plantynge, and alterynge of fruits, as well in colors as in taste." Fitzherbert's husbandry appeared in 1534, but the first author who treats expressly on gardening is Tusser, whose " Five hundred Points of Good Husbandrie, &c. with divers approved lessons on hopps and gardening," &c. was first published in 1537.

Thomas Tusser, (*Sir J. Banks in Hort. Trans.* I. 150.) who had received a liberal education at Eton school, and at Trinity-Hall Cambridge, lived many years as a farmer in Suffolk and Norfolk; he afterwards removed to London, where he published the first edition of his work, under the title of " 100 Points of Good Husbandry," in 1557.

In his fourth edition, he first introduced the subject of gardening, and has given us not only a list of the fruits, but also of all the plants then cultivated in our gardens, either for pleasure or profit, under the following heads:

Seedes and herbes for the kychen, herbes and rootes for sallets and sawce, herbes and roots to boyle or to butter, strewing herbs of all sorts, herbes, branches and flowers for windowes and pots, herbs to still in summer, necessarie herbs to grow in the gardens for physick, not reherst before.

This list consists of more than 150 species, besides the following fruits: apple-trees of all sorts, apricoches, bar-berries, bollese black and white, cherries red and black, chestnuts, cornet plums, (probably the Cornelian cherry); damisens white and black, filberts red and white, gooseberries, grapes white and red; grene or grass-plums, hurtil-berries, *vaccinum vitis-idæa*, medlers, or merles, mulberries; peaches white, red, and yellow fleshed (called also the orange peach); peres of all sorts, peer plums, black and yellow, quince trees; raspes, reisons, probably currants, small nuts; strawberries red and white; service trees, wardens white and red; wallnuts, wheat plums.

Sir Joseph Banks is of opinion, that Tusser might also have included the fig, that fruit having been introduced previous to 1534, by Cardinal Pole. The orange and pomegranate, judging from those of Beddington, which Evelyn in 1700, says, had stood 120 years, were introduced soon afterwards; and the melon, according to Lobel, before 1570, so that on the whole, we had all the fundamental varieties of our present fruits in the middle of the sixteenth century. The pine apple is the only exception, which was not introduced till 1690.

The fertility of the soil of England was depreciated by some in Tusser's time, probably from seeing the superior productions brought from Holland and France. Dr. Boleyn, a cotemporary, defends it, saying, " we had apples, pears, plums, cherries, and hops of our own growth, before the importation of these articles into England by the London and Kentish gardeners, but that the cultivation of them had been greatly neglected. He refers as a proof of the natural fertility of the land to the great crop of sea-pease, (*Pisum maritimum,*) which grew on the beach between Orford and Aldborough, and which saved the poor in the dearth of 1555. Oldys soon afterwards, speaking of Gerrard's fine garden, alluding to the depreciation of our soil and climate by some, says " from whence it would appear, that our ground could produce other fruits besides hips and haws, acorns and pignuts." At this time, observes Dr. Pulteney, (*Sketches, &c.* 118.) " kitchen garden wares were imported from Holland, and fruits from France."

Queen Elizabeth is said (*Archæologia*) to have encouraged horticulture as well as flower gardening, if, as Niel observes, we may believe a court poet, celebrating majesty:

" *Cultor herbarum, memor atque florum.*"

During her reign various works on this branch appeared, by Didymus Mountain, Hyll, Mascal, Scott, Googe, &c.; but these, for the most part, are translations from the Roman and modern continental authors. Mascal is said to have introduced some good varieties of the apple. Googe mentions above twelve authors, cotemporaries of Fitzherbert, whose writings are now lost.

Gerards's Herbal, appeared in 1597, and Gabriel Plates's Jewel House of Art and Nature, about the end of the century. Plattes who wrote from fifty years experience, and whose labors were so productive to others, died in the streets for want of food, and was found without a shirt.

Charles I. seems to have patronised gardening. His kitchen-gardener was Tradescant, a Dutchman, and he appointed the celebrated Parkinson his herbalist. In 1629, appeared the first edition of this man's great work, in folio, entitled, " *Paradisi in sole Paradisus terrestris;* or, a Garden of all sortes of pleasant Flowers, with a Kitchen Garden of all manner of Herbs and Roots, and an Orchard of all sort of Fruit-bearing Trees," &c. This may be considered as the first general book of English gardening possessing the character of originality. For the culture of melons, he recommends an open hot-bed on a sloping bank, covering the melons occasionally with straw, — the method practised in the north of France at this day. Cauliflowers, celery, and finochio, were then great rarities. Virginia potatoes (our common sort) were then rare; but Canada potatoes (our Jerusalem artichoke) were in common use. The variety of fruits described, or at least mentioned, appears very great. Of apples there are 58 sorts; of pears, 64; plums, 61; peaches, 21; nectarines, 5; apricots, 6; cherries, no fewer than 36; grape vines, 23; figs, 3; with quinces, medlars, almonds, walnuts, filberds, and the common small fruits.

Cromwell was a great promoter of agriculture and the useful branches of gardening, and his soldiers introduced all the best improvements wherever they went. He gave a pension of 100*l.* a year to Hartlib a Lithuanian, who had studied husbandry in Flanders, and published " A Letter to Dr. Beati, concerning the Defects and Remedies of English Husbandry," and the Legacy, both useful works. He was an author, says Harte, who preferred the faulty sublime, to the faulty mediocrity. He recommended the adoption in England of the two secrets of Flemish husbandry, that of letting farms on improving leases, and cultivating green crops.

Charles II. being restored to the throne, introduced French gardening, and his gardener, Rose, before-mentioned, planted, Daines Barrington informs us, " such famous dwarfs at Hampton Court, Carlton, and Marlborough Gardens, that London, who was Rose's apprentice, in his Retired Gardener, published 1667, challenges all Europe to produce the like." Waller, the poet, in allusion to the two last gardens, describes the mall of St. James's Park, as:

" All with a border of rich fruit-trees crown'd."

When Quintinye came to England to visit Evelyn, Charles II. offered him a pension to stay and superintend the royal gardens here, but this he declined, and returned to serve his own master.

128. Evelyn published his translation of The French Gardener, in 1658, on his

returning from his travels, and from that time to his death in 1706, continued one of the greatest promoters of our art. In 1664 he published his Pomona, and Calendarium Hortense, the latter, the first work of the kind which had appeared in this country. The second edition was dedicated to Cowley, the poet, a great admirer of gardens. In 1658, his translation of Quintinye's work on orange-trees, and his Complete Gardener appeared; and his Acetaria, in 1699, was his last work on this branch of gardening. Evelyn is universally allowed to have been one of the warmest friends to improvements in gardening and planting that has ever appeared. He is eulogized by Wooton, in his Reflections on Ancient and Modern Learning, as having done more than all former ages, and by Switzer, in his historical preface to *Ichnographia rustica*, as being the first that taught gardening, to speak proper English.

" It is curious," Niel observes, " that while the labors of Evelyn justly placed him at the head of the improvers of his time, he should have missed an opportunity, fairly placed within his reach, of handing down his name as the greatest horticultural benefactor of Britain. In March, 1662, it was proposed to the Royal Society to recommend the cultivating of potatoes with the view of preventing the recurrence of famine; Evelyn was particularly consulted, and was requested to mention the proposal at the end of his Sylva, then announced for publication. He does not seem to have complied with this request, nor to have paid any attention to the culture of the plant: he merely mentions it in his Acetaria, and dismisses it with apparent indifference. This American plant, however, has proved a treasure to this country, " compared with which the mines of Potosi are worthless."

During Evelyn's time several books on gardening came out, some of them countenanced by him and others, in which he took no share. One of the earliest of these was the translation of an Essay on the Management of Fruit-trees, published under the fictitious name of Le Gendre, but written as Quintinye states, by Arnaud d'Andilly, a person of quality, " wherein is treated of nurseries, wall-fruits, hedges of fruit-trees, dwarf-trees, high standers, &c." He wrote from the experience of a long life, the leisure of which had been spent in the " ordering of fruit-trees." He was one of the first who attended to the proper training and pruning of wall-trees; he boldly condemns the absurd taste, then prevalent, of cutting fruit-trees into the shape of lions or pyramids, but he was not able to divest himself of the doctrine of the moon's influence, and the necessity of planting and pruning only at certain periods of her waxing and waning. About the same time Dr. Robert Sherrock published, " The History of the Propagation and Improvement of Vegetables by the concurrence of Art and Nature;" a work containing a reasonable portion of information, disguised with a good deal of pedantry. Soon after, John Rea, gent. published his " Flora, or a complete Florilege," folio; in three parts: " 1. Flora, treating of the choicest plants, flowers and fruits that will endure our winters; 2. Ceres, containing such plants or flowers as are yearly, or every other year, raised from seeds; 3. Pomona, treating of the best garden fruits, of evergreens, and flowering shrubs." This was followed, first, by a " *Systema Agriculturæ*," and then by a " *Systema Horticulturæ*," by J. W. (John Worlidge) gent.; and by the publication of the " English Gardener," by Leonard Meager, " above thirty years a practitioner in the art of gardening." This last work contains a good deal of useful information: it is divided into three parts; 1. Of planting stocks, fruit-trees, and shrubs; 2. Kitchen garden; and, 3. Garden of pleasure.

" The Practical Planter, or plain and full Instructions to raise all Sorts of Fruit-trees that prosper in England" by T. Langford, gent. appeared in 1696, with an attestation of its merits by Evelyn. The following memorandums from Evelyn's Diary, relate this branch:

" Lady Brook's at Hackney, vines planted in strawberry borders, staked at ten feet distance.

" 1661. I saw the famous queen-pine brought from Barbadoes, and presented to his majesty, (he had seen one four years before.) Saw afterwards the first king-pine presented at the Banquetting-house, and tasted of it. (At Kensington Palace is a picture, in which Charles II. is receiving a pine apple from his gardener, Rose, who is presenting it on his knees.)

The most remarkable things at Sir William Temple's at East Sheen, " are his orangery and gardens, where the wall fruit-trees are most exquisitely nailed and trained, far better than I have noted any where else." Sir William has some judicious remarks on the soils and situations of gardens, in his Essay written in 1668. He was long ambassador at the Hague, and had the honor, as he informs us, and as Switzer confirms, of introducing some of our best peaches, apricots, cherries, and grapes.

1678. At Kew Garden, (*Memoirs*, vol. ii. p. 17.) Sir Henry Capel has the choicest plantation of fruit in England, as he is the most industrious and most understanding in it." Daines Barrington (*Archæologia*, viii. 122.) considers Lord Capel to have been the first person of consequence in England, who was at much expense in his gardens, having brought over with him many new fruits from France He supposes that

Charles II. had the first hot and ice-house ever built in this country, as at the installation dinner given at Windsor, on the 23d of April, 1667, there were cherries, strawberries, and ice-creams. These fruits, however, had been long, as Switzer states, raised by dung-heat by the London gardeners.

Lord Bacon, speaking of housing of plants, suggests, that "as we housed the exotics of hot countries, lemons, oranges, and myrtles, to preserve them, so we may house our natives to forward them, and make them thrive in the cold seasons; and thus we may have violets, strawberries, and pease, all winter, provided they be sown and removed at proper times.

Hot-beds were then in use. Musk-melons, we are informed, are sown in a hot bed, exposed to the south sun, and laid upon tiles to increase the heat by reflection, and covered by straw to preserve them from the cold, &c. *Phil. Works by Shaw, Veg.* sect. 1.

Monconys mentions, that in 1663, Spring Gardens (the then Vauxhall) was much resorted to, having grass and sand-walks, dividing a square of twenty or thirty yards, which were inclosed with hedges of gooseberries, whilst within these were raspberries, roses, beans, and asparagus.

Switzer mentions Lucre and Field, gardeners to the Earl of Bedford, and Cooke, gardener to Lord Essex, noticed by Evelyn, and author of a work on forest-trees, as famous practical gardeners in Charles II.'s time.

129. George London, who had been sent to France by his master, Rose, was made on his return, head-gardener to the Bishop of London; and at the beginning of the Revolution was appointed superintendant of the royal gardens, at a salary of 200*l.* a-year, and page of the back-stairs to Queen Mary. In connection with Cooke, Lucre, and Field, already mentioned, he established the Brompton Nursery. The first place they laid out was Lord Weymouth's, at Longleat, where, Switzer informs us, each partner staid his month. London, Switzer says, might have been called director-general of the gardens of England, most of which he visited once or twice a-year, riding generally fifty or sixty miles a day. Two of the partners died, and a third selling his share to Wise, the whole fell to London and Wise, and was then worth from 30 to 40,000*l.*, perhaps, says Switzer, as much as that of all the nurseries of France put together. London's last work, was Edger, in Essex; he died in 1713.

"The Dutch Gardener," by Van Osten, the gardener of Leyden, was translated in 1711; and about the same time appeared the "Retired Gardener," translated from the French of Louis Liger, often quoted in the early editions of Miller's Dictionary.

Early in the eighteenth century, Lawrence published "The Clergyman's Recreation, shewing the Pleasure and Profit of the Art of Gardening." But Richard Bradley, F. R. S. and Professor of Botany at Cambridge, soon eclipsed all other writers of this period, both for the number and the influence of his horticultural publications. They exceeded twenty in number, and were generally written in a popular style: several of them, as might be expected, are mere compilations, and others are avowed translations. The writings of Switzer, however, about the same time, also acquired a share of celebrity. They extend to six volumes in octavo, embracing, besides "*Ichnographia Rustica*," a "Practical Fruit Gardener," and a "Practical Kitchen Gardener."

130. In 1724, appeared in two octavo volumes, the first edition of the "Gardener's Dictionary," by Philip Miller, of the Botanic Garden at Chelsea. He professes to collect and digest the labours of his predecessors; but the book partakes largely of the character of an original work, and it soon attracted general notice. This work may be considered as containing a complete view of gardening as an art of culture, during the lifetime of its author. An enlarged edition by professor Martyn, in which he is said to have been occupied twenty years, was completed in 1807: as a book of gardening its merits are less evident, than as a historico-botanical work. Miller improved the culture of the fig; and the Italian broccoli and the pine-apple were introduced at the beginning of this century, and first made known through his work. The pine-apple was introduced by Sir Matthew Decker, at Richmond. Warner, of Rotherhithe, excelled in the culture of the vine, and raised from seed the red, or Warner's Hamburgh, a variety which still continues to be much esteemed.

In the last year of the seventeenth century, appeared a curious work, entitled "Fruit-walls improved by inclining them to the Horizon," by N. Facio de Doulier, F. R. S. This work incurred the censure of the practical authors of the day; but founded on correct mathematical principles, it attracted the attention of the learned, and of some noblemen. Among the latter was the Duke of Rutland, and the failure of the trial of one of these walls, led to the earliest example which we have been able to discover of forcing grapes in England. This, Lawrence and Switzer agree, was successfully accomplished at Belvoir Castle, in 1705. Switzer published the first plans of forcing houses, with directions for forcing generally, in his Fruit Gardener, in 1717. Switzer was son of a foreigner of that name, who had a seed-shop in Westminster, and apprenticed his son to London and Wise. He had received a good education, and was the best garden-draftsman of his day. His writings, as it appears to us, have never been sufficiently appreciated, in all probability, because he attempted to introduce a more free and varied manner of laying out gardens, which Daines Barrington calls, Bridgman's first manner. The names of most of the encouragers of horticulture at the beginning of the eighteenth century, are to be found in his Fruit Gardener, second edition, 1763.

In the early part of Miller's time, Batty, Langley, and Ellis, published various horticultural works of some merit. In 1755, Thomas Hitt, produced his "Treatise on Fruit-Trees;" and in it he proposed an improved mode of training wall-trees, by regular horizontal branches, with upright bearers. This is a work, Niel observes, well deserving of attention; and the author has not, it is believed, received all the praise to which he is entitled. While practical works such as those now mentioned, engaged the attention of horticulturists in general, some philosophical pieces also appeared, and justly acquired celebrity for their authors; particularly, "Vegetable Statics" by Hales, and the "Principles of Agriculture and Vegetation," by Dr. Francis Home, father of the present distinguished Professor of Materia Medica, in the university of Edinburgh.

From the middle to the end of the eighteenth century, one of the most popular and useful writers on horticultural subjects was John Abercrombie, who, either from diffidence or some other motive, at first published his writings under the borrowed name of *Thomas Mawe*. It is said he was patronised and encouraged by the celebrated Dr. Oliver Goldsmith. He was the son of a market-gardener at Edinburgh, and had gone into England when a young man, and after acting as a workman for some years at Kew Gardens, had been enabled to begin business as a nurseryman at Hackney. The work entitled, "Every Man his own Gardener," has passed through at least twenty editions. This is formed on the plan of a calendar, containing practical instructions under detached monthly heads. Before his death, which happened in 1806, he had prepared another work entitled "The Practical Gardener," in which the systematic method is adopted, of connecting under one article every thing relative to the culture of the same plant. This last has been published in the form of a thick duodecimo volume. He wrote also, "The British Fruit Gardener," "The Complete Forcing Gardener," and "The Complete Kitchen Gardener and Hot-bed Forcer," and still other books of similar import. It is perhaps to be regretted that he was induced by booksellers to multiply his publications so much, this circumstance having tended to bring upon him the imputation of book-making, and to excite some degree of prejudice against him. In point of fact, however, he understood the business of gardening extremely well, and his writings altogether afford a very complete view of horticultural operations. *Ed. Encyc.* art. *Hort.*

Another deservedly popular work on horticulture remains to be noticed. It is written by the Rev. Charles Marshall, a clergyman of the church of England, who is evidently a very zealous amateur gardener. The title is, "An Introduction to the Knowledge and Practice of Gardening." A great deal of correct information is here condensed into little space, and conveyed in perspicuous and unaffected language. There is subjoined to it a compendious calendar, better calculated, we think, to be useful as a remembrancer, than any one published since the time of Evelyn. *Ibid.*

Of late years, the culture of the vine and of the pine-apple has been very well treated by Speechly, in separate works. Forsyth's "Treatise on Fruit-trees and their Diseases, with a particular Method of Cure," first appeared in 1791, in 4to. The royal patronage, kindly bestowed on an old and meritorious servant, secured to this work a considerable degree of attention, and even procured for the author the extraordinary distinction of a parliamentary reward. Many excellent remarks are to be found in the book. *Ibid.*

131. Towards the end of the last and beginning of the present century, Dr. James Anderson, one of the most enlightened writers on rural economy that has ever appeared, published various ingenious and philosophical papers on horticultural subjects, especially in his "Bee," and "Recreations." He also invented and took out a patent for a hothouse in 1802. The doctor's plan did not succeed, but it gave rise to one more successful by D. Stewart, gardener to J. J. Angerstein. So great has been the demand for hothouses of every description for the last twenty years, that several other patents have been taken out, and the construction of them has been taken up, as a separate occupation in London and Birmingham.

About the end of the century, a plan of growing cucumbers by means of the heat obtained from the steam of dung was published by M'Phail, gardener to the Earl of Liverpool, and a successful cultivator of the pine. In the beginning of the present century, Griffin and Baldwin, have published on the pine, both excellent cultivators.

Steam began to be applied as a vehicle for conveying heat in hot-houses by

Wakefield, of Liverpool, and Butler, the Earl of Derby's gardener, about 1792. It did not attract general attention in England, however, till about 1815, but it is now spreading rapidly, and promises to be an important horticultural improvement.

132. The London Horticultural Society was instituted in 1805, under the patronage of Earls Dartmouth and Powis, Sir Joseph Banks, T. A. Knight, and other distinguished characters. The first volume of its Transactions appeared in 1812, containing some valuable papers by its president, T. A. Knight, R. A. Salisbury, and other eminent horticulturists. In 1817, about two acres of ground was taken near Hammersmith as an experimental garden, and in 1818 a small hot-house erected. In this garden a number of fruit-trees, from France, America, and other places, some Chinese plants from Canton, and a variety of others have been collected, and some of the fruit-trees propagated and distributed among the nurserymen. The second volume of the Society's Transactions was completed in 1818, and the third in 1820, both containing many valuable papers, theoretical and practical. An additional piece of ground was taken this year for temporary purposes; but the Society expect soon to form such a garden as will answer the expectations of the public. The members at present exceed 1500. Its present flourishing state, as a body, is almost entirely owing to the exertions of J. Sabine, F. R. S., the secretary; and its character for science is supported by the papers of T. A. Knight, by far the most philosophical horticulturist who has yet appeared in this country. Should J. Sabine continue to maintain that influence in this society to which his activity and extended views so fully entitle him, there can be no doubt something will be effected for horticulture exceeding what has yet been done by any country.

Of the numerous encouragers of horticulture at the present time, we can only mention a few names. The Earls of Bridgewater, Carnarvon, Sir Joseph Banks, Sir Abraham Hume, J. G. Lambton, J. A. Stuart Wortley, have excellent fruit and kitchen-gardens, and extensive forcing departments.

As amateur horticulturists, J. Sabine, J. Braddick, and G. Caswell, may be mentioned; as celebrated fruit and market-gardeners, Gunter, Grange, and Andrews; and as eminent head-gardeners, Aiton, gardener to the king; Baldwin, to the Marquis of Hertford, and Oldacre, to Sir Joseph Banks.

133. The abbots, Chalmers remarks, were the earliest Scottish horticulturists, and their orchards are still apparent to the eyes of antiquaries, while their gardens can now be traced only in the chartularies. A number of examples of gardens and orchards are mentioned in writings of the twelfth and thirteenth centuries; and even at this day, Niel observes, "several excellent kinds of fruits, chiefly apples and pears, are to be found existing in gardens, near old abbies and monasteries. That such fruits were introduced by ecclesiastics cannot admit of a doubt. The Arbroath oslin, which seems nearly allied to the burr knot apple of England, may be taken as an instance; that apple having been long known all round the abbey of Aberbrothwick, in Forfarshire; and tradition uniformly ascribing its introduction to the monks." *On Scottish Gardens and Orchards*, p. 2. "The great care bestowed on the culture of fruits, and of some culinary herbs by the clergy and nobility," Niel observes, "could not fail to excite, in some degree, the curiosity and the attention of the inhabitants in general; and it may, perhaps, be said that the first impulse has scarcely spent its force; for it is thus but comparatively a short time (four or five centuries) since the cultivation of apples, pears, cherries, gooseberries, and currants, and many of the common kitchen-vegetables, were introduced into this country. To a people of a naturally plodding turn of mind, and of a nervous and firm structure of body, it may easily be conceived that gardening would soon become a very desirable employment, and numbers would the more readily attach themselves to the occupation, on account of the total want of manufactures to occupy the spare hands." *Ibid.* p. 3.

Scotland has been more distinguished for producing excellent practical gardeners than good publications on the art of gardening. There does not appear to have existed any Scottish system of gardening, as a separate book, till the beginning of the eighteenth century, when the "Scots Gardener" was published by John Reid, gardener to Sir George Mackenzie of Rosehaugh. The work is divided into two parts; the first treating of contriving and planting of gardens, orchards, avenues, and groves; the second, of the propagation and improvement of forest and fruit-trees, kitchen herbs, roots, and fruits; with a gardener's calendar; the whole adapted to the climate of Scotland. The style is very inaccurate; but the matter evinces not only an acquaintance with previous horticultural works, but a practical knowledge of the subject. About thirty years after the publication of Reid's book, there appeared "The Scots Gardener's Director," by James Justice, F. R. S. and one of the principal clerks of Session, (*i. e.* of the Court of Session, or supreme civil court of Scotland.) This is characterised by professor Martyn, as "an original and truly valuable work, founded upon reflection and experience." Nearly at the same time Dr. Gibson published an anonymous octavo volume on fruit-trees, containing many useful remarks, and some curious notices concerning the history of the most esteemed apples and pears of Scottish origin, or which are generally supposed to be of Scottish origin. In 1774 there appeared a small octavo volume, entitled "The Planter's, Florist's, and Gardener's Pocket Dictionary," by James Gordon, nurseryman at Fountainbridge, near Edinburgh. It is avowedly a compilation; but the author being a practical gardener, occasionally gives his own opinions and practice. It has already been seen, that several of the Scottish gardeners who have settled in England, have attained distinction as authors. We allude, in particular, to Abercrombie, the voluminous writer lately spoken of, and to Forsyth, the author of the "Treatise on Fruit-Trees." *Ed. Encyc.* art. *Hort.*

"Among the recent Scottish writers on gardening, one remains to be mentioned, who will long hold a distinguished place, the late Walter Nicol. He was the son of the gardener who planned and executed the extensive pleasure-grounds of Raith, in Fifeshire; and here he received his horticultural education. He afterwards acted for some time as gardener to the Marquis of Townsend, at Rainhamhall, in the county of Norfolk; but he left England, in order to take charge of the fine gardens and grounds of General Wemyss, of Wemyss Castle, in Fife, the improvements there having been conducted under the directions of his father. Here he observed a praiseworthy practice, now too much neglected by head-gardeners, that of instructing his young men or assistants, not only in botany, but in writing, arithmetic, geometry, and mensuration. He used to remark, that he thus not only improved his scholars, but taught himself, and made his knowledge so familiar, that he could apply it in the daily business of life. In this way he gradually became qualified to communicate his information to the public. In 1797, the first of his works appeared, under the title of "The Scots Forcing Gardener," in one volume, octavo. About this time he changed his mode of life, and dedicated his whole attention to the planning and improving of ornamental grounds. In 1803, he published the "Practical Planter," a book which both increased his reputation as a writer, and extended his employment as an improver. In 1809 appeared the "Villa Garden Directory," a little book which soon acquired the high character which it still retains. The "Gardener's Calendar," in one large volume octavo, came out in 1810, and forms at this day one of the best books on horticulture in our language. In the same year he undertook an extensive journey through England, visiting all the principal seats and plantations in that country; and on his return he made some progress in composing a "Planter's Calendar." But after a few weeks' illness he died, on the 5th of March, 1811. His last work, just mentioned, has since been completed and published by his friend, Edward Sang, nurseryman at Kirkcaldy, in Fife. In 1809, the Caledonian Horticultural Society was established at Edinburgh by the individual exertions of that venerable physician and excellent amateur gardener, Dr. Andrew Duncan, senior, professor of the Institutes of Medicine in the university there. The society has been fostered by several of the Scottish nobility and gentry, particularly the Duke of Buccleugh, the Earl of Wemys and March, the Earl of Leven, Sir James Hall, Sir George Stewart Mackenzie, Sir George Buchan Hepburn, and others. It publishes "Memoirs," in the octavo size, in detached parts or numbers, two parts generally appearing in the course of the year; and some important enough papers have in this way been brought before the public. A desire of improving their knowledge of gardening has thus been excited among gentlemen; and the intelligence and zeal of practical cultivators is thus, in the most unassuming way, made known to the world." *Ibid.*

134. The best garden in *Scotland*, about the beginning of the eighteenth century, was that of J. Justice, at Crichton, near Edinburgh. From the year 1760, to 1785, that of Moredun claimed the priority. Moredun garden was managed by William Kyle, author of a work on forcing peaches and vines; and Dr. Duncan informs us, that the late Baron Moncrieff, its proprietor, "used to boast, that from his own garden, within a few miles of Edinburgh, he could, by the aid of glass, coals, and a good gardener, match any country in Europe in peaches, grapes, pines, and every other fine fruit, excepting apples and pears;" these he acknowledged were grown better in the open air in England, and the north of France. (*Discourse to Caled. Hort. Soc.* 1814.)

It is observed, in another of Dr. Duncan's discourses to this society, that in 1817, on the 10th of June, a bunch of Hamburgh grapes was presented, weighing four pounds, the berries beautiful and large. "In June, it is added, such grapes could not be obtained at any price, either in France, Spain, or Italy." These facts are decisive proofs of the perfection to which horticulture has attained in Scotland, in spite of many disadvantages of soil, climate, and pecuniary circumstances.

To the garden of Moredun succeeded, as the first in excellence, those of Raith and Wemyss Castle. At present some of the best kitchen-gardens in Scotland, are also the most noted for ornamental productions; and as such have been already mentioned; perhaps that of Dalkeith may have the preference; Ferguson's, at Raith; Lord Duncan's at Lundie; the Honorable William Maul's, at Brechin Castle; Lord Roseberry's, at Barnbugle, are models of their kind, and few in England, of the same extent, can be compared to them.

135. *Ireland*, in general, may be considered as equally far behind England in horticulture as in other branches of gardening. It is only, indeed, since the union that any great attention has been paid to the subject.

As far as respects hardy fruits and culinary vegetables, the gardens of the principal proprietors in Ireland may be reckoned nearly equal to those of Scotland or England, as they are generally managed by gardeners of these countries; but, in respect to exotic productions, Irish gardens are far behind those of the sister countries. Indeed, it is only within the last fifteen years that it has become the practice to build hot-houses of any description in that country, and the number of these is still very limited. The first forcing-house was erected in the Blissington gardens. The gardens of the minor nobility and gentry of Ireland are poor in horticultural productions; many content themselves with cabbages and potatoes, and perhaps a few peas, onions, and apples.

Subsect. 4. *British Gardening in respect to the planting of Timber Trees and Hedges.*

136. England, like every other country capable of producing trees, is described, in the earliest account of it, to have been covered with wood. When Domesday-book was compiled, the woods were so numerous and extensive, as to be valued, not by the quantity of timber, but by the number of swine which the acorns and mast could maintain.

Four hundred years after this, in the time of King Edward IV., an eminent writer says, that England was then a well-timbered country.

The subject of planting for timber and fuel seems not to have attracted much attention as an important part of the rural economy of England till about the beginning of the seventeenth century. Sir John Norden, in his "Surveyor's Dialogue," published in 1607, notices the subject, as had been done before by Benose, in 1538, and Fitzherbert, in 1539.

In 1612 was published "Of planting and preserving of Timber and Fuel, an old Thrift newly revived," by R. C.; and in the following year, "Directions for the planting of Timber and Firewood," by Arthur Standish. Planting for timber and copse is noticed in "Googe's Husbandry," published in 1614, and is the express subject of Manwood's "Treatise on Forests, and their Original and Beginning," published in 1615; and of "Rathbone's Surveyor," in 1616. It is singular that so many books on this subject should have been published so near together, at so early a period. The reason seems to be, as professor Martyn has observed, that a material attack was made on the forest-trees in the 27th year of the reign of Henry VIII., when that monarch seized on the church-lands; and from this time the consumption of oak-timber was continually increasing, not only in consequence of the extension of commerce, and of great additions to the royal navy, but because it was made more use of in building houses. This alarmed both government and individuals.

Holinshed, who lived in the reign of Queen Elizabeth, says, that in times past men were contented to dwell in houses built of sallow, willow, &c.; so that the use of oak was, in a manner, dedicated wholly unto churches, religious houses, princes' palaces, navigation, &c.; but now nothing but oak is any where regarded.

After this, in the reign of King James I., it appears that there was great store of timber, more than proportioned to the demand. For on a survey of the royal forests, &c. in 1608, we find that a great part of what was then intended to be sold, remained a considerable time undisposed of.

During the civil war, in the time of King Charles I., and all the time of the interregnum, the royal forests, as well as the woods of the nobility and gentry, suffered so much, that many extensive forests had, in a few years, hardly any memorial left of their existence but their names. This loss would not have operated so severely, had the principal nobility and gentry been as solicitous to plant with judgment, as to cut down their woods.

The publication of Evelyn's Sylvia, in 1664, raised a great spirit of planting, and created a new æra in this as in other branches of gardening. In his dedication to Charles II., in 1678, he observes, that he need not acquaint the king how many millions of timber-trees have been planted in his dominions, at the instigation, and by the sole direction of that work. The government at that time, alarmed by the devastation which had been committed during the civil war, gave great attention to the increase and preservation of timber in the royal forests.

The Society of Arts, &c., established in 1753, have greatly contributed, by their honorary and pecuniary rewards, to restore the spirit for planting. The republication of Evelyn's Sylvia, in a splendid manner by Dr. Hunter, and subsequently of different works by Kennedy, Young, the Bishop of Landaff, Marshall, Pontey, and others, has doubtless contributed to that desirable end; and the result is, that many thousand acres of waste lands have, within the last fifty years, been planted with timber-trees.

137. Young trees, the early authors inform us, were procured from the natural forests and copses, where they were self-sown; but about the beginning of the seventeenth century, public nursery-gardens were formed, originally for fruit-trees, but

towards the end, nurserymen, as we learn from Switzer and Cooke, began to raise forest-trees and hedge-plants from seeds. The first nursery we hear of was that of Corbett, at Twickenham, mentioned by Ben Johnson, and the next of consequence that of London and Wise, at Brompton Park, already mentioned, and still continued as a nursery.

As great modern planters in the eighteenth century may be mentioned, the Dukes of Portland, Newcastle, Northumberland, Bedford, and Richmond, the Marquis of Bath, Bishop of Landaff, the Earl of Lonsdale, Lord Yarborough, Sir W. W. Wynne, Sir Richard Hoare, Sir George Saville, W. Coke, R. Wyndham, J. C. Curwen, &c.

138. When hedges were introduced to England is uncertain. They would probably be first exhibited in the gardens of the Roman governors, and afterwards re-appear in those of the monks. From these examples, from the Roman authors on husbandry, or more probably from the suggestion of travellers who had seen them abroad, they would be introduced in rural economy. Marshal conjectures, that clearing out patches in the woods for aration, and leaving strips of bushes between them, may have given the first idea of a hedge; and this supposition is rendered more plausible, from the circumstance of some of the oldest hedges occupying so much space, and consisting of a variety of plants. However originated, they did not come into general use in laying out farms till after the Flemish husbandry was introduced in Norfolk about the middle of the 17th century. (*Kent's Hints, &c.*) So rapidly have they increased since that period, that within the last sixty or eighty years, they have entirely changed the face of the country. In the time of George I. almost every tract of country in England might have been said to consist of four distinct parts or kinds of scenery. 1. The houses of the proprietors, and their parks and gardens, and the adjoining village, containing their farmers and laborers. 2. The common field or intercommonable lands in aration. 3. The common pasture, or waste untouched by the plough; and, 4. The forest containing a mass of timber or copse. But at present these fundamental features are mixed, and variously grouped, and the general face of the country presents one continual scene of garden-like wooodiness, interspersed with buildings and cultivated fields, unequalled in the world.

The oldest inclosures in England are in Kent and Essex, and seem to have been formed of hawthorn, sloe, crab, hazel, dogwood, &c. taken from the copses, and planted promiscuously; but now almost all field or fence-hedges are formed of single or double rows of hawthorn, with or without trees, planted at regular distances to shoot up for timber.

139. It is certain, Graham (*Report of Scotland*, vol. ii.) observes, that in ancient times Scotland was clothed with extensive tracts of wood. By various operations carried on by the hand of Nature and of man, this clothing has been in a great measure destroyed. The attempts to restore it by planting timber, however, appear to be of recent origin. Dr. Walker seems to be of opinion, that the elder (Sambucus nigra) was the first barren tree planted in Scotland; and that the plane or sycamore was the next. The wood of the former was in much request for making arrows. "A few chestnuts and beeches," he adds, "were first planted in gardens, not long before the middle of the seventeenth century, some of which have remained to our times." Notwithstanding this high authority, however, there seems to be good reason to conclude, that some trees which still exist were planted before the Reformation; they appear to have been introduced by the monks, being found for the most part in ecclesiastical establishments. Such are the Spanish chestnuts, the most of which are still in a thriving condition in the island of Inchmahoma, in the lake of Monteith, in Perthshire, where there was a priory by King David I. Some of these chestnut-trees measure within a few inches of eighteen feet in circumference, at six feet from the ground. They are probably three hundred years old, or upwards. There are planted oaks at Buchanan, which are apparently of the same age.

Dr. Walker gives a table of the period of the introduction of other exotic trees, as far as he could obtain information. The doctor states Thomas Earl of Haddington to be the father of planting in Scotland, having begun to plant Binning-wood, which is now of great extent and value, in 1705. But it is stated, on an authority almost approaching to certainty, that the fine timber in the lawn at Callender House, in Stirlingshire, was planted by the Earl of Linlithgow and Callender, who had accompanied Charles II. in his exile, upon his return from the continent after the Restoration. This timber is remarkable, not only for its size, but for its quantity.

Planting for timber became very general in Scotland between the years 1730 and 1760, by the exertions and example of Archibald Duke of Argyle, the Duke of Athol, the Earls of Bute, Loudon, Hyndford, and Panmure, Sir James Nasmyth, Sir Archibald Grant, Fletcher of Salton, and others. It is well ascertained, that Sir Archibald Grant began to plant in 1719.

140. The first treatise on forest-trees, published in Scotland, was written by the Earl of Haddington, in 1760, though some observations on the subject had been previously made public by Fletcher of Salton, Home, Maxwell, and Switzer, in their

agricultural works, published at Edinburgh, and in the Scots Museum Rusticum; Boutcher's treatise appeared in 1778; Nicol's Practical Gardener, in 1801; and his Planter's Kalendar, edited by Sang in 1812.

A great stimulus to planting in Scotland was given by the Essays of Dr. Anderson, published in 1784, in which the value of the larch-tree, and the progress it had made at Dunkeld, since planted there in 1741, were pointed out. The examples and writings of Lord Kames also contributed to bring this, and every description of rural improvement into repute; but the high price of timber during the war produced the most sensible effect as to planting.

The two first tree-nurseries in Scotland were established at Edinburgh, about the beginning of the eighteenth century, by Malcolm, at the Water Gate; and Gordon, at the Fountain Bridge. To these succeeded a considerable one by Anderson and Leslie, about 1770. Leslie contributed to render the larch popular, and was the first nurseryman who ventured to erect a greenhouse. Since this period, tree-nurseries are nearly as common in Scotland as in England.

The most extensive planters of the present day are the Dukes of Athol and Argyle, the Earls of Breadalbane, Eglinton, Fife, Sir Archibald Grant, Sir H. D. Hamilton, J. Maule, George Ross, &c.

141. Hedges were introduced to Scotland about the middle of the seventeenth century by Cromwell's soldiers. The first were planted at Inch Buckling Brae, in East Lothian, and at the head of Loch Tay, in Perthshire. The former hedge was in existence in 1804, and then consisted of a single row of old hawthorns. They are now general in all the low and tolerably fertile and sheltered parts of the country, contributing with the plantations to ameliorate the climate, and greatly to improve the scenery.

142. Though in every part of Ireland, in which I have been, observes A. Young in 1777, (*Tour*, vol. ii. 2d edit.), " one hundred contiguous acres are not to be found without evident signs, that they were once wood, at least very well-wooded; yet now " the greatest part of the kingdom exhibits a naked, bleak, dreary view, for want of wood, which has been destroyed for a century past with the most careless prodigality, and still continues to be cut and wasted. The woods yet remaining are what in England would be called copses. The gentlemen in that country are much too apt to think they have got timber, when in fact they have got nothing but fine large copse-wood."

Shaw Mason, in a Statistical Survey of Ireland, lately published, says there were natural woods in some places in James II.'s time; but he produces very few instances of artificial plantations of full growth, and none of older date than the middle of the seventeenth century, when it appears, that through the instigation of Blythe and other officers in Cromwell's army, some gentlemen began to plant and improve. The late Lord Chief Baron Foster was the greatest planter when A. Young visited Ireland, and his Lordship informed the tourist that the great spirit for this sort of improvement began about 1749 and 1750. S. Hume, M. R. I. A., author of a Practical Essay on Planting, published in 1794, says much has been done within a few years, and especially since the establishment of the Dublin Society in 1749. He mentions Walter Lawrence, of Belvue, in Galway, Sir W. G. Newcomen, of Carrickglass, in Longford, as great planters. He adds a list of other proprietors, some of whom, as the Earl of Abercorn, the Honorable J. Foster, &c. may be considered as among the principal encouragers of this branch of our art in the present day.

Hedges, as fences, were probably, as in Scotland, introduced by the officers of Cromwell's army.

SUBSECT. 5. *British Gardening as empirically practised.*

143. The use of gardens, is perhaps more general in Britain than in any other country, if we except Holland.

The laborious journeyman mechanic, whose residence in large cities, is often in the air, rather than on the earth, decorates his garret window with a garden of pots. The debtor deprived of personal liberty, and the pauper in the work-house, divested of all property in external things, and without any fixed object on which to place their affections, sometimes resort to this symbol of territorial appropriation and enjoyment. So natural it is for all to fancy they have an inherent right in the soil, and so necessary to happiness to exercise the affections, by having some object on which to place them.

Almost every cottage in England has its appendant garden, larger or smaller, and slovenly or neatly managed, according to circumstances. In the best districts of England, the principal oleraceous vegetables, some salads, herbs, flowers, and fruits are cultivated, and in the remote parts of Scotland, at least potatoes and borecoles are planted.

Tradesmen and operative manufacturers, who have a permanent interest in their cottages, have generally the best cottage gardens, and many of them, especially a

Norwich, Manchester, and Paisley, excel in the culture of florists' flowers. In Sir John Sinclair's "General Report of Scotland," a particular account of the Paisley florists will be found in the appendix, and some account of those in Manchester and Norwich in the "Surveys" of these counties, published by the Board of Agriculture. The gardens of farmers are larger, but seldom better managed than those of the common cottagers, and not often so well as those of the operative manufacturers in England. They are best managed in Kent, and in East Lothian.

The gardens and grounds of citizens, who have country-houses, may be in size, from an eighth of an acre, to a hundred acres or upwards. Such a latitude, it may easily be conceived, admits of great variety of kitchen-gardens, hot-houses, flower-gardens and pleasure-grounds. They are in general, the best managed gardens in Britain, and constitute the principal scenery, and the greatest ornament of the neighbourhood of every large town. Those round the Metropolis, Liverpool, and Edinburgh, are pre-eminent.

The gardens of independent gentlemen, of middling fortune, vary considerably in dimension. Few of the kitchen-gardens are under an acre, the flower-garden may contain a fourth, or a third of an acre, and the pleasure-ground, from three to ten or twelve acres. The lawn, or park, varies from thirty or forty to three or four hundred acres. The whole is in general respectably kept up, though there are many exceptions arising from want of taste, of income, or engagements in other pursuits on the part of the proprietor; or restricted means, slovenliness, and want of taste and skill in the head gardener. These gardens abound in every part of every district of Britain, in proportion to the agricultural population.

The first-rate gardens of Britain belong chiefly to the extensive land-holders; but in part also to wealthy commercial men. The kitchen-gardens of this class may include from three to twelve acres, the flower-garden from two to ten acres, the pleasure-ground from twenty to one hundred acres, and the park from five hundred to five thousand acres. Excepting in the cases of minority, absence of the family, or pecuniary embarrassments, these gardens are kept up in good style. They are managed by intelligent head gardeners, with assistants for the different departments, and apprentices and journeymen as operatives. A few of such residences are to be found in almost every county of England, in most of those in Scotland, and occasionally in Ireland.

The royal gardens of England cannot be greatly commended; they are in no respect adequate to the dignity of the kingly office. That at Kew has been already mentioned as containing a good collection of plants; but neither this nor any of the other royal gardens are at all kept in order as they ought to be, not on account of want of skill in the royal gardeners, but for want of support from their employers.

Gardens for public recreation are not very common in Britain, but of late a considerable specimen has been formed at London in the "Regent's Park," an extensive public promenade; and the "Calton Hill" at Edinburgh, of singular variety in prospects. There are also squares and other walks, and equestrian promenades, in the metropolis, and other large towns; but in respect to this class of gardens, they are much less in use in Britain, than on the continent, for Britons are comparatively domestic and solitary animals.

Of gardens for public instruction, there are botanic gardens attached to the principal universities, and experimental gardens belonging to the London and Edinburgh horticultural societies.

Commercial gardens are very numerous in Britain, arising from the number, magnitude, and wealth of her cities being much greater in proportion to the territorial extent of the country than in any other kingdom. In general, they have been originated by head gardeners, who have given up private servitude.

Market-gardens and orchards are numerous, especially round the metropolis, and their productions are unequalled, or at least not surpassed by any gardens in the world, public or private. Forcing is carried on extensively in these gardens, and the pine cultivated in abundance, and to great perfection. Their produce is daily exposed in different markets and shops, so that every citizen of London may, throughout the year, purchase the same luxuries as the king, or as the most wealthy proprietors have furnished from their own gardens; and obtain for a few shillings, what the wealth of Crœsus could not procure in any other country! a striking proof of what commerce will effect for the industrious.

Some gardens are devoted to the raising of garden seeds for the seed merchants and others, to the growing of herbs and flowers for the chemist or distiller.

There are florists' gardens, where plants are forced so as to furnish roses and other flowers of summer in mid-winter. The tradesman's wife may thus at pleasure, procure a drawing-room garden equal to that of her sovereign, and superior to that of all the kings and nobles on the rest of the globe.

For stocking and forming new gardens and plantations, and repairing or encreasing the stock of old ones, there are nursery gardens, in which a very considerable capital is embarked. These have greatly encreased with the encreasing spirit for planting, and other branches of gardening. The principal are near the metropolis; but they are to be found in most districts originated in almost every case by head gardeners, whose capital consists of the savings made during their servitude.

The operative part of gardening is carried on by laborers, apprentices, journeymen, and masters.

The laborers are women for weeding, gathering some descriptions of crops, and other light works: and men for assisting in the heavier operations in extraordinary seasons. The permanent sub-operatives are the apprentices and journeymen; the former are indentured generally for three years at the expiration of which they become journeymen, and after a few years' practice in that capacity, in different gardens, they are considered qualified for being masters, or taking the charge of villa, private, or first-rate gardens, according to their capacity, education, and assiduity, and the class of gardens in which they have studied and practised. Formerly there were lodges, or societies of gardeners, and a sort of mystic institution and pass word kept up like those of the German gardeners and masons, but within the last fifty years this has been in most places given up. The use of books, and the general progress of society, render such institutions useless in point of knowledge and hospitality, and injurious politically, or in respect to the market-value of labor. See *Preston's History of Masonry.*

The head-gardeners of this country are universally allowed to be the most intelligent and trust-worthy part of the operatives of any branch of rural economy, and the most faithful and ingenious of those who constitute the serving establishment of a country residence. Those of Scotland are by many preferred, chiefly, perhaps, from their having been better educated in their youth, and more accustomed to frugality and labor. Scotland, Niel observes, "has long been famous for producing professional gardeners; perhaps more so than any other country, unless we except Holland, about a century ago. At present, not only Great Britain, but Poland and Russia are supplied from Scotland; and the numbers of an inferior class to be found in every part of England and Ireland, is quite astonishing. The comparative want of national manufactures and commerce in Scotland, has already been assigned as one reason why more hands turn their attention to rural matters; and we may add, that the system of universally educating the lower orders, has contributed to their pre-eminence in whatever they undertake. There are other general reasons, such as the nature of the profession, the retired life, frequent society of their superiors, and access to good libraries, which render gardeners, in general, more intelligent than most men of the same condition." (*Gen. Rep. &c.* c. ii.) Lord Gardenstone (*Travelling Memorandum*, 1790,) says that in every country in Europe, he found gardeners more sober, industrious, and intelligent than other men of a like condition in society.

144. The use of gardens in Ireland is of a very limited description, and the gardens there, of all the classes, are greatly inferior to the corresponding classes in Britain. A few exceptions may be made in favor of the Dublin botanic gardens, and those of one or two wealthy citizens and extensive proprietors; but the cottage gardens, in many districts, contain nothing besides potatoes; and potatoes are the chief ingredients in the gardens of private gentlemen. Parnel has ably shown (1819) that till wheaten bread and meat take place of these roots, no great improvement can be expected among the lower classes.

Nations, like individuals, arrive at a certain period of their existence before they have acquired the art of making the most of life. Ireland does not seem to have arrived at virility; many of her proprietors spend their time and their wealth in other countries, to the neglect and ruin of their properties, and the misery of those whose fate it is to live under them. When their pecuniary resources and best energies are exhausted they return, but it is too late. It is too late to understand our duty and our advantage, when we can no longer perform the one, or reap the other; and it was but a poor consolation which Face, in the Alchemist, gave his comrade, when the laboratory being blown up, and all their visionary hopes vanished, he discovered, among the ruins, that there was just mercury enough left to cure the itch.

145. The artists or architects of gardens, in Britain, are of three classes. First, head gardeners who have laid out the whole, or part of a residence, under some professor, and who commence artist or ground workmen, as this class is generally denominated, as a source of independence. Such was Hitt, Brown, &c. Secondly, architects who have devoted themselves chiefly to country buildings, and thus acquiring some knowledge of country matters, the effects of scenery, &c. combine with building, that of laying out grounds, depending for the execution of their ideas on the practical knowledge of the gardener, *pro tempore.* This class are commonly called ground architects. Such was Kent. Thirdly, artists who have been educated and apprenticed, or otherwise brought up entirely, or chiefly for that profession. These are often called

landscape gardeners, but the term is obviously of too limited application, as it refers only to one branch of the art. Such was Bridgeman, Eames, &c.

Subsect. 6. *British Gardening, as a Science, and as to the Authors it has produced.*

146. England has always excelled more in practical knowledge than in theory or science. What a German or a Frenchman effects by skill, we effect by capital or main force. Accustomed to abundance, and to procure every thing by money, we feel little want of science. Our resource is in our purses rather than in our heads, and we blunder on without regarding expense till we attain our object. English gardening, if tried by this criterion, will be found attended by the national characteristics.

Those superstitious observances attendant on a rude state of society retained their ground in British gardening till the end of the seventeenth century. Meager, Mascal, Worlidge, and the authors who preceded them, regulate the performance of horticultural operations by the age of the moon. Turnips or onions, according to these authors, sown when the moon is full, will not bulb but send up flower stalks; and fruit-trees, planted or grafted at that season, will have their period of bearing greatly retarded. A weak tree is to be pruned in the increase, and a strong tree in the wane of the moon. Quintinye seems to have been the first to oppose this doctrine in France, and through Evelyn's translation of his Complete Gardener, he seems to have overturned it also in England. " I solemnly declare," he says, " that after a diligent observation of the moon's changes for thirty years together, and an enquiry whether they had any influence in gardening, the affirmative of which has been so long established among us, I perceived that it was no weightier than old wives' tales, and that it had been advanced by unexperienced gardeners.

" I have, therefore, followed what appeared most reasonable, and rejected what was otherwise; in short, graft in what time of the moon you please, if your graft be good, and grafted on a proper stock, provided you do it like an artist, you will be sure to succeed.

" In the same manner sow what sorts of grain you please, and plant as you please, in any quarter of the moon, I'll answer for your success, the first and last day of the moon being equally favorable."

Quintinye not only removed ancient prejudices, but introduced more rational principles of pruning than had before been offered. Switzer says, he first made it known that a transplanted tree could not grow till it made fresh fibres, and that therefore the old ones when dried up, might be cut off.

The influence of Bacon's writings produced the decline and fall of astrology, in the beginning of the eighteenth century; a different mode of studying the sciences was adopted. Vegetable physiology and chemistry, the first, a new science, and the latter degraded under the name of Alchemy began to be studied, and the influence of this dawn of intellectual day was felt even in agriculture and gardening.

The practice of forcing fruits and flowers, which became general about the middle of the century, led gardeners to reflect on the science of their art, by bringing more effectually into notice the specific influence of light, heat, air, water, and other agents of vegetation. The elementary botanical works, published about the same time by diffusing the doctrines of Linnæus, co-operated; as did the various horticultural writers of this century, especially Miller, Bradley, and Hill, and subsequently Home, Anderson, and others.

" The increasing culture of exotics," Doctor Pulteney observes, " from the beginning of the eighteenth century, and the greater diffusion of taste for the elegancies and luxuries of the stove and green-house, naturally tended to raise up a spirit of improvement and real science in the art of culture. To preserve far-fetched varieties, it became necessary to scrutinise into the true principles of the art, which ultimately must depend on the knowledge of the climate of such plant, and the soil in which it flourishes in that climate. Under the influence of such men as Sloane, the Sherrards, and other great encouragers of science, gardeners acquired botanical knowledge, and were excited to greater exertions in their art."

The encreased zeal for planting, and more careful attendance to the pruning of trees, tended to throw light on the subject of vegetable wounds, and their analogy with those of animals, as to the modes of healing, though the French laugh at our ignorance on this subject (*Cours d'Agr.* art. *Plaie,*) at the close of the eighteenth century.

147. It was reserved for T. A. Knight to do more for the science of horticulture in England than any author, since the days of Evelyn and Quintinye, less perhaps from his profound knowledge of vegetable physiology than from a peculiar tact or sagacity in making observations, resorting to an experiment at a proper crisis, and applying his discoveries to practice.

The first of this philosopher's writings will be found in the Philosophical Transactions for 1795, entitled *Observations on the Grafting of Trees.* In the same transactions for 1801 and 1803, are contained his ingenious papers on the fecundation of fruits, and on the sap of trees. Subsequent volumes contain other important papers; and a great number in which science and art are combined, in a manner tending directly to enlighten and instruct the practical gardener, will be found in the transactions of the horticultural society. Through the influence of this author and that society, over which he is so worthy to preside, we see commenced an important era in the horticulture of this country, an era rendered peculiarly valuable, as transferring the discoveries of science immediately to art, and rendering them available by practitioners. How great may be its influence, on the comforts and luxuries of the table, it is impossible to foresee. The introduction and distribution of better sorts of the common hardy fruits and culinary plants will tend immediately to the benefit of the humbler classes of society; and by increasing a little the size, and encouraging the culture, both ornamental and useful, of cottage-gardens, the attachment of this class to their homes, and consequently their interest in the country, will be increased. Even agriculture will derive advantages, of which, as an example, may be adduced the result of pinching off the blossoms of the potato, which, by leaving more nourishment for the root, will increase the produce (according to T. A. Knight's estimate) at least one ton per acre. *Hort. Tr.* 1. 190. See also as to the advantages of improving cider-fruits, *Treatise on the Apple and Pear*, 5th edit. p. 162.

148. Gardening, as an art of design and taste, may be said to have been conducted mechanically, and copied from precedents, like civil architecture, till the middle of the eighteenth century; but at this time the writings of Addison, Pope, Shenstone, and G. Mason, appeared, and in these, and especially in the *Observations on Modern Gardening*, by Whateley, are laid down unalterable principles for the imitation of nature in the arrangement of garden scenery. The minds of gardeners, however, were not sufficiently cultivated to appreciate and appropriate the science of such works, and to apply it in practice; nor could it by any means be expected they should, as the difference between the ancient and the modern taste in laying out grounds is no less than between a mechanical and a liberal art. To understand it wholly, it is necessary, in some degree, to be a gardener, a metaphysician, and a painter. Men can imitate, however, what they do not understand; and the great demand for artists professing the new style of design produced numerous copyists, who, fixing on what was most conspicuous, and mistaking often the means for the end, filled the country with spiritless caricatures of natural scenery. Sir W. Chambers first attacked this false taste, and subsequently W. Price, and R. P. Knight, whose well-known works on the picturesque, and on landscape, as already noticed (112), have most materially contributed to open the eyes of country-gentlemen on this subject, and banish that charlatanry which for half a century had triumphed over good sense and nature, under the sanction of fashion and the names of Brown, and other empirical practitioners. The science of this department may be said to be completely ascertained; but it will probably be long before it be appropriated by gardeners, and applied in the exercise of the art as a trade. A somewhat better education in youth, and more leisure for reading in the periods usually devoted to constant bodily labor, will effect this change, and its influence on the beauty of the scenery of country residences, and on the face of the country at large, would be such as cannot be contemplated without a feeling of enthusiastic admiration. If this taste were once duly valued, and paid for by those whose wealth enables them to employ first-rate gardeners, it would soon be produced. But the taste of our nobility does not, in general, take this turn, otherwise many of them would display a very different style of scenery around their mansions.

Britain has produced more original authors on gardening than any other country. It may be sufficient here to mention, in the horticultural department, Justice, Miller, and Abercrombie. In ornamental gardening, Parkinson and Madocks; in planting, Evelyn and Nicol; and in landscape gardening, G. Mason and Whateley.

Sect. IX. *Of the present State of Gardening in Ultra-European Countries.*

149. With the exception of China, the gardens of every other country in Asia, Africa, and America, may be comprised under two heads. The aboriginal gardens displaying little design or culture, excepting in the gardens of rulers or chiefs; and the gardens of European settlers displaying something of the design and culture of their respective countries. Thus the gardening of the interior of Asia, like the manners of the inhabitants, is the same, or nearly the same now that it was 3000 years ago; that of North America is British, and that of almost all the commercial cities in the world, excepting those of China, is European, and generally either Dutch, French, or English. We shall notice slightly, 1. The aboriginal gardening of modern Persia and India. 2d. Of China. 3d. The state of gardening in North America. And 4th. In the British colonies and other settlements abroad.

Subsect. 1. *Persian and Indian Gardens of modern Times.*

150. The coincidence of the outlines of a Jewish garden, nearly 3000 years ago with

the gardens formed in the same countries at the present day, is most remarkable. Maundrel in the 14th century, Russel in the 17th, Chardin in the 18th, and Morier in the 19th centuries, enumerate the same trees and plants mentioned by Moses, Diodorus, and Herodotus, without any additions. Maundrel describes the garden of the Emir Facardine, at Beroot, as a large quadrangular spot of ground divided into sixteen lesser squares, four in a row, with walks between them, and planted with citron trees. Each of the lesser squares was bordered with stone, and in the stone-work were troughs very artificially contrived for conveying the water all over the garden, there being little outlets cut at every tree, for the stream as it passed by to flow out and water it. On the east side were two terrace walks rising one above the other, each having an ascent to it of twelve steps. At the north end they led into booths and summer-houses, and other apartments very delightful. *Travels from Aleppo to Jerusalem*, p. 40.

151. Egmont and Heyman describe the gardens of Damascus as perfect paradises, being watered with copious streams from Lebanon; and in the *Account of the Ruins of Balbeck*, the streams are said to be derived from *Lebanus and Anti-Lebanus*, and the shades of the palms and elms are described as exquisite in that burning climate. The time of the singing of birds is mentioned in Solomon's Song as a season of great pleasure, and then as now, they no doubt constituted a material article in fine gardens. Russel observes, that "in Syria there are abundance of nightingales, which not only afford much pleasure by their songs in the gardens, but are also kept tame in the houses, and let out at a small rate to divert such as choose it in the spring, so that no entertainments are made in this season without a concert of these birds." *Natural Hist. of Aleppo*, p. 71. Syria is mentioned by Pliny and other Roman authors as being famous for gardens.

152. "The gardens of the Persians" observes Sir John Chardin, in 1732, "consist commonly of a grand alley or straight avenue in the centre planted with planes, (the sinzar, or chenar of the east,) which divides the garden into two parts. There is a basin of water in the middle, proportionate to the garden, and two other lesser ones on the two sides. The space between them is sown with a mixture of flowers in natural confusion, and planted with fruit trees and roses, and this is the whole of the plan and execution. They know nothing of parterres and cabinets of verdure, labyrinths, terraces, and such other ornaments of our gardens. The reason of which is, that the Persians do not walk in their gardens as we do, but content themselves with having the view of them, and breathing the fresh air. For this purpose they seat themselves in some part of the garden as soon as they come into it, and remain there till they go out." According to the same author, the most eastern part of Persia, Hyrcania, is one entire and continued parterre from September to the end of April. "All the country is covered with flowers, and this is also the best season for fruits, since in the other months they cannot support the heat and unhealthy state of the air. Towards Media and the northern frontiers of Arabia, the fields produce of themselves tulips, anemonies, single ranunculuses of the most beautiful red, and crown imperials. In other places, as around Ispahan, jonquils are wild and flower all the winter. In the season of narcissus, seven or eight sorts spring up among lilies, (*Lilium*,) lily of the valley, violets of all colours, gilly-flowers, and jessamines, all of an odour and beauty far surpassing those of Europe. But nothing can be more beautiful than the peach trees, so completely covered with flowers as to obstruct the view through their branches." Morier mentions the garden of Azar Gerib in Ispahan, as extending a mile in length, and being formed on a declivity divided into twelve terraces, supported by walls, each terrace divided into a great number of squares. This garden is devoted to the culture of the most esteemed Persian fruits.

153. The gardens of Kerim Khan are thus described by Morier "an immense wall of the neatest construction, encloses a square tract of land, which is laid out into walks, shaded by cypress and *chenar*, (*Platanus*,) and watered by a variety of marble canals, and small artificial cascades. Over the entrance, which is a lofty and arched passage, is built a pleasure house. In the centre of the garden is another of the principal pleasure houses. There is a basin in the middle of the principal room, where a fountain plays and refreshes the air, &c. The whole soil of this garden is artificial, having been excavated from the area below, and raised into a high terrace. The garden is now falling into decay; but those who saw it in the reign of Kerim Khan delight to describe its splendor, and do not cease to give the most ravishing pictures of the beauty of all the environs of his capital." *Journey to Persia*, 1812, p. 106. See also *Johnson's Journey from India*, 1817, chap. v.

154. The gardens of the chiefs of India, now or lately existing, are of the same general character as those of Persia. "In the gardens belonging to the Mahomedan princes, which in some parts of India were made at a very great expense, a separate piece of ground was usually allotted for each kind of plant, the whole being divided into square plots, separated by walks. Thus one plot was filled with rose-trees,

another with pomegranates, &c. The gardens of this sort, most celebrated in India, were those of Bengalore and Delhi. The former, belonging to Tippoo, were made by him and his father, Hyder Ali. As Bengalore is very much elevated above the sea, it enjoys a temperate climate; and in the royal gardens there were seen not only the trees of the country, but also the cypress, vine, apple, pear, and peach; both the latter produced fruit. Strawberries were likewise raised, and oaks and pine-trees, brought from the Cape of Good-Hope, flourished.

The gardens of Kalimar near Delhi, which were made in the beginning of the seventeenth century by the Emperor Shaw Jehan, are said to have cost 1,000,000*l.* sterling, and were about a mile in circumference. They were surrounded by a high brick wall; but the whole are now in ruins." *Edin. Encyc.* art. *India*, p. 87.

155. Some account of the royal gardens of Shaw Leemar, near Lahore, a city of Hindostan, is given in the "Journal of the Royal Institution" for July, 1820. "They differ," says the writer, "from the indigenous royal gardens generally found in India, in belonging to the class of hanging-gardens." Their length is about 500 yards, and their breadth about 140. They consist of three terraces watered by a stream brought upwards of sixty miles, and irrigating the country through which it passes. The only thing worthy of notice is the use of this water in cascades for cooling the air. There are large trees, including the apple, pear, and mangoe, a border and island of flowers, among which the narcissus was in abundance. Captain Benj. Blake, who describes these gardens, in making excursions in the neighbourhood, "stumbled, as it were, upon a most magnificent mausoleum, round which was a walled garden of orange and pomegranate trees."

156. The gardens of the island of Japan partake of the same general character as those of Persia and Hindostan. According to Kæmpfer, they display little of taste in design, but are full of the finest flowers and fruits. "Such," he says, "is the beauty of the flowers which ornament the hills, the fields, and the forests, that the country may even dispute the preference, in this point with Persia. They transplant the most beautiful of their wild flowers into the gardens, where they improve them by culture. Colors are the grand beauties desired both in plants and trees. Chestnut-trees, lemons, oranges, citrons and peaches, apricots and plums, abound. The sloe, or wild plum, is cultivated on account of its flowers, which by culture acquire the size of a double rose, and are so abundant that they cover the whole tree with a snowy surface speckled with blood. These trees are the finest of their ornaments, they are planted in preference around their temples: and they are also cultivated in pots or boxes for private houses, as oranges are in Europe. They plant the summits of the mountains, and both sides of the public roads, with long rows of fir-trees and cypress, which are common in the country. They even ornament sandy places and deserts by plantations; and there exists a law in this island, that no one can cut down a tree without permission of the magistrate of the place, and even when he obtains permission, must replace it immediately by another."

157. The gardens of the different African seaports on the Mediterranean, such as Tangier, Algier, Tunis, Tripoli, &c. have the same general character as those of Persia; but inferior in proportion to the degraded state of society in these comparatively barbarous countries. The author of a "Ten Years residence in Tripoli," confirms the remarks of Chardin and Kæmpfer, as to the carelessness with which art lends her aid to nature. "In their gardens the Moors form no walks; only an irregular path is left, which you trace by the side of white marble channels for irrigation. Their form is generally square, and they are enclosed by a wall, within which is planted a corresponding line of palm-trees. The whole is a mixture of beauty and desolation." *Narrative, &c.* p. 52.

158. With respect to the aboriginal horticulture of these countries, it consists chiefly in the culture of the native fruits, the variety of which is greater than that indigenous to any other country. The peach, the mango, all the palm tribe, and in short, every fruit-tree cultivated in Persia and India by the natives, is raised from seed, the art of grafting or laying being unknown.

Water is the grand desideratum of every description of culture in this country. Without it nothing can be done either in agriculture or gardening. It is brought from immense distances at great expense, and by very curious contrivances. One mode practised in Persia, consists in forming subterraneous channels at a considerable depth from the surface, with supply-wells at certain distances; which wells are known only to those who are acquainted with the country. The conduits are described by Polybius, a Greek author, who wrote in the second century before Christ, and Morier (*Journey to Persia*) found the description perfectly applicable in 1814. Doves'-dung is in great request in Persia and Syria, for the culture of melons. Large pigeon-houses are built in many places, expressly to collect it. The melon is now, as it was 2500 years ago, one of the necessary articles of human food, and when the Prophet Isaiah meant to convey an idea of the miseries of a famine, he foretold that a cup of doves-dung would be sold for a shekel of silver. The whole province of Syria was formerly famous for its horticultural productions, of which the bunch of grapes brought to Moses by his spies (*Numb.* xiii. 23.) is a proof; but it has been in a constant state of neglect since it came into the hands of the Turks, "who of all nations," as Montesquieu observes, "are the most proper to enjoy large tracts of land with insignificance."

159. Trees and even bushes appear to have been held in superstitious veneration in these countries as early as the time of Moses, of which the story of the burning-bush may be adduced as a proof. There are many other instances mentioned in the Jewish writings, of attachment to trees, and especially to the oak. Morier, Johnson, and Sir William Ousley, (*Embassy, &c.* vol. i.) describe the Persians as often worshipping under old trees in preference to their religious buildings. The *chenar* is greatly preferred. On these trees the devotees sacrifice their old cloaths by hanging them to their branches, and the trunks of favorite trees are commonly found studded with rusty nails and tatters. *Sir William Ousley, App.* 1819.

Groves of trees are equally revered in India, and are commonly found near the native temples and burial places of the princes.

The gardening of India as a British colony, will be afterwards considered.

Subsect. 2. *Chinese Gardening.*

160. Future, and perhaps not very distant times, will render Europeans better acquainted with the history of China. The very little which we know of their gardening, refers only to modern times, and has been chiefly communicated by the Jesuits sent there as missionaries about the middle of the seventeenth century. It does not appear perfectly clear to us, that the difference between the gardens of Persia and India, and those of China, is so great as has been very generally asserted and believed. It is evident, that the Chinese study irregularity and imitate nature, in attempting to form rocks; but that this imitation is carried to that extent in wood, water, and ground, and conducted on principles so refined, as those given as Chinese by Sir William Chambers, subsequent travellers do not authorise us to believe. With all this, it must be confessed, there appears some difference between the Chinese style and that of every other people, though to trace the line of demarcation does not appear practicable in the present state of our information on the subject.

One of the earliest accounts of Chinese gardens was given by Pere le Comte, who, as well as Du Halde, had resided in the country as missionaries. "The Chinese," observes Le Comte, (*Lettre* vi.) "appear still more to neglect their gardens than their houses. They would consider it as a want of sense to occupy their grounds only in parterres, in cultivating flowers, and in forming alleys and thickets. The Chinese, who value order so little in their gardens, still consider them as sources of pleasure, and bestow some expense in their formation. They form grottoes, raise little hills, procure pieces of rocks, which they join together with the intention of imitating nature. If they can, besides these things, find enough of water to water their cabbages and legumes, they consider, that as to that material they have nothing more to desire, and content themselves with a well or a pond."

Olof Toreen, a Swede, who visited China early in the eighteenth century, and has published an account of his travels, states, "that in the Chinese gardens are neither seen trees artificially cultivated, nor alleys, nor figured parterres of flowers; but a general confusion of the productions of verdant nature." *Voyage to Osbek, the East Indies and China*, 8vo. 1761.

The first jet d'eau ever seen in China was formed in the imperial gardens by Pere Benoit, who went to Pekin as astronomer. The emperor was transported with it, and instead of astronomer, made the reverend father the fountaineer.

Some account of this garden is to be found in the well-known *Lettres Edifiantes et Curieuses*, &c. in a letter dated Pekin, 1743, giving an account of the emperor's gardens there. It was translated by Spence, under the fictitious title of Sir Harry Beaumont, whom Lord Walpole describes as having "both taste and zeal for the present style;" and was published in Dodsley's collection in 1761. The chief features in the emperor's gardens were buildings, mock towns, villages, artificial hills, valleys, lakes, and canals; serpentine bridges, covered by colonnades and resting places, with a farm and fields, where his imperial majesty is accustomed to patronise rural industry, by putting his hand to the plough, or, as it has been otherwise expressed, "by playing at agriculture once a-year."

Views of these gardens, taken by native artists for the Chinese missionaries, were sent to Paris about the middle of the eighteenth century, and engravings from them were published by permission of the court in 1788, in a work entitled *Recueils des Plans des Jardins Anglois-Chinois.* We have examined these with the utmost care, but confess we can see nothing but a mass of buildings in bad perspective, generally forming squares or courts, backed by peaked hills, and interspersed with pieces of water, sometimes evidently artificial, and at other times seemingly natural.

But these were only the gardens of the court made as an extraordinary exertion by the emperor. The national taste in gardening must have had something characteristic in it, even to general observers; and these characteristics seem to have been made known in Europe from the verbal accounts of Chinese merchants, or travellers, in the beginning of the seventeenth century. A proof of this is to be found in Sir William Temple's Essay, written about the middle of the seventeenth century. He informs us, that though he recommends regularity in gardens, yet, for any thing he knows, there may be more beauty in such as are wholly irregular. "Something of this sort," he says, "I have seen in some places, but heard more of it from others, who have lived much among the Chinese." Referring to their studied irregularity, he adds, "When they find this sort of beauty in perfection, so as to hit the eye, they say it is *sharawadgi*, an expression signifying fine or admirable." It appears from this passage, that the Chinese style had not only been known, but imitated in England nearly a century previously to the publication of the "Jesuits' Letters," and, at least, sixty years before Kent's time. Sir William Temple retired to East Sheen in 1680, and died in the year 1700.

To the French accounts of the Chinese style, which, it is generally allowed, are nearest the truth, succeeded that of Sir William Chambers. This author, afterwards surveyor-general, resided some time at Canton, and after returning to England, gave a detailed account of Chinese gardening; first in the appendix to his *Designs of Chinese Buildings, &c.* in 1757, and subsequently at greater length in his *Dissertation on Oriental Gardening*, in 1772, and commended, as G. Mason observes, by so good a judge as Gray.

This author avows that his information is not derived entirely from personal examination, but chiefly from the conversation of a celebrated Chinese painter; and it has been very reasonably conjectured, that he has drawn, in some cases, on his own imagination, in order to enhance the reader's opinion of Chinese taste, with the laudable end of improving that of his own country. In his essay of 1757, which was published in French as well as English, and was soon translated, as Hirschfield informs us, into German, he says, "the Chinese taste in laying out gardens is good, and what we have for some time past been aiming at in England." With the exception of their formal and continual display of garden buildings, and their attempts of raising characters, not only picturesque and pleasing, but also of horror, surprise, and enchantment, Sir William's directions, especially in his second work, will apply to the most improved conceptions of planting and forming pieces of water for the modern style; or, in other words, for creating scenery such as will always resemble, and often might be mistaken for that of nature.

By perusing the work of Sir William Chambers, some idea may be formed as to the probability of its having given rise to the English manner, and how far the two varieties of gardening still agree. Whatever may be the merits of the Chinese in this art, it may reasonably be conjectured, that their taste for picturesque beauty is not so exactly conformable to European ideas on that subject as Sir William would lead us to believe. These decorative scenes are carried to such an extreme, so encumbered with deceptions, and what we would not hesitate to consider puerilities; and there appears throughout so little reference to utility, that the more mature and chastened taste of Europeans cannot sympathise with them. Chinese taste is, indeed, altogether peculiar; it is undoubtedly perfectly natural to that people, and therefore not to be subjected to European criticism.

"The Chinese gardens," observes Lord Walpole, "are as whimsically irregular as European gardens were formerly uniform and unvaried; nature in them is as much avoided as in those of our ancestors." In allusion to those of the emperor's palace, described in the *Lettres Edifiantes*, as of vast extent, and which contained 200 palaces, all painted and varnished, he says, "this pretty gaudy scene is the work of caprice and whim; and, when we reflect on their buildings, presents no image but that of unsubstantial tawdriness." At the same time, they do not seem to be altogether devoid of picturesque and even wild scenes; for Lord Macartney mentions that the view from one of the imperial gardens might be compared to that from the terrace at Lowther Castle, which is altogether wild and romantic, and bounded by high uncultivated mountains, with no other buildings than one or two native cottages. In what degree of estimation such a view is there held does not, however, appear; it would be too much to conclude that, because it existed in that situation, it had been created or left on purpose, or was considered as eminently beautiful or desirable. "It is our excellence," observes his lordship, "to improve nature; that of a Chinese gardener to conquer her; his aim is to change every thing from what he found it. A waste he adorns with trees; a desert he waters with a river or a lake; and on a smooth flat are raised hills, hollowed out valleys, and placed all sorts of buildings."

The gardens of Woo-yuen are thus described by Ellis in his *Journal of the late Embassy to China*, 1818: "We stopped opposite the gardens of Woo-yuen, which, after a little hesitation on the part of the mandarins, we were allowed to visit. Although now much neglected, they were interesting as a specimen of Chinese gardening. The Chinese are certainly good imitators of nature, and their piles of rocks are not liable to the same ridicule as some modern Gothic ruins in England; indeed they are works of art on so great a scale, that they may well bear a rivalship with the original: the buildings are spread over the ground without any attention to effect being produced by their exterior, unconnected with the scenery; the object seems to be to furnish pretexts for excursions within the enclosure, which is so disposed as to appear more extensive than it really is. Much labour has been expended upon the walks, which, in places, resemble Mosaic work. These gardens were a favorite resort of Kien-long, whose dining-room and study were shown to us; in the latter was a black marble slab, with a poem inscribed upon it, composed by his majesty, in praise of the garden. The characters were particularly well executed. The trees in the garden were chiefly the olea-fragrans and some planes." Vol. i. p. 433.

"The villa of Puanke-qua, belonging to one of the principal hong merchants of Canton, is interesting as a specimen of Chinese taste in laying out grounds; the great object is to produce as much variety as possible within a small space." Vol. ii. p. 186.

The Fatee gardens at Canton, belonging to rich individuals, and the resort of the fashionables, "consist of straight walks, lined with flower pots, containing the curious and beautiful plants of the country." Vol. ii. p. 186.

It is easy to discover something of preconceived notions both in the relations of Pere le Comte and Ellis, neither of whom appear to have been at all conversant with the subject. Sir William Chambers's relation is avowedly on hearsay, and universally allowed to be more imaginary than real. Lord Macartney, Sir George Staunton, and Barrow, agree on the whole with Le Comte; but to have a correct idea of Chinese gardening as an art of design, at least as it appears to us, they must be examined by some person who has made that branch his particular study.

161. Horticulture is generally considered to be in an advanced state in China, but we have no evidence that the Chinese are acquainted with its scientific principles, and especially with the physiology of plants. The climate and soil of so immense a tract as China, is necessarily various, and equally so, in consequence, the vegetable productions. Besides the fruits peculiar to the country, many of which are unknown to the rest of the world, it produces the greater part of those of Europe; but, excepting the grapes and pomegranates, they are much inferior. The orange was introduced to Europe from China by the Portuguese, in the sixteenth century.

The Chinese are supposed to have a number of culinary vegetables peculiar to themselves. They are said to cultivate edible plants, even in the beds of their rivers and lakes, and among others, the pitsi or water chestnut, (*Scirpus tuberosus*, Rox.) which yields tubers of a farinaceous quality and agreeable taste.

Le Comte, Du Halde, Eckeberg, and others, praise the manner in which the Chinese cultivate culinary vegetables, which, they say, are abundant in their gardens, and form the chief part of the nourishment of the lower orders. They add, however, that the greater part of their fruits do not equal ours; either because the Chinese are ignorant of the art of improving them, or because they do not give themselves the trouble. Their grand object is to cultivate corn and rice; and they are, according to these authors, ignorant of botany. One of the authors of these remarks, Captain Eckeberg, has published, in the transactions of the academy of sciences of Stockholm, a treatise on the rural economy of this people; and Count Lasteyrie has collected what is known on the same subject. The British works, published after different embassies, contain accounts of their modes of propagation, by inarching and local radication; of their dwarfing forest-trees, producing double-flowers, monstrous unions, and various other exertions, in the way of conquering nature. It is a singular fact, that with all this practical skill, the Chinese do not appear to be acquainted with the art of ingrafting, otherwise than by approach, nor with inoculation.

162. Judging from the number of beautiful plants and shrubs which have been imported from China since the first British embassy in 1793, and from the rich collections of drawings in the Banksian and other libraries, we should conclude that the culture of flowers and plants of ornament was in considerable reputation in China. The beautiful varieties of camelia azalea, rosa, and of various other genera, are well known natives of that country. In the *Hortus Kewensis* will be found the names and dates of the introduction of a number of other species of great beauty.

China, in a political view, is an empire of mere "bulk without spirit vast," and its sublime emperor, Kea-king, the torch of the east, and true descendant of Tay-tsoy with his army of two millions of men, would fall prostrate before a handful of European troops. Something of this sort may probably take place ere long, as will, we have no doubt, the establishment of a regular overland route to India. This route, if China were open, might be extended to the Yellow Sea or the Corea, and an Englishman might then make the tour of Asia with more ease than the tour of Europe was made half a century ago. The treasures this would add to our botany and gardening, (not to mention the commercial advantages,) and the stimulus it would give to the civilization of the eastern world, are worthy of contemplation.

Subsect. 3. *Gardening in North America.*

163. It is easy to conceive, that the use of gardens in this country must be very general; and equally so, that they must be chiefly confined to horticultural, or useful productions.

B. M'Mahon, in his *American Kalendar*, says, "America has not yet made that rapid progress in gardening, ornamental planting, and fanciful rural designs, which might naturally be expected from an intelligent, happy, and independent people, possessed so universally of landed property, unoppressed by taxation or tithes, and blest with consequent comfort and affluence." Preface.

From the few American publications which have appeared on gardening, and from the transactions of their societies, we submit what we have been able to glean, as to the state of horticulture, botanic gardening, and timber-trees.

Horticulture.—William Coxe of Burlington in New Jersey, in his *View of the Cultivation of Fruit-trees*, (Philad. 1817) is of opinion, "that the numerous varieties of American apples have proceeded from seeds brought there by their European ancestors; and that none of the Indian orchards which have been discovered in America, are more ancient than the first settlement of the Europeans on this continent."

The middle states of America, he says, "possess a climate eminently favorable to the production of the finer liquor and table-apples; and the limits of that district of country which produces apples of the due degree of richness and flavor for both purposes are the Mohawk river in New York, and the James river in Virginia. Apples grow well in other places, but that exquisite flavor for which the Newton pippin, and Esopus Spitzenberg are so much admired, and which has given such high reputation to the cyder from the Hewes's crab, the white crab, the grey-house, winesap, and Harrison, can only be found within the limits here described. Cold and heat, are equally necessary to the production of a fine apple, and neither must predominate in too great a degree. Some European cyder fruits have recovered their reputation by being transplanted to the more genial climate of America, where the growth of trees compared with Europe is as five to three."

The peach is a native of South America; in North America, Coxe says, it is subject to a malady, which no remedy can cure nor cultivation avert. This is a worm which destroys the roots and trunk of the tree. The only palliative is fresh soil. Preface, p. 11.

Plums and cherries are natives of the United States, and wood-cuts are given in Coxe's work of the principal sorts of thesefruits commonly cultivated, and which are chiefly those well known in Britain.

"The vine," Dr. Dean observes, (*New England Georgical Dictionary, in loco* Massachusetts, 1797,) "may, without doubt, be cultivated in every latitude of the North American states. They are wild in the neighbourhood of Boston." He has known a good wine made from the juice of wild purple grapes; and seen excellent eating grapes produced in the American gardens, without any extraordinary culture.

The melon grows to a large size in the southern states, and ripens even in New England in the common way of planting, but are not so large nor so early.

"The vine," Kingdom says, (*America*, 1820,) "flourishes in the Ohio state; and vegetables grow in the same perfection as in England, excepting the cauliflower and some species of beans. Water-melons, musk-melons, squashes, sweet potatoes, cucumbers, &c. arrive at great perfection. These fruits are excellent and abundant, particularly peaches and apples." Page 12.

"Those who wish to grow sugar must go south of 29½°, cotton, south of 36°; and for corn the best is from 36° to 41°. The first work after a settlement is to plant a peach and apple orchard, placing the trees alternately. The peach, being short-lived, is soon removed, and its place covered by the branches of the apple-trees." P. 5.

The seeds of pumpkins are scattered in the field, when planting the corn, and no further trouble is necessary than throwing them into the waggon when ripe. They weigh from thirty to forty pounds each; and cattle and hogs are fond of them.

In Maryland, Virginia, and the neighbouring provinces of the United States, peaches are propagated invariably from the stone. The fruit is used for feeding hogs, and distilled for brandy. In Virginia the prickly pear abounds in the woods, and is reckoned a cooling, grateful fruit. *Braddick in Hort. Trans.* v. ii.

164. " In Lower Canada the fruit is neither remarkable for goodness nor cheapness, except strawberries and raspberries, which are very abundant. Apples and pears are sent from Montreal to Quebec, and sell for about the same price as in England. Oranges and lemons are imported from England, and are sometimes very scarce. Gooseberries, plums, and melons are plentiful; but currants, cherries, walnuts, and filberts scarce." P. 97.

" Upper Canada is very fertile. At Montreal are extensive orchards. Here the sugar-maple is abundant, and pierced for sugar when the sap begins to rise. A tree twenty inches in diameter will yield five pounds of sugar annually, sometimes for thirty years. Pot and pearl-ashes are made from the felled trees. Beech yields at the rate of 219lbs. for 1000lbs. of ashes, and most other trees less. Sun-flowers are abundant, but oil is not extracted from them as in the United States." P. 92.

A great variety of fruit-trees may be had at the nursery-gardens at Montreal. The apples from thence are considered superior to any other. The peach-trees are introduced into the orchards from York to Amherstburgh. Cherries, walnuts, chestnuts, hickery, hasel, and filbert-nuts grow wild; as do gooseberries, strawberries, blueberries, cranberries, and black currants.

M'Mahon, already mentioned, is a seedsman in Philadelphia, and " has connected with the seed-trade a botanical, agricultural, and horticultural book-store." His work is the first of the kind which has appeared in America, and includes every department to be found in our calendars. Ample instructions are given for growing the pine, vine, melon, and other delicate fruits, and also for the forcing departments both of the flower and kitchen-gardens; but we cannot gather from the work any thing as to the extent of American practice in these particulars.

165. *Botanic Gardening.*—America is rich in botany, especially in trees. Dr. Hosack, in the preface to his *Hortus Elginensis*, observes, " that, although much has been done by the governments of Great Britain, France, Spain, Sweden, and Germany in the investigation of the vegetable productions of America: although much has been accomplished by the labours of Cælesty Kalm, Wangenheim, Schoepf, Walter, and the Michaux; and by our countrymen, Clayton, the Bartrams, Calden, Muhlenburg, Marshal, Cutler, and the learned P. Burton of Pennsylvania, much yet remains to be done in this western part of the globe."

There were in America, at an early period, men who recommended the necessity of instituting botanic gardens, as Lieutenant-Governor Calden and Dr. Middleton of New York, in 1769; and, upon the revival of the medical school in Columbia college in 1792, a professor of botany was appointed, and Dr. Mitchel was appointed professor. Dr. Hosack succeeded Dr. Mitchel, and the result was, first, the latter professor's establishing a botanical garden at his own expense, and afterwards government purchasing it of him for the benefit of the medical schools of New York.

This garden contains twenty acres; the first catalogue was published in 1806, and the second, in 1811, containing nearly 4000 species. *Statement, &c. as to the Elgin Botanical Garden, by Dr. Hosack, New York,* 1811.

The first American Flora appeared in 1816, by F. Pursh, a German botanist, who spent nearly twelve years beyond the Atlantic in botanic travel, and in the management of two botanic gardens, the last that of Elgin. From the preface to this work we are enabled to give the names of the principal botanic gardens in the United States. In British America there are none. The first gardens Pursh saw were " the old established gardens of M. Marshall, author of a small treatise on the forest-trees of North America. These were rather on the decline. The botanic garden of J. and W. Bartram on the banks of the Delaware, near Philadelphia, was founded by their father under the patronage of Dr. Fothergill. W. Bertram is author of travels in North and South Carolina, and of an introduction to Botany. The garden of W. Hamilton, Esq. of Woodlands, is one of the best in America; that of Elgin has been already mentioned.

166. *Forest-Trees.*—Michaux's work on the trees of America is the fruit of two voyages in 1802 and 1806. The number of trees which in America grow above thirty feet high, which he has seen and describes, is one hundred and thirty-seven, of which eighty-five are employed in the arts. In France there are only thirty-seven which rise to that height, of which eighteen serve to form timber-plantations, and of these seven only are employed in civil and marine constructions.

Michaux acknowledges his obligations to W. Hamilton, " an enlightened amateur of the sciences and arts," who pleases himself in uniting at his magnificent residence at Woodlands, near Philadelphia, not only all the useful vegetables of the United States, but those of every country of the world, which may offer any interest in the arts or in medicine." Introduction 10.

From the transactions of the Society of Agriculture of New York, we learn, that hawthorn-hedges and other live fences are generally adopted in the cultivated districts; but the time is not yet arrived for forming timber-plantations.

Such is the scanty information which we have been able to glean of the state of gardening in this rising country; destined at, perhaps no distant period, to excel all others in this, and in every other art.

167. *Mexico.*—Agriculture, the Abbé Clavigero mentions, was, from time immemorial, exercised by the Mexicans; but when they were brought into subjection to the Calhuan and Tepanecan nations, and confined to the miserable little islands on the lake, they ceased for some years to cultivate the land, because they had none, until necessity and industry together taught them to form moveable fields and gardens, which floated on the waters of the lake. The mode of forming these of wicker-work, water-plants, and mud, may be easily conceived. The boat or basis is commonly eight perches long by three broad. They first cultivated the maize and useful plants only, but afterwards "there were among them gardens of flowers and odoriferous plants, which were employed in the worship of the gods, and served for the recreation of the nobles." At present they cultivate flowers, and every sort of garden-herbs upon them, all of which thrive surprisingly.

In the largest gardens there is commonly a little tree, and even a little hut to shelter the cultivator, and defend him from rain or the sun. When the owner of a garden wishes to change his situation, to remove from a disagreeable neighbour, or come nearer to his own family, he gets into his little vessel, and by his own strength alone, if the garden is small, or with aid, if it is large, he tows it after him, and conducts it where he pleases with the little tree and hut on it. That part of the lake where the gardens are, is a place of infinite recreation, where the senses receive the highest possible gratification.

As soon as the Mexicans had shaken off the Tepanecan yoke, and had gained by their conquests lands fit for cultivation, they applied themselves with great diligence to agriculture. They were also extremely well skilled in the cultivation of kitchen and other gardens, in which they planted with great regularity and taste, fruit-trees, and medicinal plants and flowers. The last of these were much in demand, bunches of flowers being presented to persons of rank, kings, lords, and ambassadors, and also used in temples and private oratories. Amongst the ancient gardens, of which an account has been handed down to us, the royal gardens of Mexico and Tezeuco, and those of the lords of Iztapalapan and Huantepec, have been much celebrated. One, belonging to the lord of Iztapalapan was laid out in four squares and planted with great variety of trees, through which a number of roads and paths led, some formed by fruit-bearing trees, and others by espaliers of flowering shrubs and aromatic plants. It was watered by canals, and had in the centre a fish-pond four hundred yards in diameter, where innumerable water-fowl resorted. Hernandez says, this garden contained many foreign trees.

The garden of Huaxtepec was six miles in circumference, watered by a river, planted with numerous species of trees and plants beautifully disposed, along with pleasure-houses. Many foreign plants were cultivated, and every kind of medicinal plant belonging to that clime, for the use of the hospital which they founded there. Cortez, in a letter to Charles V. in 1522, told him that this garden was the most extensive, the most beautiful, and most delightful which had ever been beheld. Bernard Dias and other authors concur in the same opinion. The Mexicans paid great attention to the preservation of woods, which supplied them with timber and fuel. *History of Mexico*, i. 379.

Humboldt (*Voyage*, &c. *livre* iii. *chap.* 8.) in 1803, considered the city of Mexico as one of the finest he had ever seen. He mentions a picturesque convent in its neighbourhood, with an immense garden of orange-trees, peaches, apples, cherries, and other fruit-trees of Europe. The botanic garden in the promenade (*cours*) of the vice-king's palace, is small, but extremely rich in vegetables, rare or interesting for industry and commerce.

The chinampas, or what Europeans call floating-gardens, he says still exist. They are of two sorts; the one mobile and blown here and there by the winds, and the others fixed and united to the shore. The former alone merit the appellation of floating, and they are diminishing day by day. He assigns to them the same origin as the Abbé Clavigero; but thinks it probable that nature also may have suggested the first idea, and gives instances of small pieces of surface netted with roots and covered with plants being detached from the marshy shores of other American lakes, and floating about in the water. The bean, pea, apple, artichoke, cauliflowers, and a great variety of other culinary plants are cultivated on them. In the ninth chapter of Humboldt's work will be found an ample account of the useful plants of Mexico. It is singular, that the potato, which one would have imagined should have been introduced from the southern continent to Mexico, should have been first carried there by the Spaniards. It is not, Humboldt says, a native of Peru, nor to be found between latitude 12° and 50°. In Chili it has been cultivated for a long series of ages, where there is a wild sort with bitter roots.

Subsect. 4. *Gardening in the British Colonies, and in other Foreign Settlements of European Nations.*

168. It cannot be expected that our art should be displayed to much advantage in distant, and sometimes precarious territorial appendages, where the object is most frequently either to acquire the means of returning to garden at home, or to ensure a retreat from taxes, and other evils attendant on old countries, not yet renovated by revolutions.

It is evident, that wherever a people establish themselves, they will also establish in part their arts or manners. All colonists carry with them the seeds of the useful vegetables, which they have been accustomed to cultivate; and subsequently they attempt to introduce the more delicate or luxurious fruits and flowers. The European governments have also established botanic gardens whenever their utility has been made apparent; and in this as well as in the ornamental part of gardening, it is but fair to state that the French and Dutch have been before England in point of time, as well as in point of excellence. The Dutch had a fine government garden at the Cape of Good-Hope, and another at Batavia in the middle of the 17th century. The French had a garden in Cayenne, in 1630. The first colonial botanic garden established by the English, was that of Jamaica, about 1780.

It must also be confessed, that our botanic gardens have hitherto been less useful to horticulture than the government or residence gardens, and the botanical gardens of the Dutch; because in these last useful plants are the principal objects; whereas in ours, number of species is, or seems to be most attended to. Horticulture in civilised countries may be deemed sufficiently protected and encouraged by its own immediate contributions to the wants and desires of mankind; but in barbarous countries every art requires protection at the first establishment of a colony. Perhaps there is no way in which man in a civilised state can promote the progress of rude society more, than by introducing new and useful fruits and herbs. The numerous vegetables now used in the domestic economy of civilised society have been collected from various and opposite parts of the globe. Where would be the enjoyments of an European table, if they depended on our native herbs and fruits? Europe in this respect is under great obligations to Persia and Egypt; and these countries, and many others of Asia, Africa, and America, are now in their turn receiving much greater benefits from the colonies of Europeans who settle on them.

The Cape of Good-Hope possesses at present all the best culinary productions and fruits of Europe and Asia. Till 1660, that the Dutch established a colony there, it had no other fruits than the chestnut, a nut like the wild almond, and the wild plum, and no culinary plants but a sort of vetch. The first shipment of convicts was landed at Sidney cove in 1789, and since that period, every horticultural product of Britain has been introduced there, and cultivated, with one or two exceptions, in the greatest perfection.

The influence which the introduction of these comforts, together with instruction, must have on uncivilised countries, both as to society and climate, and finally on the whole globe itself, cannot be foreseen. The now tractless deserts of arid sand in Africa, may be destined at some future age to be watered and cultivated by the superfluous population of the other quarters of the world. The evaporation and coolness produced by a surface cultivated chiefly by irrigation, may effect a material change in the climate, and millions of human beings may live and exert their energies where civilised man at present scarcely dares to tread.

Neglecting a number of colonial establishments, of which little is known, or in which little has been done in the way of gardening, we submit only some statements as to the West Indies, East Indies, Ceylon, Cape of Good Hope, New South Wales, Van Diemen's Land, South America, Brazil, Cayenne, and Malta.

169. *West India Islands.* The native products of these islands are various and excellent, and they have been greatly encreased by fruits and spices, introduced from the East Indies and other places. Among these it may be sufficient to mention the pine-apple, bread-fruit, mangosteen, durion, and cinnamon. There is a large botanic garden at St. Vincents, and others at Trinidad and Martinique, supported by their respective governments. There was formerly one of 70 acres in Jamaica, of which some particulars deserve here to be recorded. "The botanic garden of Jamaica was originally begun by J. Hinton, Esq. and afterwards bought by government, and enlarged so as to contain 70 acres. One of the objects of its establishment was to preserve, without artificial means, the productions of various climates. Such a project could only be executed in a tropical latitude, where the various elevations of the ground would regulate the required temperature. The site chosen for this purpose, is about seven miles from Kingston on the side of the Liguanea mountain, the summit of which is 3600 feet above the level of the sea. Here, ascending from the base, are found the productions of the various countries of the earth, every change of situation

represents a change of latitude, and the whole surface of the mountain may be clothed with the appropriate vegetations of every climate from the pole to the equator. By means of this noble and useful establishment, the vegetable productions of various climes have been naturalized to the soil, and the plantations of Jamaica have been enriched, with many valuable trees, shrubs, and plants, which were heretofore unknown in the island; of these may be mentioned cinnamon, mangosteen, mangoes, sago, bread-fruit, star-apple, camphor, gum arabic, sassafras, &c. introduced from a French ship captured in 1782. *Edwards' Jamaica*, 188. In the year 1812, the whole was sold by the House of Assembly, for the small sum of 4000*l.* to an apothecary in Kingston. It is impossible to avoid regretting such a circumstance, and very difficult to avoid expressing other sentiments. Some account of the garden of St. Vincents, will be found in the transactions of the Society of Arts.

Pine apple plants, and also ripe fruits are frequently sent from the West Indies to Europe, and arrive commonly in a fit state for planting and the desert.

170. *East Indies.* Bengal, the province most under British subjection, resembles Egypt, in consisting of one immense plain of fertile soil, watered by the Ganges, which overflows it annually. Calcutta, the capital, has been subject to the English since 1765, but it does not appear that much has yet been done by the East India Company, in the way of gardening.

At Barrackpoor, about sixteen miles from the capital, the unfinished arches of a house begun by the Marquis Wellesley, but discontinued by the frugality of the Court of Directors, still remain. In the park there is a menagerie; and not far distant the botanic garden. This garden, founded in 1790, is beautifully situated on the west bank of the river, and gives to one of its bendings, the name of Garden-reach. Above the garden there is an extensive plantation of teak, a tree not a native of this part of India, but which thrives well here. This garden is under the direction of Dr. Roxburgh, well known as the author of a work on the Plants of Coromandel. Maria Graham, (*Letters from India,*) describes it as rich in palms, mimosas and parasitic plants, and as neatly kept. Seeds from this garden are sent annually to Kew and other European gardens; as well as to various British settlements in the East, as Ceylon, &c.

Some hundreds of plants, Sir William Jones observes, which are yet imperfectly known to European botanists, and with the virtues of which they are wholly unacquainted, grow wild in the plains and in the forests of India.

With respect to horticulture, the orchard is what chiefly contributes to attach the peasant of Bengal to his native soil. He feels a superstitious veneration for the trees planted by his ancestors, and derives comfort and profit from their fruit. Orchards of mango trees diversify every part of this immense country; the palmira abounds in Bahar. The cocoa-nut thrives in those parts which are not remote from the tropic. The date-tree grows every where, but especially in Bahar. Plantations of areca are common in the central parts of the country. Potatoes have been introduced, and apparently with the most beneficial effect, as the produce is deemed equal in quality to that of the same plant in England. Asparagus, cauliflower, and other esculent plants, are raised, but they are comparatively tasteless.

The tables of the gentlemen in Calcutta are distinguished by a vast profusion of most beautiful fruits, procured at a very moderate expense, such as pine-apples, plantains, mangoes, pomeloes or shadocks, melons of all sorts, oranges, custard-apples, guavas, peaches, and an endless variety of other orchard fruits.

Forest trees do not naturally abound in Bengal; the teak-tree (*Tectona grandis*) is the oak of the East, and grows in abundance in the hilly kingdoms of Birman and Begum, whence Calcutta is supplied for the purposes of naval architecture. Whether it shall be found worth while to cultivate this tree in Bengal, appears very doubtful, The bamboo is the timber used in the general œconomy of the country. Hedges of native armed plants are occasionally used round gardens, orchards, and small enclosures.

171. *Ceylon.* All the productions of Hindostan are said to thrive here. General Macdowall, with the assistance of Dr. Roxburgh, of Calcutta, made a valuable collection of exotics which he left at Columbo in 1804. He introduced peaches, grafted and trained on espaliers, which bore at three years old. Gardeners, in hot climates, Cordiner observes, (*Account of Ceylon,* vol. ii. p. 387.) are much perplexed by the trees which are deciduous in Europe, retaining their leaves all the year. It is said, the regular fall of the leaf may be obtained by boring a hole in the trunk, pouring in some quicksilver, and allowing the bark to close over it. Apples and asparagus succeeded well in this climate.

The country is rich in botany, and abounds in palm-trees, and plantains. Cordiner describes the cinnamon groves as delightful. " Nothing can exceed the luxury of riding through them in the cool hours of the morning, when the air is cool and the sweetness of the spring blended with the glow of summer. Every plant in the garden is at all times clothed with a fresh and lively green, and when the cinnamon laurels put forth their flame-colored leaves and delicate blossoms, the scenery is exquisitely beautiful. The fragrance, however, is not so powerful as strangers are apt to imagine. The cinnamon bark affords no scent when the trees are growing in tranquillity, and it is only in a few places that the air is perfumed with the delicious odour of other shrubs, the greater proportion of the flowers and blossoms of India, being entirely destitute of that quality.

Gentle undulations in the ground, and clumps of majestic trees, add to the picturesque appearance of the scene; and a person cannot move twenty yards into a grove without meeting a hundred species of beautiful plants and flowers springing up spontaneously. Several roads for carriages make winding circuits in the woods; and numerous intersecting foot-paths penetrate the deepest thickets. In sauntering amidst these groves, a botanist or a simple lover of nature, may experience the most supreme delight which the vegetable creation is capable of affording. *Cordiner's Ceylon*, vol. ii. p. 421.

172. *Cape of Good Hope.* A very fine garden was formed here by the Dutch about the middle of the seventeenth century, which is described in *Lachman's Travels of the Jesuits*, (vol. i. letter 37.) and thus noticed by Sir William Temple. "It contained nineteen acres, was of an oblong figure, very large extent, and divided into four quarters, by long and cross walks, ranged with all sorts of orange-trees, lemons, limes, and citrons; each of these four quarters is planted with the trees, fruits, flowers, and plants, that are native and proper to each of the four parts of the world; so as in this one inclosure are to be found the several gardens of Europe, Asia, Africa, and America. There could not be, in my mind, a greater thought of a gardener, nor a nobler idea of a garden, nor better suited or chosen for the climate."

Father de Premare says, "it is one of the most beautiful spectacles in the world," and indeed it is not easy for a mere European traveller to conceive the magnificence of palm-trees and plantains in their native climates. Whether this garden still exists, we have not been able to learn, but as it doubtless contributed to introduce the horticultural productions of Europe to this part of the globe, it deserves to be remembered with gratitude to its founders.

The only indigenous fruits at the Cape, as already observed (168) are the chestnut, and two stone fruits. Those that have been introduced into the colony are the vine, apple, cherry, plum, peach, nectarine, apricot, fig, orange, lemon, citron, almond, &c.

In fruit, flowers, and elegant trees and shrubs, no country exceeds the Cape. The apricots, Mandarin and China oranges, peaches, guavas, mulberries, prunes, and grapes of Europe, florish in the greatest perfection; pomegranates, melons, apples, pears, almonds, chestnuts, walnuts, and mulberries, are also plentiful; the apples and pears are rather inferior; but strawberries are found ripe all the year, and a few raspberries of a superior quality. No grapes of Europe are considered preferable to those of this colony.

The colony of Capetown, consists chiefly of vine-growers. They are of French extraction, possess farms of about 120 English acres, and the culture of the grape, with an elegant garden, generally occupies the whole. The lands are surrounded and divided by oak and quince hedges, and the vines, cultivated as in France and Germany, have the appearance of plantations of raspberries. The Cape-market is richly supplied from these gardens.

Between Table Bay and False Bay, are the two farms producing the Constantia wine. Here most of the above fruits thrive, but gooseberries, currants, plums, and cherries, do not succeed at all. The shrubs and heath plants that diversify the hills and dales of this district, and every spot where a root will strike, are also in endless variety. *Kingdom's British Colonies*, p. 181.

173. *New South Wales.* There are two colonies established in this extensive territory and its adjoining islands; the one at Sidney, in 1788, and the other at Van Diemen's Land some years afterwards. The botanical riches of this country, and the singular aspect of the native plants, are well known. There are gardeners and botanists established in and near Sidney, who collect seeds for England, and other parts of Europe; and it is in contemplation to establish a government botanic garden there, which will doubtless be of essential service in collecting and preserving native plants. The climate and soil of both settlements are favorable for horticulture. Potatoes, cabbages, carrots, parsnips, turnips, and every species of vegetable known in England, are produced in this colony. The cauliflower and broccoli, and the pea, arrive to greater perfection than in Europe; but the bean and potatoe degenerate. The climate is too hot for the bean, and the potatoe is only grown to advantage on new lands.

This colony is justly famed for the goodness and variety of its fruits; peaches, apricots, nectarines, oranges, grapes, pears, plums, figs, pomegranates, raspberries, strawberries, and melons of all sorts, attain the highest degree of maturity in the open-air; and even the pine-apple may be produced merely by the aid of the common glass-frame. The climate of Port Jackson, however, is not altogether congenial to the growth of the apple, currant, and gooseberry, although the whole of these fruits are produced there, and the apple in particular in very great abundance; but it is decidedly inferior to the apple of Britain. In Van Diemen's Land these fruits arrive at the greatest perfection; and as the climate of the country to the westward of the Blue Mountains is equally cold, they will, without doubt, attain there an equal degree of excellence. Of all the fruits which are thus enumerated, as being produced in the colony, the peach is the most abundant and the most useful. The different varieties which have been already introduced succeed one another in uninterrupted succession from the middle of November to the latter end of March, thus filling up an interval of more than four months, and affording a wholesome and nutritious article of food during one-third of the year. The tree thrives in all soils and situations, and its growth is so rapid, that if you plant a stone, it will in three years afterwards bear an abundant crop. The fruit is the food of hogs, and when thrown into heaps, and allowed to undergo a proper degree of fermentation, is found to fatten them very rapidly. Cyder is also made from it; and the leys also fatten hogs. *Kingdom's British Colonies*, p. 264.

174. *Van Diemen's Land.* This settlement does not contain either such a variety or abundance of fruit as the parent colony. The greater coldness of the climate sufficiently accounts for the former deficiency, and the recency of its establishment for the latter. The orange, citron, guava, loquat, pomegranate, and many other fruits, which attain the greatest perfection at Port Jackson, cannot be produced here without having recourse to artificial means; while many more, as the peach, nectarine, grape, &c. only arrive at a very inferior degree of maturity. On the other hand, the apple, currant, and gooseberry, and indeed all those fruits for which the climate of the parent colony is too warm, are raised here without difficulty. *Kingdom*, 300.

175. *South America.* Very little has been done for gardening in this country, though it is the only part of the world in which the most useful of all culinary roots, the potato, is indigenous. The present fashionable flower, the Dahlia, is also from the same quarter. But such is the political situation of that part of South America, considered as belonging to Spain, that nothing can be expected from the peaceful arts for some time to come.

176. *Brazil.* The Portuguese colony is somewhat more fortunate. The soil and climate of Rio produces oranges, mangoes, figs, grapes, the guava, pine-apples, &c. cocoa-nuts, jacas, water-melons, nuts of the sapucaya-tree, Brazilian pine, &c. which are offered for sale in the streets at all hours. *Maximilian's Travels in* 1815, 1816, *and* 1817, p. 28.

177. *Cayenne.* The French have a botanic garden, and several fine private gardens in the fertile colony of Cayenne. A very interesting account of this colony, and its productions, natural and artificial, will be found in the *Maison Rustique de Cayenne*, published by Prefontaine in 1763.

178. *Malta.* There is a small botanic garden on this island, supported by the government; and a late governor, Sir A. Balls is said (*Letters from Malta*, 1817.) to have established public gardens at every village for the employment of the poor, and the dissemination of useful seeds and plants among the farmers. No success attended this measure, from mismanagement, as it is said, in the curators. Great part of Malta was originally little better than a bare limestone-rock; but this rock is full of cracks or vertical fissures, which are filled with calcareous soil washed down from the surface. This is dug up by the inhabitants, and re-spread over the surface; and by means of irrigation and careful culture, the cotton plant is grown as an article of general economy. In the more fertile part of the island, the orange tribe are grown, and the Maltese, or red-fleshed orange, being a variety in much esteem, there is some demand for young trees as articles of foreign commerce. These trees are more scientifically trained and inoculated than those of Genoa.

BOOK II.

GARDENING CONSIDERED AS TO ITS PROGRESS AND PRESENT STATE UNDER DIFFERENT POLITICAL AND GEOGRAPHICAL CIRCUMSTANCES.

It is evident that every art must be affected by the government under which it is exercised, either directly by its laws and institutions, or indirectly by the state of society as modified by their influence. Gardening and agriculture differ from other arts in being still more affected by climates than by governments; the influence of the latter is temporary or accidental, while that of the former is absolute and unchangeable.

Chap. I.

Gardening as affected by different Forms of Government and States of Society.

179. All governments may be reduced to two classes; the primitive, or those where the people are governed by the will, or laws of one or a few persons independently of the people; and the rational, or those where they are governed by laws formed by a congregated assemblage of their own body. The former are calculated for rude and ignorant ages, when man, in a state of infancy, is governed by a king, as children are ruled by their parents; the latter, for more enlightened times, when a people, like children arrived at manhood, are capable of thinking for themselves and acting in concert.

Every state of society may be classed under two heads: a fixed state, where property is hereditary, and one part of the people are perfectly independent, and the other dependent; or a free state, where men may belong to either class, according to their talents and the chances of life. In the former case, life may be compared to a game of chance alone; in the latter to a game of chance and skill combined.

Sect. I. *Gardening as affected by different Forms of Government.*

180. As an art furnishing a part of the necessaries of life, gardening may be practised under any form of government; and wherever there is some liberty and security of property, its productions of necessity and comfort will ensure its use. Wherever civilised man has a house, he will always have an accompanying spot for roots and legumes; and wherever he enjoys a farm, he will desire orchards or vineyards for fruits or wine; and copse-woods and forest-treees, for fuel and timber: shelter, shade, and ornament, will follow in due time. Under paternal forms of government, the taste of the monarch will generally be indiscriminately followed by such of his subjects as can indulge in it; and thus fashion will assume the province of reason. Such a government must be favourable or unfavourable to the arts, according to the taste of its chief. Monarchs generally love splendor more than elegance or use; and in gardening are less likely to render its useful productions common among their subjects, than to increase the luxurious enjoyments of a few wealthy courtiers. This was exemplified in Louis XIV., who set the fashion not only in France but in Europe; but never, in all probability, added a foot of ground to the garden of a single cottager, or placed an additional cabbage or potato on his table. Under republican governments, the first tendency of public feeling is to equality and economy, and consequently to discourage those arts, or branches of arts, which minister to luxury. Gardening, under such circumstances, will be practised as a useful art, rather than one of design and taste; and more for its substantial benefits and scientific objects, than for its extraordinary productions and peculiar gratifications. In the beginning of the French revolution, we find the compilers of the Encyclopædia (see the vol. *sur l'Aratoire et Jardinage*) holding light the productions of forcing-houses, and the taste for double flowers. In America, the same simplicity of taste prevails, and also in Switzerland.

181. The final tendency, however, of every free government or society, is to conglomerate property in irregular masses as nature has distributed all her properties; and this irregularity is the most favorable for gardening both as a necessary, convenient, and elegant art; for to be displayed in any country to perfection, it must be practised in all its branches, and for all the purposes to which it is applicable. A republican or representative government, and a commercial people may be reckoned a case highly favourable to the arts, of which Holland, Genoa, and Venice, formerly, and this country at present may be adduced as examples. Under mixed governments where there is a representative body, and a first or executive magistrate, his taste will naturally have considerable influence on that of the people, as in Charles the Second's time in England; unless, as sometimes happens, the king or executive officer's taste is behind that of the people, in which case if the people be free and enlightened, the arts of design and taste will, as they ought, become a republic, governed by their own laws. This has been in some degree the case in England since the accession of the Brunswick line, a fine illustration of which is given by Eustache (*Tour* 1. 608.) in comparing the taste exhibited in the royal palaces built or altered by this race, with that displayed in the residences of private English gentlemen since the revolution.

182. Religion, as well as government, is calculated to have some effect on gardening. Those whose offices are accompanied by splendor and show, and which have numerous fetes and spectacles will be favorable to the culture of flowers and plants of ornament, and those which forbid, at certain seasons, the use of animal food, will in some degree encourage the productions of fruits and culinary vegetables. Where those alternating days of rest of such antiquity in society, and so conducive to the comfort of the laboring classes, (*Graham's Sabbath, Pref.*), are to be spent wholly or partly in recreative

enjoyments, encouragement will be given to public gardens of different kinds; but where they are to be spent in a devotion founded in fear, and consequently gloomy and austere in its offices, such a religion cannot be said to encourage gardening. The religions of Italy and Scotland afford examples of each of these cases.

Sect. II. *Gardening as affected by different States of Society.*

182. In mixed states of society, where property is in few hands, and the population consists chiefly of lords of the soil and of slaves, the immensely rich may accomplish great designs, which shall astonish by their magnificence; but taste among such a people is not likely to be refined; works of art are only prized as marks of wealth; their merit is not understood, and therefore, declining in interest after the first burst of surprise, they are soon viewed with indifference, and afterwards neglected or destroyed. Gardening, in such circumstances, is not likely to be improved in any of its branches, nor the use of gardens rendered general among any part of the population. Russia and Poland may be referred to as examples.

In free states of society, where commerce is a leading pursuit, and property is irregularly distributed among all classes; where there are wealthy, rich, and thriving citizens, and where the comforts of life are known and relished by every class, gardening is likely to prosper in all its branches. The first-rate gardens of the wealthy will be an example to the rich, act as a premium to operative gardeners and artists, and encourage commercial gardens. The fine gardens displayed by the wealthy commercialist will act as a stimulus to the independent gentleman, too apt to be stationary in his improvements. The retiring tradesman will aspire to the same excellence as the merchant, and stimulate him in his turn. Cottage gardens will be found real ornaments to the country, and supply useful food and agreeable fruits to the labouring class of society, who, as they become more enlightened, will prefer employing their leisure hours in this way, rather than in grosser pleasures or habits. This was formerly the state of Holland, and is, in some degree, at present, that of Britain.

In free states of society, where agriculture is chiefly followed, where property continues much divided, and mankind, as will always be the case under such circumstances, are sober and rational, the useful branches of gardening will be generally practised and much improved. Wholesome culinary vegetables will be enjoyed by all classes, and agreeable fruits by most of the inhabitants. Switzerland may be referred to as an example.

Under any government or state of society, times of peace and commercial prosperity will be more favorable than their opposites. The long and flourishing peace of the two first empires,' Sir W. Temple observes, gave earlier rise and growth to learning and civilisation, and all the consequences of them, in magnificence and elegancy of building and gardening; whereas Greece and Rome were almost perpetually engaged in quarrels and wars, either abroad or at home, and so were busy in actions done under the sun, rather than those under the shade.

In mixed states of society, where a part of the population are privileged orders or hereditary proprietors, and the rest partly free and partly dependent, gardening is likely to be encouraged, more especially as an art of design. The proprietor of an entailed territory may be said to enjoy a sort of tangible immortality; for by establishing in his person and estate a sort of local and corporeal connection between his ancestry and posterity, he sees neither beginning nor ending to his life and property. Such a being is anxious to distinguish his little reign by some permanent improvement; and those which are most likely to answer his purpose will be building or gardening. However distant the expected benefits of his efforts, they are sure to be enjoyed; and even if he exceeds his income, and contracts debts which he cannot pay, he knows that the labour and property of others, which he has embodied on his estate, will remain for its benefit, and that posterity will give him credit for zeal and ambition. But partial rights of this sort are much more injurious than beneficial to society, by giving the privileged party a legal title to contract debts which he is not able to pay. They are remains of those feudal or primitive institutions which, as mankind become enlightened, will be swept away, with various other antiquated customs and absurdities, till man at last, whatever may be the circumslances of fortune or family under which he may be ushered into society, will be left to sink or rise in wealth and respect, according to his personal merits. Britain may be referred to as affording examples of injurious exclusive privileges, and, though rarely abused in this way, yet George, the third Duke of Marlborough, may be adduced as having taken advantage of them.

Chap. II.

Gardening as affected by different Climates, Habits of Life, and Manners.

It is obvious that gardening, in so far as respects the culture of plants, must differ in different climates, some of which will be found favorable for fruits, others for flowers, for culinary vegetables, and for timber trees. Considered as an art of design, and as furnishing agreeable views, and scenes for exercise or recreation, it will be found to vary, not only with the climate, but with the surface of the country, and the habits and manners of society.

Sect. I. *Influence of Climate in respect to Fruits, Culinary Plants, Flowers, Timber Trees, and Horticultural Skill.*

183. "It is evident," Niel observes, "that the horticulture of every country must vary in its nature and objects, according to the climate, and that the practice of gardening in one country cannot be applied to any other, unless that other greatly resemble the former in climate. Useful hints may no doubt be occasionally drawn from observing the modes in other countries. But it is scarcely necessary to remark, that in warm climates the practice must differ very widely from that which obtains in the temperate or the cold. In the former, the plants which require to be fostered in our stoves, either grow spontaneously, or are cultivated in the open fields, while the greater part of our common potherbs refuse to flourish in sultry regions. Again, the far northern countries of Europe, Sweden, Norway, and Russia, possess peculiarities of climate: snow covers the soil throughout the winter, and the summers are uninterruptedly bright and warm. Even in Britain, such is the difference of climate between the favored counties of the south-west of England, and that part of the island which lies to the north of the Cheviot Hills, that the same rules cannot be applied to both, without very considerable modification. The horticulture of the north of France, of Belgium, Holland, and Denmark, may, in general, be considered as approaching to that of South Britain; and these countries may frequently afford mutual lessons to each other, each availing itself of the other's discoveries, and adopting its improvements."

"Those noble fruits," Sir W. Temple observes, "the citron, the orange, and the lemon, are the native product of those noble regions, Assyria, Media, and Persia; and though they have been from thence transplanted and propagated in many parts of Europe, yet they have not arrived at such perfection in beauty, taste, or virtue, as in their native soil and climate." "The reason of it can be no other than that of an excellent and proper soil, being there extended under the best climate for the production of all sorts of the best fruits; which seems to be from about twenty-five to about thirty-five degrees of latitude. Now the regions under this climate in the present Persian empire, (which comprehends most of the other two, called anciently Assyria and Media,) are composed of many provinces, full of great and fertile plains, bounded by high mountains, especially to the north; watered naturally with many rivers, and those, by art and labour, derived into many more and smaller streams, which all conspire to form a country, in all circumstances, the most proper and agreeable for the production of the best and noblest fruits. Whereas, if we survey the regions of the western world, lying in the same latitude, between twenty-five and thirty-five degrees, we shall find them extend either over the Mediterranean sea, the ocean, or the sandy barren countries of Africa; and that no part of the continent of Europe lies so southward as thirty-five degrees; which may serve to discover the true genuine reason why the fruits of the east have been always observed, and agreed to transcend those of the west."

The pine-apple Sir William Temple was not acquainted with. It is a native of Africa and South America, and was introduced into Europe about the time in which he wrote, but not cultivated as a desert fruit for ten years afterwards. It may be cultivated in the open air for thirty degrees on each side of the equator. It is brought to great perfection in the West India islands, but not more so than in this country and in Holland under glass.

"Persia," Chardin observes, "is the first country in the world for beautiful and superb flowers, properly so called." The same observation will apply to the whole of India; but it is to be observed, that the flowers of these and other hot and dry countries are less odoriferous than in such as are temperate, and have a comparatively moist atmosphere. Moisture is favorable for conveying all odours, or, at least, for strengthening their impression on the olfactory nerves.

Low moist climates are most favorable for the growth of culinary vegetables; and in this respect Holland, England, and the more temperate parts of France and Flanders, are before the rest of Europe. Sir William Temple, who lived much in Holland and the adjoining countries, says gardening, in his time, was there in the greatest perfection.

The second country in Europe for culinary gardening and flowers, appears to us to be Lombardy; and considering that it is highly favorable for fruits, it may, as already observed, be considered the most propitious country in Europe for horticulture and ornamental gardening. There appear to be also corresponding situations in America, China, and New Holland, especially in the latter country, which may one day become a second America. Wherever the fruit of the gooseberry and strawberry, and the bulb of the turnip and the head of the cabbage, attain a good size, there the climate may be considered highly favorable to the growth of kitchen crops, most kernel fruits of Europe, and florists' flowers; but a warmer and drier climate is required for the richer stone fruits, and most of those of the torrid zone.

Dry and rather elevated regions are the most favorable for the production of forest trees, whose timber is valued for durability. The resinous tribe produce the best timber in cold mountainous regions in every part of the globe. The oak, the chestnut, and the mahogany, delight in strong soils and moderate temperatures, such as skirt the bottoms of mountains. In general, no species of timber is found to be durable which has been produced in low, moist, warm, situations.

Climates naturally highly favorable for the productions of gardening, are unfavorable to the progress of gardening as an art, and its practice as a trade. In Persia and some parts of America, where the finest peaches are produced, the art of grafting is unknown or not practised; and, in general, in the hot countries, where melons, gourds, and other rapid growing annuals so readily produce their fruit, the culture of culinary leaves and legumes is neglected. In the West India islands and great part of America, the gourd serves the purposes of the cabbage, turnip, lettuce, and spinach, and with garlic, onions, and yams, constitutes their principal culinary crops. Chardin, after enumerating the natural products of Persia, says, "we are not to conclude from thence that they have the finest gardens in the world; on the contrary, by a very general rule, there, where nature has been most abundant and liberal in her productions, art is proportionably rude and unknown; for, nature having gardened so well, almost nothing is left for art."

Climates and soils comparatively unfavorable for fruits and plants, are naturally conducive to skill in gardening. A very variable and unsettled climate, Niel observes, (*Gen. Report of Scotland*, ch. ix.) tends to call into action all the powers of the mind, and to produce habits of encreasing attention; and where a gardener is able to raise tolerable crops, both of the more tender fruits and vegetables, in climates and situations adverse to the production of either, he has doubtless more real merit in accomplishing his object, even though the articles should be somewhat inferior in quality, than he who, in a propitious soil and climate, raises them to the utmost perfection. Yet the merits of such a gardener are often overlooked, and the master, through ignorance or indifference, or a niggardly penuriousness of approbation, receives that as an effort of mechanical routine, which is due to a rare union of science, skill, and indefatigable attention.

The climate and country of England, Sir W. Temple considers as highly favorable for gardening. "Perhaps few countries," he says, "are before us in the number of our plants, and I believe none equals us in the variety of fruits, which may be justly called good; and from the earliest cherry and strawberry to the last apples and pears, may furnish every day of the circling year. For the taste and perfection of what we esteem the best, I may truly say that the French, who have eaten my peaches and grapes at Shene, in no very ill year, have generally concluded, that the last are as good as any they have eaten in France on this side Fontainbleau; and the first as good as any they have ate in Gascony; I mean those which come from the stone, and are properly called peaches, not those which are hard, and are termed pavies; for these cannot grow in too warm a climate, nor ever be good in a cold, and are better at Madrid than in Gascony itself. Italians have agreed, my white figs to be as good as any of that sort in Italy, which is the earlier kind of white fig there; for in the latter kind and the blue, we cannot come near the warm climates, no more than in the Frontignan or Muscat grape.

"My orange-trees are as large as any I saw when I was young in France, except those of Fontainbleau, or what I have since seen in the Low-countries, except some very old ones of the Prince of Orange's; as laden with flowers as any can well be, as full of fruit as I suffer or desire them, and as well tasted as are commonly brought over, except the best sorts of Seville and Portugal. And thus much I could not but say in defence of our climate, which is so much and so generally decried abroad." "The truth is, our climate wants no heat to produce excellent fruits; and the default of it is only the short season of our heats or summers, by which many of the latter are left behind, and imperfect with us. But all such as are ripe before the end of August are, for aught I know, as good with us as any where else. This makes me esteem the true region of gardens in England to be the compass of ten miles about London; where the accidental warmth of air, from the fires and steams of so vast a town, makes fruits, as well as corn, a great deal forwarder than in Hampshire or Wiltshire, though more southward by a full degree."

Sect. II. *Influence of Climate and Manners on Gardening, as an Art of Design and Taste.*

184. Since the introduction of the modern or natural style of gardening into Britain, it has been a common practice to condemn indiscriminately every other taste as unnatural and absurd. If by unnatural, an allusion is made to the verdant scenery of uncultivated nature, we allow that this is the case; but we would ask, if, for that reason, it follows, that though now absurd, ancient gardens were not as natural and reasonable in their day, as any of the manners and customs of these times? Gardening, as a liberal art, is destined to create scenes, in which both beauty and use are combined: admitting there-

fore, that both styles are alike convenient, to say that the modern only is beautiful, is to say that there is only one sort of beauty adapted to gardening; or that there is no beauty but that of the picturesque; or that all former ages, and every other country, is in a state of barbarism with respect to this art. If we take the term natural in a more extensive sense, and apply it to the climate, situation, condition, and manners of a people; and if we allow these to be natural, why may not their gardening be natural, as well as their particular customs and dress? The gardening we now condemn so unreservedly, has subsisted, as we have seen, from the earliest ages in warm climates; and still prevails there, as well as in more temperate countries, whose inhabitants are not altogether ignorant of the modern style. It may, therefore, be said to have grown up with mankind, and at all events must be perfectly suited to the wants and wishes of the inhabitants of such countries.

In order to judge of the fitness or utility of a style, we must know the purposes to which it is applied; and in order to judge of its beauty relatively to the people who employ it, we ought to know what beauties are already most abundant in their country, as well as something of the degree of their advancement in civilisation.

The gardens of the east, we have every reason to believe, were used more as arbors or conservatories are in this country, than as places of exercise and active enjoyment. The object was repose, indolent recreation, sedentary or luxurious enjoyment. To breathe the fresh air, shaded from a tropical sun; to inhale the odor of flowers; to listen to the murmur of breezes or fountains; to the singing of birds; or to observe the minute beauties of the surrounding foliage, were, and still continue to be, the ordinary class of beauties desired in an eastern garden. A higher and more voluptuous kind, consisted in using it as a banqueting place, bath, or seraglio, as is still the case in Turkey and Persia; in feasting the eyes with the sight of dancing beauties: in ravishing the ears with concerts of vocal or instrumental music, and in firing every sense with wine. Exercise was incompatible with that languor of body, which is attendant on a warm climate and a distant prospect; inconsistent with security from wild beasts, and that privacy which selfishness or jealousy might dictate. "The Persians," Chardin observes, "do not walk in gardens so much as we do, but content themselves with a bare prospect, and breathing the fresh air. For this reason, they set themselves down in some part of the garden at their first coming in, and never move from their seats till they are going out of it." *Travels*, ch. vi. "Nothing surprises the people of the East Indies so much as to see Europeans take pleasure in exercise. They are astonished to see people walk who might sit still." *Kinderley's Letters from the East Indies*, p. 182. Add to this, that the natural surface of warm countries is generally so parched with heat, as to be far less agreeable to look on than the verdure of a limited space, kept luxuriant by water. "Before the end of May," Russell remarks, "the whole country round Aleppo puts on so parched and barren an aspect, that one would scarcely think it capable of producing any thing but the very few plants which still have vigour enough to resist the extreme heats." *Russel's Aleppo*, p. 13. . If to these we subjoin the use of fruit, and, what is common to every exertion of man, a desire of obtaining applause for the employment of wealth and skill, we shall include every object sought in an eastern garden.

An eastern garden, therefore, appears to have been a collection of all those beauties found scattered about in general nature, in order to adapt them to the use and enjoyment of man. Let us now inquire how their plan, as far as we are acquainted with it, was calculated for this end. Moderate extent, and immediate connection with the house, are necessary and obvious ingredients in their design. The square form would be adapted for the enclosure as the simplest; the trees would be ranged in rows, to afford continuity of shade; and the walks would run parallel between them, to admit uninterrupted progress; that walk parallel to, and close under the house, would be a raised platform or terrace, to give elevation and dignity to the house, to give the master a commanding view of the garden, and to serve as a connecting link between art and comparative nature.

By leaving open plots or squares of turf in the areas, formed by intersecting rows of trees, a free circulation of air would be facilitated; and the same object, as Pliny informs us, is promoted by the quincunx, which admits the breeze from every quarter of the compass more readily than any other disposition. A picturesque or natural arrangement would have stagnated the air, and defeated one of the grand purposes in view. The same reasons would guide them in their choice of spreading, broad-leaved trees, and to thicken their boughs, or deprive them of such branches as were too low, or tended to destroy the balance of the tree, the pruning knife would be occasionally applied. Water in every form suggests the idea of coolness; but agitated in cascades, fountains, or jets-d'eau, it is used to the best advantage, and the heat of the atmosphere is moderated in proportion to the evaporation which takes place. In still ponds or basins it has another property, that of reflecting the objects around it. Buildings, as arbours, aviaries, covered seats, banqueting houses, baths, and grottoes, would become requisite for their respective uses, and would abound in proportion to the wealth or rank of the owner. Fruit-trees would be introduced in appropriate situations for the sake of their fruit, and a choice of odoriferous flowers and shrubs would fringe the margin of the walks, to admit of a more easy inspection of their beauties, and nearer contact of their odors with the olfactory nerves; they would also be disposed in greater profusion, in curious knots or parterres near to the house, or in front of the resting places, or banqueting rooms. In time, even artificial objects of value, as dials, statues, vases, and urns, would be added, in order to create as much variety and interest in a small spot as was consistent with its utility.

Such we have found (151.) to be the general arrangement of eastern gardens; and as there seems no more obvious way of attaining the wants of those to whom they belonged, we may pronounce it to be perfectly reasonable and natural.

As to the more extensive paradises or parks in which wild beasts were admitted, and even whole regiments exercised, we have but few authentic particulars respecting them. Those of Assyria must be regarded as royal extravagancies, calculated to excite astonishment and admiration at their magnitude, and the art and expence employed in their construction; and if any reliance is to be placed in the account given by ancient authors of the hanging gardens of Babylon, their design will be found singularly to unite this object with the minor beauties of the confined garden; to combine the splendor of magnificence with the delights of the justest feelings of nature. They were situated over, or according to some, adjoining to king Nebuchadnezzar's palace, or on a platform raised by lofty pillars, on the banks of the Euphrates, in the middle of the city of Babylon. They are said to have contained groves, fountains, and, in short, every object which we have mentioned, as appertaining to the more ordinary description of eastern gardens. Their object was to gratify his Medean queen, by that sort of verdant scenery and distant prospect, to which she had been accustomed in the more romantic country of her birth. The height, then, would give that commanding prospect of the water and shipping of the Euphrates, and the city, as well as the gardens within and without its walls, which she particularly desired. The air in that elevated region would be more cool than below; the noise and bustle of the city would cease to be offensive; the whole would be more exposed to breezes and winds; and the mind, deriving so much enjoyment in so singular and elevated a situation, must have experienced emotions at once sublime and romantic. But a faint idea of these gardens will be excited, by imagining the quadrangle of Somerset House crowned with a portion of Kensington gardens; or of the summer garden of Petersburgh placed over the Kremlin in Moscow.

185. How and with what propriety the eastern style came afterwards to be adopted in Greece, Italy, France, and finally in England, is our next inquiry. The principle or instinct of imitation, would be the first cause why the more distant nations, whether colonies from the east, or returning travellers or conquerors, adopted this parent style. This is so obvious, as to require no comment beyond what will be furnished by individual inquiry into our earliest tastes, habits, and predilections in dress, amusements, furniture, and other matters of common life. The next principle is that of use or fitness, which would vary in application, proportionally to the distance and different circumstances of the imitating country. Thus it would not exactly apply in Greece or Italy, where the climate was more temperate, active exercise more congenial, and the habits of the wealthy, for a long time at least, comparatively frugal. Add to this, that verdant landscapes, shade, breezes, rills, waterfalls, and lakes, with their accompaniments of odors, murmurs, singing birds, reflections of objects, were more liberally distributed over the face of general nature. The more active character of man in such countries would, in time, also appropriate to their use from this natural abundance, a greater variety of fruits and legumes.

We know little of the private gardening of the Greeks, but a very slight attention to this difference of circumstances, will enable us to account for the character assumed by the eastern style under the ancient Romans. The necessarily different culture required for perfecting fruits and culinary vegetables, would give rise to the orchard and kitchen-garden. This would simplify the objects of the ornamental garden, which would thus exhibit less a collection of natural beauties, than the display of art, the convenience of taking exercise, here a pleasure rather than a fatigue, and the gratifications of shade, cool breezes, and aromatic odors. A prospect of the surrounding country was desired, because it was beautiful; and where, from various circumstances, it was interrupted by the garden or its boundary fence, mounds or hills of earth were raised, and, in time, prospect-towers appended to the houses. Greater extent would be required for more athletic recreations, and would be indulged in also by the wealth and pride of the owner for obvious reasons. Abridgement of labor would suggest the use of the sheers, rather than the more tardy pruning knife in thickening a row of trees. A row of low trees so thickened, would suggest the idea of a row of clipt shrubs. Hence at first hedges; and subsequently, when art and expense had exhausted every beauty, and when the taste had become tired of repetition, verdant sculpture would be invented, as affording novel, curious, and fantastic beauty, bordering, as do all extremes, upon absurdity. A more extended and absolute appropriation of territory, than what we may suppose to have taken place in the comparatively rude countries of the east, would lead to agricultural pursuits, and these again would give rise to the various arrangements of a Roman country residence which we know to have existed, and which it would be superfluous to describe. Various other circumstances might be added; but enough has been stated to show that the gardening of the Romans was perfectly natural to them, under the circumstances in which they were placed; it suited their wants, and produced scenes which they found to be beautiful, and was therefore in the justest taste. To have imitated the scenery of nature, or studied picturesque beauty in a garden, would have been merely adding a drop to the ocean of beauties which surrounded them. Expense incurred for this purpose could never have procured applause to the owner, since the more like nature the production, the less would it excite notice. All that was left for man to do, therefore, was to create those beauties of art, convenience, and magnificence, which mark out his dwelling place, and gratify his pride and taste by their contrast with surrounding nature.

The gardening of the Romans was copied in France and Britain, with little variation beyond those dictated by necessity and the difference of climate. It was found to be perfectly beautiful and agreeable; and would have continued to prevail, had Britain continued in similar circumstances to those in which she was at the time of its introduction. But such has been the progress of improvement in this country, that the general face of nature became as it were an ancient garden, and every estate was lined out, bounded, and subdivided, by stripes of wood, rows of trees, canals, ponds, walls, and hedges. The credit or distinction to be obtained here, by continuing to employ the ancient style, could be no greater than what the Romans would have obtained by imitating nature. In their case all the country was one scene of uncultivated, in ours it was one scene of cultivated, beauty. In this state of things the modern style was adopted, not solely from a wish to imitate the gardening of the Chinese, or a high degree of refinement in taste, but from the steady operation of the same motives which produced and continued the ancient style, — a desire of distinction. The Chinese style, if introduced, would never have become purified, or ended in our simple style, had England remained an open country like France or Italy, or a thickly wooded one like Poland or America. On this principle it may be affirmed, that the English style cannot please in those countries, otherwise than from its novelty, or as giving rise to certain associations with the people, whose name it bears. What delight or distinction can be produced by the English style in Poland, for example, where the whole country is one forest, and the cultivated spots only so many open glades, with the most irregular and picturesque sylvan boundaries? But let a proprietor there dispose of the scenery around his residence in the Roman or French manner; let him display a fruit or kitchen garden, bounded by high stone walls; a farm subdivided by clipped hedges and ditches, and a pleasure ground of avenues, stars, circles, fountains, statues, temples, and prospect-towers, and he will gratify every spectator. The view of so much art, industry, and magnificence, amid so much wild and rude scenery, awake so many social ideas of comfort and happiness, and so much admiration at the wealth and skill employed, that a mind of the greatest refinement and the justest taste would feel the highest sensation of pleasure, and approve as much of such a country residence in the wilds of Poland or America, as he would of the most natural and picturesque residence of England, amid its highly artificial scenery.

186. We trust we have said enough to prove that gardening, as an art of design, must be considered relatively to the climate and situation of the country, and habits and manners of the people, where it is employed; and that the ancient and modern styles, viewed in this light, are each perfectly natural, and equally meriting adoption, according to relative circumstances; less than from any positive beauty, or advantages of either manner. We are consequently of opinion, that the ancient style, divested of some ingredients which relate to warm climates, and purified from the extravagances of extremes in decoration, would be in much better taste in some situations in the Highlands of Scotland and the south of Ireland, than the modern style; and that this style cannot, for a long series of years, afford any other satisfaction on the continent than what arises from the temporary interest of novelty and accidental association. It may never be altogether lost sight of in subsequent arrangements; but whenever the influence of fashion has subsided, the beauties of the ancient style will be desired, as fulfilling better the objects in view, till landed property, in these countries, becomes enclosed, subdivided, and cultivated, as it is in England.

187. Part of the prevailing antipathy to the ancient style proceeds from a generally entertained idea, that the modern is an improvement on it; but the truth is, the two styles are as essentially and entirely different in principle, as painting and architecture, the one being an imitative, and the other an inventive art.

Landscape gardening agrees with ancient gardening in no other circumstance, than as employing the same materials. It is an imitative art, like painting or poetry, and is governed by the same laws. The ancient style is an inventive and mixed art, like architecture, and governed by the same principles. The beauties which architecture and geometric gardening aimed at, were those of art and utility, in which art was every where avowed. The modern style of gardening, and the arts of poetry and painting, imitate nature; and, in doing so, the art employed is studiously concealed. Those arts, therefore, can never be compared, whose means are so different; and to say that landscape gardening is an improvement on geometric gardening, is a similar misapplication of language, as to say that a lawn is an improvement of a corn-field, because it is substituted in its place. It is absurd, therefore, to despise the ancient style, because it has not the same beauties as the modern, to which it never aspired. It has beauties of a different kind, equally perfect in their kind as those of the modern style. The question therefore is not, whether we shall admit occasional specimens of obsolete gardening, for the sake of antiquity, but whether we shall admit specimens of a different style, from that in general use, but equally perfect in its kind. *Ed. Encyc.* art. *Landscape Gardening.*

188. Marsden (*Island of Sumatra*, 1782,) was among the first authors who ventured to approve of the ancient style in particular cases, in opposition to the then prevailing fashion of condemning it as absolutely bad. Dr. Falconer soon afterwards (*Historical View*, &c. 1782.) defended it at length on the principles which we have chiefly adopted in the foregoing remarks. A similar dissertation has been produced by Hope, (Author of *Designs for Furniture*, &c.) who coincides with Price, and Knight, in recommending the partial introduction of many of the decorations and convenient appendages of the Roman and Italian gardens, especially near the mansion. "Economy," he observes, "may no doubt be alleged as an unanswerable reason for having even the most important and dignified of our country mansions entirely destitute of the accompaniments of covered walks, terraces, and balustrades, parterres, berceaux, and such like works; but that taste should be made the pretence for wholly discarding those numerous additional means of encreasing the splendour and the variety of the scene, is an abuse of terms as egregious as it is inconceivable."

"When I perceive a man," observes Sir W. Bridges, "incapable of deriving pleasure from more than one style of composition, and dogmatising on its exclusive merit, I pity his weakness and despise his presumption. When he narrows his curiosity, either to what is old or what is new; when he confines his praise, either to the dead or to the living, though in both cases he is ridiculous, perhaps his folly is more evinced in the last." *Censura literaria*, vol. viii. p. 214.

It is the privilege of the man, who has opened to his mind by observation and study, all the springs of pleasant association, to delight by turns in the rudeness of solitary woods, in the cheerfulness of spreading plains, in the decorations of refined art, in the magnificence of luxuriant wealth, in the activity of crowded ports, the industry of cities, the pomp of spectacles, the pageantry of festivals. *Ed. Rev.* 1806.

189. What country, considered as to its government, civilisation, soil, surface, and climate, is best adapted for the grandest display of gardening of which the art is susceptible, we cannot take upon us to determine; nor do we believe it possible to point out any country possessing the requisites for excellence in every department. Britain, France, Holland, and the north of Italy, are unquestionably the best countries of Europe for European gardening; and of these, the best parts are such as combine hills and plains, rocks, rivers, and prospects.

The preference of Britain, as to government and civilisation, and its equality at least as to soil and surface, will not be disputed. As to climate, Charles II. in reply to some who were reviling it, said, he thought that was the best climate where he could be abroad in the air with pleasure, or at least without trouble and inconvenience, the most days of the year, and the most hours of the day; and this he thought he could be in England, more than in any country he knew of in Europe.

"There are," says Sir W. Temple, "besides the temper of our climate, two things particular to us, that contribute much to the beauty and elegance of our gardens, which are, the gravel of our walks, and the fineness and almost perpetual greenness of our turf. The first is not known any where else, which leaves all their dry walks, in other countries, very unpleasant and uneasy. The other cannot be found in France or in Holland as we have it, the soil not admitting that fineness of blade in Holland, nor the sun that greenness in France, during most of the summer; nor indeed is it to be found but in the finest of our soils."

That which prevents the gardening of Britain from attaining to a much higher degree of perfection as an art of design, is not any natural deficiencies in our climate or soil, nor the want of means to make the most of them, but the want of taste in the proprietors; for after all that has been done and written, there appear to be few who have a just relish for that sort of beauty in pleasure grounds which is properly called picturesque, or such as a painter might introduce in a picture. We do not allude to any objects or arrangements which would interfere with utility; but to such a disposition of forms as painters call grouping, connection, harmony, and above all, to that general result which is called unity of expression or character.

PART II.

GARDENING CONSIDERED AS A SCIENCE.

190. Knowledge in the infancy of every art is necessarily confined to particulars, but after long observation and experience, the mind begins to generalize facts, and this is the first step towards the foundation of theory or science; which is nothing more than the substitution of rational principles of action, for habits founded on custom or prejudice. A number of generalized facts accumulated, the next process of the mind is to classify or systematize them; this is the highest effort in the progress of knowledge; and that art will be the most perfectly understood as a science, in which the greatest number of facts, or in other words, the most extensive range of experience and observation, is generalized and arranged in a connected system.

Unfortified by the light of science, the practical man has no other assurance for the success of the future, than the experience of the past, and no resource for unforeseen events but ordinary expedients; he resorts to general rules and precepts, which direct what is to be done every where, and on every occasion; instead of applying to principles, for particular instructions, adapted to peculiar cases, or singular purposes. Industry may be baffled, and hope defeated, by a thousand contingencies from causes incident to every process of art or operation of nature. By these the mere routine practitioner is deranged, or thrown off his guard; whilst the man of science refers events to their true causes, suggests the adaptation of measures to meet every case; and knowing the laws of nature to be immutable, he operates on her materials with confidence in the result. All the operations of territorial cultivation are either mechanical, or chemical; and must therefore depend on the laws which govern the common materials of our globe. Those laws, or the manner and circumstances in which these materials operate on each other, constitute the limit of human science; for any attempt to go farther and discover first causes, inevitably ends in disappointment.

Science alone, however, without practical experience will not insure success, and may at first end in disappointment. But "where theoretical knowledge, and practical skill," as D. Stewart observes, "are happily combined in the same person, the intellectual power of man appears in its full perfection, and fits him equally to conduct with a masterly hand the details of ordinary business, and to contend successfully with the untried difficulties of new and hazardous situations." *Elements of the Philosophy of the Human Mind*, p. 232. 2d edit.

The science of every art must necessarily depend on the end or object for which that art is practised; on the nature of the materials employed to procure or attain those ends; and on the nature of the agents made use of by human skill to operate on those materials. The object of the art of gardening is twofold. That of cultivating vegetables for use or ornament in domestic or general economy; and that of forming arrangements of external scenery, beautiful as such, and suitable for personal recreation. The first object, therefore, to be ascertained on this subject, should be the wants, desires, and taste of that society for which the gardening is intended. The 2d, the study of the vegetable kingdom. The 3d, the study of the natural agents of garden-culture. The 4th, that of the artificial agents of garden-culture. The 5th, that of the operations of garden-culture, and the 6th and last that of the visible beauty of the material world.

As it would be useless to study gardening with reference to a state of society which did not exist, so the first branch of knowledge may be considered as ascertained by every individual, from his own consciousness; that is, from the circumstance of his being himself a specimen of the society for the time being. This branch, therefore, does not require farther consideration in a work like the present.

With regard to the second and third branches, in which it may be said gardening is considered as *a science of chemical agencies*, though in this view the oldest and most useful of arts, it may still be considered as in its infancy as a science. It admits, therefore, of much improvement; though unquestionably it has made considerable progress within the last fifty years, since the study of vegetable physiology and chemistry have become more general; and since these arts have been enriched by the discoveries of Mirbel, Keyser, Knight, Lavosier, Chaptal, and Davy; and applied to agriculture and horticulture by Davy and Knight in England, and Decandolle and Thouin in France.

With respect to the fourth and fifth branches, in which it may be said, gardening is considered as *a science of mechanical operations*, it may be said to have partaken of the general progress of the age, and to have adopted various improvements made in architecture and engineering (which include implements, machines, and buildings,) in so far as they were found applicable to either its useful or agreeable destinations. Here, however, there is still great room for advancement, especially in the construction of hot-houses, and the formation of walled gardens.

With respect to the last branch, in which gardening is considered as *a science of design and taste*, it is founded on principles common to other arts, as to architecture and landscape painting, whose ends are similar; and here, though its science has long been as much neglected as in the other branches, yet now it may be considered to be fully ascertained and fixed by Allison and Price; and applied by Whateley and Price in England, and Girardin and De Lisle in France.

To know the science of any art perfectly, something should undoubtedly be known of all the others which bear relation to it; or serve in any way to explain the nature and influence of its operations and arrangements. But this is more than can be expected from men in general, (Aubert, in his *Cours de Phytologie*, Paris, 1816, gives a table of twenty sciences as related to Botany alone,) what cannot be hoped for from practical men; and what would require in a systematic view of gardening like the present, treatises on most of the other arts. It is preferable, in our opinion, to draw from other branches of knowledge, the explanations which they afford of particular operations or phenomena, that come into notice in discussing what we have laid down as leading principles of gardening. Thus, in place of treating of chemistry, we have merely drawn from that science what belongs to the study of vegetables, soils, and manures, &c.; instead of a treatise on the mechanical powers, we have merely given an explanation of the principles on which each class of implements and machines operate; and in place of treating of architecture and painting, we have merely discussed the subject of design and composition in these arts; the first as applicable to buildings and artificial dispositions of ground, and the second as directing the formation of real scenery.

BOOK I.

THE STUDY OF THE VEGETABLE KINGDOM.

191. Organised bodies are divided into two orders; those endowed with sentiment or a consciousness of their existence, and those deprived of that sensibility. The study of the former is designated zoology; that of the latter, botany or phytology. As the study of the vegetable kingdom embraces a variety of objects, modern botanists have introduced the following subdivisions:—1. Systematic botany, in which plants are studied apart, as distinct beings, and considered in respect to their resemblances, differences, nomenclature, and classification. 2. Vegetable physiology, or the study of plants as living beings, in which is considered the form of their organs, their mode of nourishment, and of multiplying themselves. 3. Botanical geography, or the history of vegetables, considered relatively to climate, surface, soil, country, habitation, &c. 4. Applied botany, in which vegetables are considered with respect to the wants of man and other animals, and which includes the study of the medical and economical properties of plants; the means by which man procures such as he wants, either by searching for them in a wild state or by cultivation. This last department of the science may be considered as including agriculture and gardening; but these are parts of it so vast and important, as to form separate branches of study. Conformably to this view of the subject, we have here considered the study of plants as to history, glossology, phytography, taxonomie, organology, vegetable anatomy, vegetable chemistry, vegetable physiology, vegetable pathology, vegetable geography, and vegetable culture.

Chap. I.

Origin, Progress, and present State of the Study of Plants.

192. From the great indispensability of vegetable productions to the support of animal life, the study of plants may be regarded as coeval with the creation of man. The first stage in the progress of this study would be that in which the attention of the human mind was directed to the discrimination of vegetables, as indispensible necessaries of life. A second stage, that in which men began to direct their attention to vegetables, as capable of furnishing, by means of cultivation, an increased supply of human food,

proportioned to the wants of population. Then it was that agriculture, in the proper sense of the word, would commence in society. A third stage was that in which plants began to be regarded as furnishing, not only necessaries, but comforts; and from this period, whenever it happened, may be dated the origin of gardening. A fourth stage was that in which plants began to be considered as furnishing, not merely comforts, but luxuries. Odors and beautiful flowers would be prized, and hence the origin of ornamental gardening. Such is the theory of the progress of the study of plants; we shall now take a rapid view of the actual progress of this study among the ancients and moderns.

Passing over the fabulous history of the Greeks, we shall commence with Solomon, who appears to have written a treatise on vegetables somewhere about the year B. C. 1004. This work is lost; and the next name in order is Thales, in B. C. 604. To him succeeded the celebrated Pythagoras, about B. C. 550, who is believed to have prohibited his disciples the use of beans, on account of a supposed identity of origin between beans and human flesh. He is also said to have written a treatise on onions. Annaxagoras, another Greek philosopher of this period, maintained that the seeds of all vegetables are lodged in the atmosphere; from whence they descend, along with the rain and dews into the earth, where they mingle with the soil, and spring up into plants. Empedocles is said to have attributed sexes, desires, and passions to plants; and Democritus wrote a treatise on their smells.

Hippocrates, about the year B. C. 409, introduced a new and enlightened system of medical study, a subject intimately connected with that of plants; and his cotemporary, Crategas, wrote a book on botany, of which, some fragments lately existed in the imperial library at Vienna.

Aristotle, about B. C. 350, wrote a scientific work on plants, which, though also lost, is quoted by cotemporaries, and has thus obtained for its author the title of father of natural history, as well as prince of metaphysicians. His disciple, Theophrastus, about B. C. 300, wrote on plants; he described 500 species, and endeavours to account for the phenomena of vegetation.

Soon after Theophrastus, the Greek empire began to decline, and with it, the study of plants. Botany, with the other arts and sciences, migrated to Italy, in which it made some progress, as we may see by the writings of Pliny, Virgil, and other georgical authors of the Augustan age. Those Roman writers, however, that can be considered strictly botanical, are only Dioscorides and Pliny. The work of the former, is a body of materia medica; that of the latter, Rousseau considers as a body of receipts. Nothing is known of the state of botany from the time of these authors till the revival of the arts in the beginning of the fifteenth century; when one of the first fruits it produced was the introduction of figures from wooden cuts, by Brunsfelsius of Mayence, in Germany. His Historia Plantarum, published in the beginning of the sixteenth century, excited the emulation of other botanists; and soon after followed his countrymen, Bock, Cordus, Fuschius, Dodonæus, and Clusius. Mathiolus was the first Italian; Delachamp and Bauhin the first Frenchmen; and Turner and Gerarde the first Englishmen, who caught the flame.

But though prints had been introduced, method was wanting, without which all study of natural history must be of the most imperfect and limited kind. Gesner, a native of Zurich, in Switzerland, made the first attempt at arranging plants into classes, orders, and genera, about the middle of the sixteenth century. Cæsalpinus, a native of Tuscany, presented a similar arrangement at the same time, without knowing any thing of that of Gesner: a common occurrence in the history of inventions, and a proof that the general state of botanical science rendered such an invention necessary. After this period the study of botany proceeded with rapid strides; and herbariums and copper-plates of plants, were invented by Columna of Naples.

We have already seen that botanic gardens were established about the middle of the sixteenth century, first in Italy in 1533, and afterwards in France, Germany, and England, before the completion of the sixteenth century. This circumstance contributed, in an astonishing degree ,to the progress of the study of plants, and procured the patronage of the wealthy.

193. The first impulse having spent its force, botany declined or was stationary, for the greatest part of the sixteenth century; but revived, owing, as it is thought, to a new direction given to the spirit of philosophical inquiry, by the illustrious Bacon. This wonderful philosopher explored and developed the true foundations of human knowledge, with a sagacity and penetration unparalleled in the history of mankind. He dared to disengage himself from the fetters of academical authority, condemned the visionary speculations of the schools, and recommended the substitution of analytical and inductive investigation, proclaiming truth to be but the image of nature.

The structure of plants, and the phænomena of vegetable life, began now to attract attention, 2000 years after it had been first attempted by Theophrastus. Malphigi, an

Italian, and Grew, an Englishman, carried on this study at the same time unknown to each other; the result of their investigations were communicated to the scientific world, towards the end of the seventeenth century, removing in great part the veil which had hitherto enveloped the phænomena of vegetation. The plan which these philosophers pursued, was that of experiment recommended by Bacon; the result may be mentioned as the first-fruits of his philosophy.

About the end of the seventeenth and beginning of the eighteenth century, different methods or systems for arranging and naming plants were produced by Herman and Boerhaave, of Leyden; Rivinus, and others, in Germany; Tournefort and Magnol, in France; and Morrison and Ray, in England. Of these systems and nomenclatures, that of Tournefort was the most generally followed, of which we may give as an instance, the first six editions of Miller's Gardener's and Botanist's Dictionary. Tournefort's system, depended chiefly on the corolla; but when the plants of America began to be introduced, to them it was found impracticable in its application. All the other methods were in different degrees defective, and it was not till the appearance of Linnæus that this perplexity was removed.

This great and illustrious naturalist founded, what is called, the sexual system, deducing his rules of method from incontrovertible principles; establishing in his Philosophica Botanica, laws of generic and specific distinction, and rules of legitimate definition. This simplicity of system, perspicuity of arrangement, and precision of language, has elevated botany to the high rank it now holds in the scale of human knowledge; allured to the study of plants, men of the most distinguished abilities, and excited that ardor for botanical investigation, which characterises the present age.

This new system, as founded on the sexes of plants, naturally led Linnæus to the study of the structure and phenomena of vegetables, and thus effected at last a close and intimate union between systematic and physiological botany. The propriety and advantage of this union are evident, since a thorough knowledge of plants involves both studies.

The doctrines of Linnæus soon procured followers in every country; but the most distinguished of his immediate disciples, were Kalm, Hasselquist, Læfling, and Kœnig, all of whom travelled in pursuit of new plants, under the auspices of their great master. Of his more remote disciples, may be named as most distinguished, Gmelin, Oeder, Hedwig, Gærtner, Lamark, and Sir James Edward Smith, the founder and president of the Linnæan Society, of London, and proprietor of the whole of the Linnæan Herbarium; from whose meritorious labors, botany has derived and is still deriving important advantages.

The study of physiological botany, however, was less attended to than that of methodical arrangement by Linnæus and his immediate disciples, and indeed, it would have been too much to have expected an equal progress in both, by one who had made so astonishing an improvement in the one department.

To the names of Grew and Malphigi, in physiological botany, may be added, in addition to that of Linnæus, Hales, Bonnet, Du Hamel, Hedwig, Spallanzani, and especially Priestley. This philosopher first brought the aid of pneumatic chemistry to this study, which under the direction of such men as Ingenhouse, Senebier, and Sassure, has done more to illustrate the phenomena of vegetation, than all the other means of investigation put together.

If we add to these the ingenious hints and speculations of Darwin, in his Botanic Garden, and in Phytologia, the masterly experiments of Knight, given in the Philosophical Transactions, the vegetable physiology of Mirbel, but especially of Keyser, with the systematic view of the whole subject by Keith, in his "Introduction to Vegetable Physiology;" we may assert with the latter writer, "that our knowledge of the physiology of vegetables, may now be regarded as resting upon the foundation of a body of the most incontrovertible facts, and assuming a degree of importance inferior only to that of the physiology of animals." Such may be considered the present state of physiological botany.

194. The chief improvement which has been made in the systematic department since the days of Linnæus, consists in the approximations that have been made to a method of arrangement, in which the relations of plants to one another are more obvious at the first glance than they are in the Linnæan, or artificial system. The whole vegetable kingdom is thus thrown into groups, and whoever knows any one plant in that group, will have some general idea of the appearance and qualities of the whole. The use of such a classification for such as already know plants individually, is therefore obviously great, though for discovering the names of particular species, it is in its present state less convenient than the Linnæan system, for owing to the small number of plants which are yet known to botanists, the groups or classes of the natural method are far from being perfect.

Linnæus himself, with perhaps the exception of Magnol of Montpelier, was the first, who (1738,) communicated a scheme of this sort to the public, and which he modestly termed, "Fragments of a Natural Method." The next person who successfully traced the affinities of plants, was B. Jussieu, of Paris. In 1759, he displayed his method in the arrangement of the plants in the royal gardens of Trianon, near Paris. Afterwards, Michael Adanson, a pupil of Jussieu, who had travelled through part of Africa, examined all the published systems, and paid the greatest attention to the natural affinities of vegetables, published a very learned and useful work, "Familles des Plantes," in 1763. But it is to A. L. Jussieu, of the National Institute, nephew of the elder Jussieu, that the science of natural affinities owes most; and his Genera Plantarum, published in 1789, is considered "the most learned botanical work that has appeared since the Species Plantarum of Linnæus, and the most useful to those who study the philosophy of botanical arrangement." Ventenat, has lately published a commentary on the writings of A. L. Jussieu; and this author himself is now publishing a Species Plantarum, arranged according to his method. Professor Decandolle, of Geneva, considered one of the first French botanists, is also a follower of this system, in which he has made some improvements (*Theorie de la Botanique*, 1817), and he also is occupied with a Species Plantarum, arranged according to his own improvements.

195. Botanical geography, or the knowledge of the places where plants grow, (*habitationes plantarum*,) and the causes which influence their distribution over the globe, was totally neglected by the ancients. Clusius is the only botanist, who before the eighteenth century, took any pains to indicate the native countries of plants. Bauhin and Tournefort often neglected it. Linnæus is the first who gave the idea of indicating it in general works on botany, and his Floras of Sweden and Lapland are models of their kind in this respect. Since this period many excellent Floras have appeared, among which the Flora Britannica, by Sir J. E. Smith, and the Flora Française, by Professor Decandolle, may be mentioned as examples. The first grand effort at generalising the subject, was made by Humboldt, in his *Essai sur la Geographii des Plants*, &c. 1811. This essay is rich in facts, and filled, like all the works of this philosopher, with new and ingenious views of nature. In a subsequent work, *De Distributione Plantarum*, 1815, he has more especially examined the influence of elevation of surface on vegetation. Professor Decandolle, has also given some views relatively to the subject, in his Flora Française, and R. Brown, one of the first botanists in this country, in Remarks on the Botany of Terra Australis, and on the Plants of Congo. On the whole, however, this branch of botany, the most important for agriculture and gardening, and without some knowledge of which, naturalization, and even culture, must go on by mere hazard, may be regarded as still in its infancy.

With respect to *applied botany*, its history would involve that of medicine, rural œconomy, and other mixed and mechanical arts. It may therefore be deemed sufficient to refer to these arts, and especially to medicine, agriculture, and gardening, for details too numerous and minute to be here generalized. Plants, it may be observed, have in every age but the present, formed the chief articles of the *materia medica* of all countries. At present the mineral kingdom is chiefly resorted to by the practitioners of the healing art in Europe; but plants retain their grounds in other countries, and fashion, which enters into every thing, will change after exercising a certain degree of influence. The universal use of the vegetable kingdom in the dieteticks of every country; in the arts of clothing, architecture, and in short, in every branch of general œconomy, need not be enlarged on.

Fossil botany, as studied from the impressions of plants found in the secondary strata of the earth, has only lately begun to attract attention; but some essays by Schlotheim, Knor, Martin, Faujas de St. Fond, and Parkinson's *Essay on Organic Remains*, with Cuvier's works on Fossil Zoology, deserve to be mentioned.

CHAP. II.

Glossology, or the Names of the Parts of Plants.

196. All the arts and sciences require to express with brevity and perspicuity, a crowd of ideas unused in common language, and unknown to the greater part of men. Whence that multitude of terms, or technical turns, given to ordinary words which the public turn often into ridicule, because they do not feel the use of them, but which all those are obliged to make use of, who apply themselves to any study whatever. Botany having to describe an immense number of beings, and each of these beings having a great variety of organs, requires a great variety of terms. Nearly all botanists are agreed as to these terms, and in order that they may be universally understood and remain unchanged in meaning, they are taken from a dead or fixed language.

If a plant in flower is detached from the soil and surveyed externally, it may be perceived to be composed of a variety of obvious parts; such as the root, the stem, the branch, the leaf, the flower, the fruit, and perhaps the seed; and other parts less obvious, as buds, prickles, tendrils, hairs, glands, &c. These, with their modifications, and all the relative circumstances which enter into the botanical description of a plant, form the subject of the following sections.

Sect. I. **Terms used in general Description.*

197. *Outer Surface.* — 1. Glancing (*nitidus*), where the surface shines from extreme smoothness. 2. Even (*levis*), without striæ, dots, or furrows. 3. Smooth (*glaber*), without any visible hairs, bristles, or thorns. 4. Dotted (*punctatus*), fine dots perceptible to the eye, not to the touch. 5. Rough (*scaber*), small dots felt, but not seen. 6. Rugged (*asper*), where these dots are both felt and seen. 7. Hispid (*hispidus*), beset with short stiff hairs. 8. Rigid (*hirtus*), beset with moderately short hairs, but stiff. 9. Hairy (*pilosus*), beset with long single hairs. 10. Villous (*villosus*), beset with long, soft, white hairs. 11. Pubescent (*pubescens*), covered with short fine white hairs. 12. Silky (*sericeus*), a white and shining surface, from numerous and almost invisible hairs. 13. Woolly (*lanatus*), from numerous white hairs easily separable. 14. Tomentous (*tomentosus*), when fine hairs are matted together. 15. Bearded (*barbatus*), when tufts of hair appear. 16. Strigose (*strigosus*), when small close bristles are thickest at the lowest part. 17. Stinging (*urens*), where a burning sensation is induced by small hairs. 18. Fringed (*ciliatus*), where a row of hairs, equally long, is set on the margin. 19. Warty (*papillosus*), when there are small fleshy warts. 20. Pustular (*papulosus*), when there are small dimples or cavities. 21. Muricated (*muricatus*), when armed with small short spines. 22. Glutinous (*glutinosus*), when covered with slimy matter, soluble in water. 23. Viscid (*viscidus*), when covered with a viscid resinous matter. 24. Striated (*striatus*), when the surface is finely streaked. 25. Furrowed (*sulcatus*), when the streaks become deep.

198. *State of Vegetation.* — 1. Germination (*germinatio*), the swelling of the seeds, and the evolution of the tender leaves. 2. Vernation (*frondescentia, vernatio*), when the swollen buds of trees and shrubs unfold their leaves. 3. Sleep (*somnus*), the collapse of some leaves during the evening and night. 4. Defoliation (*defoliatio*), the falling off of the leaves. 5. Virginity (*virginitas*), the state which immediately precedes the unfolding of the flower-buds. 6. Expansion (*anthesis*), the perfect expansion of the flowers. 7. Estivation (*æstivatio*), the period of perfection in the flower. 8. Fructification (*fructificatio*), the period at which the anthers give off their pollen to the neighbouring parts. 9. Caprification (*caprificatio*), the impregnation without the immediate agency of the plants themselves. 10. Watchings (*vigiliæ*), the opening and shutting of flowers at particular times. 11. Grossification (*grossificatio*), the increase of the future fruit. 12. Maturation (*maturatio*,) the ripening of the fruit. 13. Dissemination (*disseminatio*), the scattering abroad of the fruit after it becomes ripe.

Sect. II. *Terms used in particular Description.*

199. *Seed.* — 1. Seed (*semen*). The part by which plants are propagated. 2. Cotyledons (*cotyledones*). The parts which compose the substance of the seed. 3. Corcle, (*corculum*). The rudiment of the future plant, which lies between the cotyledons. 4. Rostel (*rostellum*), descends from the corcle to the earth. 5. Plumule (*plumula*), ascends from the corcle. 6. External membrane (*tunica externa*). 7. Internal membrane (*tunica interna*). 8. Scar, or eye (*hilum*), the point to which the umbilical cord is attached. 9. Umbilical cord (*funiculus umbilicalis*), connects the seed until it be perfectly ripe.

200. *Arillus.* — Arillus is a soft membrane extending over the seed. 1. Succulent (*succulentus, baccatus, carnosus*), thick and fleshy. 2. Cartilaginous (*cartilaginosus*), firm and thick. 3. Membranaceous (*membranaceus*), thin and transparent. 4. Halved (*dimidiatus*). Half the seed covered. 5. Torn (*lacerus*), when irregularly laciniated. 6. Capped (*calyptratus*). Covering the top of the seed. 7. Retiform (*reticulatus*), resembling a fine web.

201. *Pappus.* — Pappus, the hairy or membranous calyx of each particular floret inclosed in a common perianth. 1. Sessile (*sessilis*), resting immediately on the top of the seed. 2. Stipitate (*stipitatus*), on a pedicle. 3. Abiding (*persistens*), closely adhering to the seed. 4. Caducous (*caducus*, seu (or) *fugax*), falls off when the seed ripens. 5. Calycled (*calyculatus* s. *marginatus*), when a membranous rim rises over the seed: of this there are two kinds, *a.* Whole (*integer*), when the rim is entire, and surrounds the top of the seed. *b.* Halved (*dimidiatus*), when the rim surrounds only half the top of the seed. 6. Chaffy (*paleaceus*), when small leaves stand like scales round the top of the seed. 7. Awned (*aristatus*), when from one to three setæ are placed around the top of the seed. 8. Stellate (*stellatus*), having five long setæ radiating from one point on the top of the seed. 9. Hairy (*capillaris* s. *pilosus*), formed of many fine

white hairs. 10. Setaceous (*setaceus*), of many ridged bristles, not white. 11. Fringed (*ciliatus*). Of hard setæ set with short hairs. 12. Plumose (*plumosus*). Composed of fine setæ set with fine hairs. 13. Uniform (*uniformis*). When all the pappi in the same perianth are of the same form. 14. Unlike (*difformis* s. *dissimilis*). Where the pappi differ in form. 15. Doubled (*geminatus*). When the pappus is twofold. 16. Tuft (*coma*). A pilose pappus attached to the seeds contained in a pericarp. 17. Tail (*cauda*). A thread-like body, which appearing on the top of the seed, or of the utriculus, is set round with hairs. 18. Beak (*rostrum*), a persistent style on the seed or pericarp. When hooked it is called a horn (*cornu*). 19. Wing (*ala*), a membrane attached to the seed or pericarp. Of this several varieties, as follows: 1. Monopterygia. Having one ala. 2. *Dipterygia* s. *bialata*. Two wings. 3. *Triptergia* s. *trialata*. Three wings. 4. *Tetraptera* s. *quadrialata*. Four wings. 5. *Pentaptera*, *polyptera* s. *quinquealata* and *multialata*. Having five or many wings. 20. Crest (*crista*), a thick wing, indented on some pericarps. 21. Ribs (*costæ* s. *juga*), prominent ridges in some pericarps. 22. Wart (*veruca*), a small round eminence on many seeds. 23. Hoariness (*pruina*), a fine white powder, that covers many seeds and pericarps. 24. Hair Net (*capillitium*), reticulated hairs, which fasten the seeds of some species of fungi. 25. Springer (*elater*), a filiform elastic body, found on the seeds of the Musci hepatici. Called also Catenula. 26. Ground Bristle (*trichidium pecten*), a tender hair that supports the seed in some fungi.

202. *Root.* — The root (*radix*) is situated at the inferior extremity of the plant, and supplies it with nourishment. In botanical language, every part covered by the earth is a root: in physiology, the term is confined to those parts which nourish and keep the plant firm. 1. Collar (*corona*), that part of the root which forms the base of the stem, or from which the herb originates. 2. Rhizoma (*rhizoma*), the thick part of a biennial or perennial root. 3. Radicles (*radiculæ*), the hair-like absorbent vessels of the roots. 4. Fibrillæ (*fibrillæ*), the thread-like processes of the roots. 5. Tuber (*tuber*), the fleshy part of the root, which produces parts similar to itself, and then dies. 6. Bulb (*bulbus*), a fleshy-coated mass attached to small radicles. 7. Shoots (*soboles*), a horizontal prolongation of the roots producing new parts. Roots are divided by botanists into classes, the distinctions of which are founded on the above parts. The root is also characterised in the following manner: 8. Woody (*lignosa*). 9. Fleshy (*carnosa*). *Daucus carota*. 10. Spindle-shaped (*fusiformis*). *Daucus carota*. 11. Bitten (*præmorsa*). 12. Contorted (*contorta*). 13. Flat (*placentiformis*). *Cyclamen Europæum*. 14. Jointed (*geniculata*). *Gratiola officinalis*. 15. Scaly (*squamosa*). *Lathræa squamaria*. 16. Toothed (*dentata*). *Ophrys corallorhiza*. 17. Tufted (*comosa*), having hairy tufts at the point. *Æthusa meum*. 18. Manyheaded (*multiceps*), divided into many branches from which shoots spring. *Astragalus uralensis*. 19. Simple (*simplex*), without branches. 20. Branching (*ramosa*). 21. Perpendicular (*perpendicularis*. 22. Horizontal (*horizontalis*). 23. Creeping (*repens*), horizontal, with side branches. 24. Knobbed (*tuberculata*). *Bunium bulbocastanum*. 25. Scarred (*cicatrisata*). *Polypodium vulgare*. 26. Chaffy (*paleacea*), illustrated in many of the filices. 27. Fibrous (*fibrosa*). 28. Capillary (*capillaris*). *Scirpus annularis*. 29. Velvety (*velutina*). *Muscus frondosus*. 30. Cleft (*fissa*). *Peltidea canina*. 31. Knotty (*nodosa*). 32. Granulated (*granulata*). *Saxifraga granulata*. 33. Testiculated (*testiculata*). *Orchides*. 34. Palmated (*palmata*), knobs divided at the point hanging down. *Orchis*. 35. Fingered (*digitata*), a single knob compressed and divided. *Dioscoria* alternifolia. 36. Bundled (*fasciculata*). *Ranunculus ficaria*. 37. Depending (*pendula*). *Spiræa filipendula*. 38. Articulated (*articulata*), one knob growing out of another. 39. Necklacelike (*moniliformis*). *Spiræa filipendula*. 40. Imbricated (*imbricata* s. *squamosa*). 41. Coated (*tunicata*). *Allium cepa*. 42. Nestling (*nidulans*), when small bulbs, of which the whole bulb is composed, appear under the external membrane. 43. Aggregated (*aggregata* s. *composita*), when several bulbs are conjoined at their bases. 44. Twofold (*geminata*). *Fritillaria pyrenaica*. 45. Doubled (*duplicata*), when one bulb stands over and grows out of another. 46. Supported (*suffulta*), when the root stands at a distance from the bulb, and is distinctly separated from it. *Ixia punicea*. 47. Divided (*divisa*), that branches out of the earth. *Fucus digitatus*. 48. Byssuslike (*byssacea*), having a woolly appearance. 49. Shieldlike (*scutiformis*). *Lichen floridus*. 50. Fading (*evanescens*), when the root insinuates itself into and is lost in wood, as in the *Viscum album*.

203. *Intermediate Stem.* — Intermediate stem (*caudex intermedius*), that part which belongs neither to the root nor stem, and is peculiar to some plants. 1. Root-shaped (*radiciformis*), that has the appearance of a tuberous root, but only partially concealed by the earth. 2. Turnip-shaped (*napiformis*). *Brassica oleracea gongylodes*. 3. Bulbous (*bulbosus*). *Ranunculus bulbosus*. 4. Stem-like (*cauliformis*). *Lilium bulbiferum; Cyclamen Europæum*.

204. *Ascending Stem.* — Ascending stem (*caudex ascendens*), that part above the soil.

1. Stock (*cormus*), supports the whole. Stem (*caudex*), simple perennial rod. As in palms and filices. 2. Trunk (*truncus*), peculiar to trees and shrubs:—*a*. Tree-like (*arboreus*). *b*. Shrubby (*fruticosus*). 3. Stalk (*caulis*), herbaceous, sometimes woody; properly confined to herbaceous plants. a. *With respect to the Branches.*—1. Distichous (*distichus*), when the opposite branches stand on the same plane. 2. Brachiate (*brachiatus*), when opposite angles stand at right angles to each other. 3. Panicled (*paniculatus*), when a stem is divided at the point into many leaves and flowering branches. *Rumex acetosella.* 4. Fastigiate (*fastigiatus*), when the branches are of such different lengths as to be of the same height. 5. Compact (*coarctus*), where the tips of the branches are bent inwards to the stem. 6. Spreading (*patens*), when the branches are nearly at right angles to the stem. 7. Diverging (*divergens*), when the branches form a right angle. 8. Divaricated (*divaricatus*), where the branches form an obtuse angle with the superior part of the stem. 9. Deflected (*deflexus*), when the branches hang down, and form an arch. 10. Reflected (*reflexus*), when the branches run nearly parallel with the stem. 11. Retroflected (*retroflexus*), when the branches are bent on every side. — b. *With respect to Direction.* 12. Parasitical (*parasiticus*), when the plant grows on some other plant. *Orobanche.* 13. Bent upwards (*adscendens*), when the extremity of a stem, which lies on the ground, is erect. 14. Decumbent (*decumbens*), where the upper part of an erect stem is bent towards the ground. 15. Sarmentose (*sarmentosus*), a procumbent stem sending out roots at certain intervals. 16. Rooting (*radicans*), when the stem sends out roots by which it adheres,as in *hedera helix*. —c. *With respect to covering.* 17. Ramentaceous (*ramentaceus*), covered with membranous scales, as in *erica ramentacea*. 18. Stipulate (*stipulatus*), furnished with stipulæ in the axillæ of the leaves, as in *vicia sativa*. 19. Perfoliate (*perfoliatus*), where the stem passes through the leaf. 20. Winged (*alatus*), when a leaf-like membrane runs along the stem. 21. Bulbiferous (*bulbifer*), having bulbs on the axillæ of the leaves, as in *lilium bulbiferum*. 22. Prickly (*aculeatus*), where there are small points which come off with the rind. 23. Spinous (*spinosus*), where the pointed protuberances do not come off with the rind. — d. *With respect to figure.* 24. Articulated (*articulatus*), where the stem has knobs at the joints, as in *cactus*. 25. Jointed (*geniculatus*), when a stem has regular knobs not seated on the joints. 26. Straw (*culmus*), the stem of grasses. 27. Naked (*nudus*), having no vagina or leaves. 28. Geniculated (*geniculatus* s. *infractus*), where the first joint is prostrate, and the rest erect.

205. *Scape.* — Scape (*Scapus*), an herbaceous stem proceeding from the ground, which bears flowers but no leaves.

206. *Stipe.* — Stipe (*Stipes*), the stem of filices, fungi, and palms. *a*. In filices, 1. Chaffy (*paleaceus*), covered with dry membranous scales. 2. Scaly, (*squamosus*) covered with foliaceous scales. —*b*. In fungi, 1. Squarrose (*squarrosus*), covered with scales reflected at their points. 2. Raised (*peronatus*), laid over with a woolly substance, which gradually passes into a kind of meal.

207. *Shoot.* — Shoot (*surculus*), the stem of the leaves of mosses. 1. Pinnated (*pinnatus*), having on opposite sides two similar branches, at similar angles to the stem. 2. Bipinnated (*bipinnatus*), when the branches of a pinnate shoot are divided in the same manner as the original shoot. 3. Proliferous (*prolifer*), when in bipinnated shoots a new stem springs out of the old one, as in *hypnum proliferum*.

208. *Sarment.* — Sarment (*sarmentum*), a filiform stem that springs from the root, sends off a new root, and forms a new plant. *Fragaria vesca*. 1. Sucker (*stolo*), a creeping radical stem, covered at its under surface with small roots, and bearing leaves at its point, from which a new plant rises. *Ajuga reptans.*

209. *Leaf Stalk.* — Leaf stalk (*petiolus*), the stalk of the leaf. 1. Glandular (*glandulosus*), seated on a gland. *Salix pentandra*. 2. Common (*communis*), bearing several small leaves. 3. Partial (*partialis* s. *communis*), bearing in a compound leaf, the leaflets.

210. *Flower-Stalk.* — Flower-stalk (*pedunculus*), supports the flowers. 1. Simple (*simplex*). 2. Partial (*partialis*), all the particular flower-stalks stand on a general flower-stalk. The particular flower-stalks are called *pedicelli*, *pediculi*. 3. Scapiform (*scapiformis*), when an upright leafless flower-stalk, bearing many flowers, stands at the base of the plant. 4. Radical (*radicalis*). 5. Petiolar (*petiolaris*), inserted into the leaf-stalk. 6. Axillary (*axillaris*), fixed between the stem and leaves. 7. Lateral (*lateralis*), on the leafless branches, or shoots of the preceding year. *Erythroxylon.* 8. Alar (*alaris*), in the axilla of the branches. *Linum radiola.*

211. *Bristle.* — Bristle (*seta*), supports the fructification of the *musci frondosi*, and the *jungermaniæ*. 1. Terminal (*terminalis*), when it stands on the apex of the moss. 2. Axillary (*axillaris*), rising at the base of the leaves.

212. *Inflorescence.* — Inflorescence (*inflorescentia*), the way in which the flower-stalk is divided or formed.

213. *Whirl.* — Whirl (*verticillus*), when the flowers surround the stem. 1. Headed

(*capitatus*), when the flowers stand so thick as to assume a semiglobular form : *Phlomis tuberosa.* 2. Leafy (*foliosus*), when there are leaves at the base of the whirl. 3. Bracteate (*bracteatus*), when there are floral leaves or bracteæ at the whirl.

214. *Head.* — Head (*capitulum*), is formed by the flowers. *Gomphrena globosa.*

215. *Glomerule.* — Glomerule (*glomerula*), the small head of small flowers.

216. *Ear.* — Ear (*spicula* s. *locusta*), the flowers of the grasses, or of the gramineous plants, as in *scirpus sylvaticus*, *triticum*, &c. 1. Two-ranked (*disticha*), when the flowers of the spicula are placed in two opposite rows on the same level, as in *cyperus.*

217. *Spike.* — Spike (*spica*), where many flowers sit on a simple filiform flower-stalk. 1. Fringed (*ciliata*), having hairs between the flowers. 2. Conjugate (*conjugata*), when two spikes are united at the base. 3. Lateral (*lateralis*), standing on the parts of the plant which are destitute of leaves.

218. *Raceme.* — Raceme (*racemus*), when several pedunculated flowers are longitudinally attached to each other.

219. *Fascicle.* — Fascicle (*fasciculus*), where a number of simple foot-stalks of equal height, rise from several points of the stem. *Dianthus carthusianorum.*

220. *Umbel.* — Umbel (*umbella*), consists of a number of flower-stalks of equal length, that rise from the point.

221. *Rays.* — Rays (*radii*), the flower-stalks of the umbel. 1. Simple (*simplices*), where the rays bear one flower. 2. Compound (*compositi*), each ray of the umbel supports a simple umbel.

222. *Cyme.* — 25. Cyme (*cyma*), where the principal flower-stalk, and those which support the florets, do not rise from the same point, but close to each other, and are divided into irregular branches. *Sambucus nigra.*

223. *Corymb.* — Corymb (*corymbus*), an erect raceme, with its lower flower-stalks of an equal height with the uppermost.

224. *Panicle.* — Panicle (*panicula*), when many simple flowers stand on unequal branches, and on a long peduncle. 1. Disappearing (*deliquescens*), when the flower-stalk so loses itself in branching that it cannot be traced to the end.

225. *Thyrse.* — Thyrse (*thyrsus*), a condensed panicle. *Legustrum vulgare.*

226. *Spadix.* — Spadix. All flower-stalks contained in a vagina are called Spadix.

227. *Catkin.* — Catkin (*amentum* s. *julus*), a long simple stem, covered with scales, under which the flowers are concealed. In the *salices*, *coryllus*, *avellana*, &c.

228. *Mass.* — Mass (*sorus*). The small masses of seed capsules found on the fronds of those felices which carry their fructification upon the frond. *Polypodium vulgare*, *lonchitis*, *asplenium*, *pteres*, &c.

229. *Leaves.* — Leaves (*folia*), are generally membranous, sometimes succulent, greenish bodies produced on different parts of the stem.. A. Simple. — a. *Form of Apex.* 1. Acute (*acutum.*) 2. Acuminated (*acuminatum*), when lengthened out. 3. Pointed (*cuspidatum*). 4. Obtuse (*obtusum*). 5. Mucronate (*mucronatum*), when a bristly point is at the round end. 6. Bitten (*præmorsum*). *Pavonia præmorsa.* 7. Truncated (*truncatum*). *Liriodendron tulipifera.* 8. Wedge-shaped (*cuneiforme*), pointed at the base. 9. Dedaleous (*dædaleum*), with a large truncated and ragged point. 10. Emarginated (*emarginatum*), where an obtuse leaf appears to have had a piece out of its apex. 11. Retuse (*retusum*), an obtuse leaf slightly emarginated. 12. Cleft (*fissum*). — b. *Form of Base.* 13. Cordata (*cordatum*). 14. Reniform (*reniforme*). 15. Lunated (*lunatum*), curved or straight at the base, and round at the anterior parts. 16. Unequal (*inequale*), when the two sides differ. 17. Sagittate (*sagittatum*). 18. Hastate (*hastatum*). 19. Ear-shaped (*auriculatum*), two small lobes bent outwards. — c. *Form of circumference.* 20. Parabolic (*parabolicum*), round at the base, and less towards the point. 21. Elliptical (*ellipticum*). 22. Spatulate (*spatulatum*). Cucubalis *otites.* 23. Rhombic (*rhombicum*). 24. Cordate oblique (*subdimidiato cordatum*), *Begonia nitida.* 25. Pandureform (*panduræforme*). 26. Ensiform (*ensiforme*). *Iris pseudacoris.* 27. Linear (*lineare*), equally broad at the base and at the apex. 28. Awl-shaped (*subulatum*), a linear leaf with a very sharp point. 29. Needle-shaped (*acerosum*), a rigid linear leaf, that endures throughout the winter, as in the pine tribe. 30. Lobed (*lobatum*). 31. Lanceolate (*lanceolatum*). 32. Palmated (*palmatum*), when there are five or seven very-long lobes. 33. Divided (*partitum*), when the division of a roundish leaf extends to the base. *Ranunculus aquaticus.* 34. Dichotomous (*dichotomum*), the linear sections of the last leaf, which are divided into two. 35. Sinuated (*sinuatum*). *Quercus robur.* 36. Pinnatifid (*pinnatifidum*), when there are regular fissures nearly reaching to the middle rib. 37. Lyre-shaped (*lyratum*). 38. Runcinate (*runcinatum*), when the clefts of a pinnatifid leaf are pointed, and form a curve behind, as in *leontodon taraxacum.* 39. Squarroso laciniate (*squarroso laciniatum*), when the leaf is cut almost to the middle rib, and the incisions run in every direction. *Carduus lanceolatus.* — d. *Margin.* 40. Crenated (*crenatum*), when set with small

and round notches, having a perpendicular position. 41. Repand (*repandum*), when there are small sinuses, between which there are also segments of small circles. 42. Dentate (*dentatum*). 43. Duplico-dentate (*duplicato dentatum*). *Ulmus campestris.* 44. Dentato-crenate (*dentato crenatum*), when each tooth is set with small and round teeth. 45. Serrated (*serratum*), set with sharp pointed and closely placed teeth. 46. Gnawed (*erosum*), unequally sinuated. *Salvia.* — e. *Surface.* 47. Bullate (*bullatum*), when the parts raised between the veins resemble blisters. 48. Folded (*plicatum*), as in *alchemilla vulgaris.* 49. Veined (*venosum*), when the vessels rise out of the middle rib. 50. Netwise veined (*reticulato venosum*), when the veins, which rise from the middle rib, are again subdivided. 51. Ribbed (*costatum*), when veins rise from the middle, and pass in straight lines to the margin. 52. Nerved (*nervosum*), when the vessels arising from the petiolus run to the apex, as in *Laurus cinnamomum* s. *L. camphora, Tropæolum majus,* &c. 53. Coloured (*coloratum*), of some other colour than green. 54. Cowled (*cucullatus*), when the lobes of a cordate-leaf are bent towards each other. 55. Keel-shaped (*carinatum*), when the middle rib resembles a keel.—B. Compound (*composita*), when several leaves are supported on one foot-stalk. 56. Digitate (*digitatum*). 57. Binate (*binatum*), when two stand on one foot-stalk. If bent back horizontally, the leaf is called conjugate. 58. Bigeminate (*bigeminatum, bigeminum*), when a divided leaf-stalk bears two leaves at each point. *Mimosa.* 59. Ternate (*ternatum*). *Trifolium pratense, fragaria vesca.* 60. Umbellate (*umbellatum*). *Panax chrysophyllum.* 61. Pedate (*pedatum, ramosum*). *Helleborus viridis, fœtidus, niger.* 62. Pinnate (*pinnatum*), where, on an undivided leaf-stalk, there is a series of leaflets on each side, and on the same plane. 63. Super-decompound (*supra decompositum*), when a leaf-stalk, which is often divided, sustains several leaves. — f. *Position.* 64. Radical (*radicale*). *Viola odorata.* 65. Seminal (*seminale*), when the leaf grows out of parts of the seed, as in hemp. 66. Cauline (*caulinum*), attached to the chief stem. 67. Ramous (*rameum*), rising from the branches. 68. Axillary (*axillare, subalare*), when the leaf stands at the origin of the branch. 69. Floral (*florale*), when close to the flower. — g. *Substance.* 70. Membranaceous (*membranaceum*), without any pulpy matter between the membranes. In most leaves. 71. Fleshy (*carnosum*). *Sempervivum tectorium.* 72. Bilocular (*biloculare*), when a hollow lower leaf is divided by a longitudinal division into two cavities, as in *Lobilia Dortmana.* 73. Articulate (*articulatum, loculosum*), when a cylindrical hollow leaf is divided by horizontal partitions. *Juncus articulatus.* 74. Depressed (*depressum*), when the upper surface is, as it were, hollowed out. 75. Gibbous (*gibbosum, gibbum*), when both surfaces are convex. 76. Scimitar-shaped (*acinaciforme*). Sharp on one side, and broad on the other. 77. Axe-shaped (*dolabriforme*). Compressed fleshy leaf. 78. Tongue-shaped (*linguiforme*), a compressed leaf ending in a round point. 79. Deltoid (*deltoides*). 80. Warty (*verucosum*). When short leaves are truncated. 81. Hook-shaped (*uncinatum*). Bent at the point. 82. Triquetrous (*triquetrum*).— h. *Situation and Position.* 83. Opposite (*oppositifolia*). Where the leaves are opposite. 84. Dissimilar (*disparia*), when opposite leaves are differently formed, as in some species of *Melostoma.* 85. Alternate (*alterna*). 86. Scattered (*sparsa*). 87. Ternate (*ternata*), when three leaves stand round the stem. 88. Stellate (*stellata, verticellata*), as in *Galium vulgare.* 89. Tufted (*fasciculata*), when several leaves stand at one point. *Pinus larix.* 90. Distichous (*disticha*), when the leaves stand in one place on the stem. *Pinus picea.* 91. Decussated (*decussata*), when the whole length of the stem is set round with four rows of leaves. In a perpendicular view of the branches, they appear to form crosses with the leaves. 92. Imbricated (*imbricata*). — i. *Insertion.* 93. Petiolated (*petiolatum*). 94. Palaceous (*palaceum*), when the foot-stalk is attached to the margin. 95. Peltated (*peltatum*), when the foot-stalk is inserted into the middle of the leaf. 96. Sessile (*sessilis*), when there is no foot-stalk. 97. Loose (*solutum*), a cylindrical or subulate leaf, which is loosely attached to its stem. *Sedum album.* 98. Riding (*equitans*), when the base of a linear or ensiform leaf embraces the stalk. 99. Decurrent (*decurrens*). 100. Embracing (*amplexicaule*), when a sessile cordate leaf embraces the stem. 101. Connate (*connatum*), when opposite and sessile leaves are joined at their bases. — k. *Direction.* 102. Appressed (*adpressum*), when the leaf turns up and lays its upper surface to the stem. 103. Rooting (*radicans*), when the leaf strikes roots.

The leaves of the *Musci frondosi* are all membranaceous and simple, and with one exception sessile. 1. Piliferous (*piliferum*), having a hair at the apex. *Polytrichum piliferum.*

Miscellaneous Parts of the Leaf. — 1. Lobe (*lobus*), the segment of a leaf which is round at the apex, as in the *Acer.* 2. Segment (*lacinia*), the uneven segment of a leaf with an angular point. 3. Leaflet (*foliolum*), the small leaves that compose a digitate, quinate, &c. leaf. The leaf of a bi-pinnate leaf (*pinna*). Leaflet of ditto (*pinnula*). Two-paired pinnated (*pinnatum, bijugum*). Angle (*angulus*), the lacinia or segment.

230. Frond (*frons*), the leaf of the palm-tribe of *Filices, Musci hepatici*, and *Algæ*. Palms have a simple stem crowned with leaves. 1. Fan-shaped (*flabelliformis*), when a number of leaves are spread out in a circle at the apex of the stipe. 2. Peltate (*peltata*), when the foliaceous substance at the apex of the stipe is closed and entire. 3. Pinnate (*pinnata*), resembling a pinnated leaf.

The *Filices*, and those plants allied to them, have all the usual characters of leaves, with some others. 1. Pinnated with confluent foliola (*pinnata pinnis confluentibus*), pinnated and united at the base. 2. Doubly pinnated (*bipinnatifida*). 3. Barren (*sterilis*), when it bears neither flowers nor fruit, as in *Blechnum boreale*. N. B. The *Musci hepatici* have no particular characters of their fronds.

Algæ have their stipes and fronds running into each other. — 1. Foliaceous (*foliacea*), when the frond is divided into sections or folds, as in *Lichen saxatilis*. 2. Gelatinous (*gelatinosa*), when it is transparent, resembling jelly, as in *Lichen crispus*. 3. Leathery (*coriacea*). *Peltidea canina*. 4. Imbricated (*imbricata*). *Lichen parietinus*. 5. Umbilicated (*umbilicata*), when the frond is fixed to the body on which it grows, by a single cord, arising out of its under surface. 6. Orbicular (*orbiculata, stellaris*). *Lichen stellaris*. 7. Crustaceous (*crustacea*). *Lichen subfuscus*. 8. Pulverulent (*pulverulenta*). *Lepra*. 9. Filamentous (*filamentosa*). *Lichen jubatus*. 10. Simple (*simplicissima*). *Fucus saccharinus*. 11. Fruticose (*fruticosa*). *Lichen unicalis*. 12. Cup-bearing (*pyxidata, scyphifera*). *Lichen pyxidatus*.

231. Appendages or Props (*fulcra*), all those parts which differ from the root, stem, leaves, and flower, most of which serve to support plants. The particulars are to be found in the following articles.

232. Stipules (*stipulæ*), are small leaves that appear on the stem, beside the foot-stalks of leaves. Double (*geminæ*), when two are opposite. 1. Lateral (*laterales*), when they stand at the origin of the foot-stalk. 2. Extrafoliaceous (*extrafoliaceæ*), when below the origin of the foot-stalk. 3. Intrafoliaceous (*intrafoliaceæ*), above the origin of the petiolus. 4. Caducous (*caducæ*), when they fall off soon after their evolution. 5. Deciduous (*deciduæ*), when they fall off a short time before the leaves. 6. Abiding (*persistentes*), when they wither and fall with the leaves, or soon after them.

233. Rament (*ramentum*), a small leaflet of a brownish colour, which appears on all trees when the buds open, and falls off soon after. It is placed in the angles of the footstalk.

234. Floral Leaves (*bracteæ*), the leaves that are interposed between the flowers.

235. Sheath (*vagina*), is the prolongation of a leaf, which rolls itself around the stem, and forms a cylinder; as in all the grasses.

236. Spathe (*spatha*), an oblong leaf which envelopes the stem, and protects the flowers before they blow. It is common to palms, to most lilies, and arums. 1. Univalve (*univalvis*). 2. Vague (*vaga*), when, besides one large common vagina, there are smaller ones for each particular division of the flower-stem. 3. Withering (*marcescens*), when it withers at flowering. 4. Permanent (*persistens*), when it remains unchanged until the fruit ripens.

237. Roll (*ochrea*), a leafy body which surrounds the branches of the flower-stalk in some grasses, as in the genus *Cyperus*. 1. Foliaceous (*foliacea*), when it ends on a subulate leaf.

238. Bottle (*ascidium*), a cylindrical, hollow, foliaceous body, often furnished with a cover, which opens occasionally, and is generally filled with pure water. It is either sessile or petiolate. In *Nepenthes distillatoria*.

239. Bladder (*ampulla*), a round, hollow, closed body, found at the roots of some water-plants. Their form in some fuci is very singular.

240. Strap (*ligula*), a small membranous leaflet at the margin of the vagina, and at the base of the leaf. 1. Truncated (*truncata*), when it terminates in a transverse line. 2. Acuminated (*acuminata*), when it has a long projecting point. 3. Decurrent (*decurrens*), when small and running down the inside of the vagina.

241. Involucre (*involucrum*), consists of leaves differing from the proper leaves of the plant, which surround and enclose one or more flowers before they are evolved. It exists chiefly in the umbelliferous plants. 1. Common (*universale*), when it encloses all the flower-stalks. 2. Partial (*partiale*), when it only encloses the partial umbels. 3. Halved (*dimidiatum*), when it only encloses half the stem. 4. Pendent (*dependens*), when the leaflets hang down.

242. Fungi. — Fungi are distinguished by parts totally differing from those of other plants. 1. Wrapper (*volva*), a thick fleshy membrane which surrounds the young and unexpanded fungus, and afterwards remains close upon the ground. It varies in external appearance. 2. Ring (*annulus*), a thin membrane which surrounds the stalk

like a ring. At first it is connected with the pileus, and afterwards it forms a distinct part. — 1. Erect (*erectus*). When the ring is merely fixed below. 2. Inverted (*inversus*). The reverse of the last. 3. Sessile (*sessilis*). When attached by one side. 4. Mobile (*mobilis*). When it can be pushed up and down, as in *Agaricus antiquatus*. 5. Permanent (*persistens*). When it exists as long as the fungus. 6. Fugacious (*fugax*). When it disappears on the developement of the fungus. 7. Cobweb-like (*arachnoideus*). When composed of a very fine membrane. — 3. Cap (*pileus*), the top of the fungus, supported by the stalk. It generally contains the organs of generation. — 1. Flat (*planus*). With a plane surface. 2. Round (*convexus*). 3. Hollow (*concavus*). Depressed above. 4. Bossed (*umbonatus*). When there is a prominent point in the centre. 5. Bell-shaped (*campanulatus*). Wide below and convex above. 6. Squarrose (*squarrosus*). When the scales stand up from the surface. 7. The parts of the pileus are as follows: *a*. The boss (*umbo*). A small protuberance in its centre. *b*. Gills (*lamellæ*). Thin foliaceous membranes on the inner side of the mushroom. They contain the capsule of the seed. 1. Two-rowed (*biseriales*). When a long and short gill alternate. 2. Three-rowed (*triseriales*). When two short gills stand between two long ones. 3. Branched (*ramosæ*). When several gills unite. 4. Decurrent (*decurrentes*). When the gills run down the stalk. 5. Venous (*venosæ*). When they are so small as to appear merely as large veins. *c*. Pores (*pori*.) Small holes on the under side of the *Boleti*. *d*. Prickles (*aculei, echini*). Projecting points on the genus *Hydnum*, which contain the organs of generation. *e*. Warts (*papillæ*). Small protuberances on the under surface, which also contain the organs of generation.

243. Little Cap (*cyphella*), a peltated cavity, with a raised rim. In some *Algæ*.

244. Envelope (*peridium*), a thin membrane on some fungi, under which the seeds lie. 1. Simple (*simplex*), a single membrane. 2. Double (*duplex*), two membranes. 3. Circumcised (*circumcissum*), when the upper is separated equally round from the under part; as in *Arcyria*.

245. Cover (*indusium*), the tender membrane that surrounds the *sorus* in the *Filices*, and is rent on the bursting of the seed vessels. 1. Flat (*planum*), as in the *Polypodium*. 2. Peltate (*peltatum*), when the membrane is flat, and attached to the seed by a thin membrane. 3. Horny (*corniculatum*), when it is cylindrical and hollow, and encloses the parts of fructification, as in the *Equisetum*. 4. Urceolate (*urceolatum*), when it has nearly the appearance of a cylindrical cup, as in *Trichomanes*. 5. Bivalve (*bivalve*), when it separates into two parts, as *Hymenophyllum*. 6. Continuous (*continuum*), when it proceeds uninterruptedly along a produced *sorus*. *Pteris, Blechnum*. 7. Superficial (*superficiale*), when it consists of the superior membrane of the leaf, as *Scolopendrum*. 8. Marginal (*marginale*), when it consists of the membrane of the margin of the leaf, as in *Adiantum*.

246. Tendril (*cirrhus*), a filiform body which some plants possess, and by which they attach themselves to some support. They are commonly spiral. 1. Axillary (*axillaris*). 2. Foliar (*foliaris*), when it springs from the points of the leaves. *Gloriosa superba*. 3. Petiolar (*petiolaris*), when it stands on the point of the common foot-stalk, a compound leaf, as in the *Vicia*. 4. Peduncular (*peduncularis*), when it rises out of the stalk. 5. Convolute (*convolutus*), when it winds regularly round some prop. 6. Revolute (*revolutus*), when it winds irregularly round.

247. Bud (*gemma*), that part of the plant which contains the embryo, leaves, and flowers. 1. Involute (*involuta*), when the edges of the leaves are turned inwards, as in *Humulus lupulus*. 2. Revolute (*revoluta*), when rolled outwards, as in the *Salices*. 3. Obvolute (*obvoluta*), when two simply closed leaves, without being rolled, embrace the half of each other. *Salvia officinalis*. 4. Convolute (*convoluta*), when the leaves are rolled up spirally. 5. Conduplicate (*conduplicata*), when they lie parallel to each other, as in the *Fagus sylvatica*. 6. Circinal (*circinata*), when the whole leaf is rolled up, so that the outside is within, and the inside without, as in the *Filices*.

248. Moss Bud (*propago*), a round or long body from some plants, which becomes a new one, as in the mosses.

249. Knot (*gongylus*), a hard round body, which falls off upon the death of the parent plant, and becomes a new one, as in *Fuci*.

250. Gland (*glandula*), a round body, which serves for transpiration and secretion, and which is generally placed on the leaves or stem.

251. Thorn (*spina*). A strong sharp projection, which does not come off with the bark, as in the *Prunus spinosa*.

252. Prickle (*aculeus*). A persistent projection which comes off with the bark. *Rosa centifolia*.

253. Awn (*arista*). A pointed beard which sits on the flower of the grasses.

254. Hair (*Pilus*). A fine slender body, which is an organ of transpiration. — The varieties are as follow: 1. Wool (*lana*). When it is crooked and soft. 2. Fine hair (*villus*). Very fine and soft. 3. Bristle (*striga*). Very stiff. 4. Hook (*hamus*).

Stiff and crooked at the point. 5. Double hook (*glochis*). Divided at the point, and each division bent backwards.

255. **Flower** (*Flos*). The part of the plant which is composed of the organs of generation and the enclosing parts. — 1. Simple (*simplex*). *a.* Naked (*nudus*). When there is neither a corolla nor a calyx. *b.* Apetalous (*apetalus.*) When no corolla. *c.* Aphyllous (*corollaceus, aphyllus*). When no calyx. *d.* Hermaphrodite (*hermaphroditus*). Where there are stamens and pistils. *e.* Female (*fœmineus*). Where there are no stamina. *f.* Male (*masculus*). Where there is no pistil. *g.* Neuter (*neuter*). Neither stamens nor pistils. — 2. Compound (*compositus* vel *communis*). *a.* Semifloscular (*semiflosculosus*). When they consist of tongue-shaped florets. *b.* Discoid (*discoideus, flosculosus*). When they consist of tubular florets. *c.* Radiate (*radiatus*). When the tubular florets are in the centre, and the tongue-shaped florets are in the circumference. The centre is called the disc (*discus*); and the circumference the radius. *d.* Semiradiate (*semiradiatus*). When only one side is composed of tongue-shaped florets.

The **Flowers** of **Mosses** are only visible with a magnifying glass, and differ from those of other plants. 1. Gemmiform (*gemmiformis*). Is seated between the leaves, and resembles a swollen bud. 2. Capituliform (*capituliformis*). A spherical foliaceous flower, raised on a peduncle. 3. Disciform (*disciformis*). Is flat and composed of broad leaves, seated at the top of the stem; as in *Polytrichum commune*.

256. **Calyx** (*calyx*). Is composed of all the coloured leaves which surround the corolla or parts of fructification. 1. Perianth (*perianthium*). That species of calyx which immediately encloses a flower. *a.* Abiding (*persistens*). Remains after the flower, as in *Hyoscyamus niger*. *b.* Deciduous (*deciduum*). Falls off with the flower, as in *Tilia Europæa*. *c.* Withering (*marcescens*). Withers after the flower; but does not fall off. *Prunus Armeniaca*. *d.* Caducous (*caducum*). Falls off before the flowers, as in *Papaver somniferum*. *e.* Parted (*partitum*). When divided to the base. *f.* Labiate (*labiatum, bilabiatum*). When divided into two laciniæ, as in *Salvia officinalis*. *g.* Colored (*coloratum*). When of a different colour than green. — 2. Glume (*gluma*), the peculiar calyx of grasses. It contains several flowers, the leaves of which are called valves (*valvulæ*). *a.* Univalve (*univalvis.*) *Lolium perenne*. *b.* Colored (*colorata*). Of any color but green. — 3. Common perianth (*anthodium*). A calyx which contains many flowers, as in *Leontodon taraxacum*. *a.* Simple (*simplex*). When the flowers are surrounded by a single row of leaves. *b.* Squarrose (*squarrosum*). When the leaflets are bent back at the points. *c.* Scariose (*scariosum*). When the leaflets are hard and dry, as in *Centaurea glastifolia*. *d.* Muricated (*muricatum*). When the margins of the foliola are set with short stiff prickles. *e.* Thorny (*spinosum*). When each leaflet is furnished with a thorn. *f.* Turbinated (*turbinatum*). When it has the form of a top. 4. Perichætium (*perichætium*). The peculiar calyx of mosses, of a very minute size.

257. **Corolla** (*Corolla*). The small colored leaves surrounding the interior parts of the flowers, and enclosed by the calyx. 1. Monopetalous (*monopetala*). *a.* Tubular (*tubulosa*). *b.* Clubbed (*clavata*). Bellied and closed at the aperture. *c.* Campanulate (*campanulata*). *d.* Cup-shaped (*cyathiformis.*) Wider from below. *e.* Urceolate (*urceolatum*). A short cylinder expanding to a wide surface. *f.* Infundibuliform (*infundibuliformis*). Resembling a funnel. *g.* Salver-shaped (*hypocrateriformis*). Having a broad rim. *h.* Ligulate (*ligulata*). Short, and suddenly ending in an oblong expansion. *i.* Ringent (*ringens*). *Salvia officinalis*. Resembling the open mouth of an animal. *k.* Masked (*personata*). When both segments of a ringent flower are pressed together. *Antirrhinum majus*.—2. Polypetalous (*polypetala*). *a.* Rose-like (*rosacea*). When pretty round petals, without any unguis at their base, form a corolla. *b.* Mallow-like (*malvacea*). When five petals unite at the base, and appear to be monopetalous. *c.* Cruciform (*cruciata*). When four petals which are much produced at their bases stand opposite to each other, as in *Sinapis alba*. *d.* Pink-like (*caryophyllacea*). When five petals are much elongated at their bases, and stand on a monopetalous calyx, as in *Dianthus caryophyllus*. *e.* Liliaceous (*liliacea*). When there are six petals without any calyx. Sometimes there are only three petals, and at other times the petals form a tube at the base. *f.* Papilionaceous (*papilionacea*). When four petals differing in figure stand together, as in *Pisum sativum*. The following are the parts: 1. Standard (*vexillum*). The uppermost and longest petal, which is commonly the largest. 2. Wings (*alæ*). The petals that stand under the vexillum. 3. Keel (*carina.*) The lowest petal, which stands under the vexillum, and contains the germen, the stamens, and pistils. — *g.* Orchideous (*Orchidea*). When composed of five petals, of which the undermost is long and sometimes cleft; the remaining four are bent towards each other.

258. **Petal** (*petalum*). A single division of the corolla. When plane, the upper part is called *lamina*, and the under part *unguis*. The following are the par-

ticular parts of the monopetalous corolla. 1. Tube (*tubus*). When the under part is hollow and equally thick. 2. Border (*limbus*). The opening of the corolla, especially when bent back. 3. Lobes (*laciniæ, lobi*), are described according to their figure, number, and other circumstances. 4. Helmet (*galea*). The upper arched lobe of a ringent or masked corolla. 5. Gape (*rictus*). The space, in ringent flowers, between the helmet and the under lip. 6. Throat (*faux*). The opening of the tube in a ringent corolla. 7. Palate (*palatum*). The arch of the under lip in a personate corolla, so elevated as to close the faux. 8. Beard (*barba, labellum*). The under lip of a ringent or personate corolla. 9. Lips (*labia*). Are the divisions of a labiate corolla. The *galea* and *barba* are so called by some botanists. 10. The *corolla* of mosses differs in appearance from that of other plants. It is confined to the female moss, and remains attached until the ripening of the fruit, when it assumes an entirely different appearance. The under part is called the *vaginula*, and the upper the calyptre (*calyptra*).

259. Nectary (*nectarium*). Every body on a flower which does not resemble any other parts. They are of three kinds; 1. Those that secrete honey. 2. Those that receive it. 3. Those that protect the various parts of the plant. — 1. Those that do secrete honey are glands (*glandulæ*), scales (*squamæ nectariferæ*), and pores (*pori nectariferi.*) — 2. Those that receive and preserve the honey are numerous. *a.* Hood (*cucullus*), a hollow bag separated from every other part of the flower, as in *Aconitum*. *b.* Tube (*tubus*). A cylindrical body constantly attached to the flower, as in *Pelargonium*. *c.* Pit (*fovea.*) A cavity in any part of the flower. *d.* Fold (*plica*). An oblong groove formed by the bending inwards of the corolla. *e.* Spur (*calcar*). A horn-shaped production of the corolla, containing honey, as in *Viola odorata*. — 3. Those that protect the various parts of the plant are as follow: *a.* Arch (*fornix*). The small elongation of the corolla, which commonly covers the stamens, or is seated at the aperture of the corolla. *b.* Beard (*barba*). A number of short hairs situated at the bottom of the flowers, on the petals, or at the opening of the calyx or corolla. *c.* Thread (*filum*). A thick tender body found at the bottom of the flower. *Passiflora Periploca*. *d.* Cylinder (*cylindrus*). A thin body that surrounds the pistil, and supports the stamens, as in *Swietenia*. *e.* Crown (*corona*). A very variable body, generally resembling the corolla.

260. Stamens (*stamina*). Are bodies composed of different parts which contain the dust or pollen essential for fructification. 1. Filament (*filamentum*). A long body that supports the anther. 2. Anther (*anthera*). A cellular body that contains the pollen. 3. Pollen (*pollen*). A very fine dust contained in the anther.

261. Pistil (*pistillum*). Stands in the middle of the stamens, and is also essential to fructification. 1. Germen (*germen*). The lowest part of the pistil, and the rudiment of the fruit. 2. Style (*stylus*). Is a small stalk seated upon the germen. 3. Stigma (*stigma*). The top of the style.

262. Fruit (*fructus*). Succeeds the flowering, and is of various kinds. 1. Seeds (*semen*). (See 191.) 2. Pericarp (*pericarpium*). *a.* Bladder (*utriculus.*) A thin skin that contains a single seed; as in the *Adonis, Thalictrum, Galium,* and *Amaranthus*. The seed is connected by the umbilical cord. *b.* Winged fruit (*samara*). A pericarp which contains one or two seeds, and is either partially or completely surrounded by a thin transparent membrane. Examples of it are *Ulmus, Acer, Fraxinus, Betula*. *c.* Follicle (*folliculus*). An oblong pericarp filled with seeds, and bursts longitudinally on one side. It is usually double. *d.* Capsule (*capsula*). A pericarp consisting of a thin coat, which contains many seeds. Its parts are, 1. The partition (*dissepimentum*); 2. the cells (*loculamenta*); 3. the *columella*, that passes through the capsule; 4. the valves (*valvula*); and 5. the suture (*sutura*). *α.* Tricoccous (*tricocca*). When a trilocular capsule appears as if three had grown together, as in *Euphorbia, Thea viridis,* and *Ricinus*. *β.* Corticated (*corticata*). When the outer case is hard, and the inner one soft, as in the *Magnolia*. The fruit of the hepatic mosses is also called a capsule. — *e.* Nut (*nux*). A seed covered with a hard shell that does not burst, as in *Corylus avellana*. The shell is called *putamen*. *f.* Drupe (*drupa*). A nut covered with a fleshy, succulent, or cartilaginous coat. *Prunus cerasus, Amygdalus persica, Cocos nucifera, Juglans regia, Halesia*. *g.* Berry (*bacca*). A succulent fruit that contains many seeds, but never bursts, as in *Ribes grossularia, Garcinia mangostana, Hedera helix*. *h.* Apple (*pomum*). A fleshy fruit, having a perfect capsule for the seed in its centre. *Pyrus malus, Pyrus communis,* &c. *i.* Pumpkin (*pepo*). A succulent fruit, having its seeds attached to the inner surface of the rind, as in *Cucumis sativus*. *k.* Silique (*siliqua*). A dry, elongated pericarp, consisting of two valves, to the inner margins of both sutures of which the seeds are attached, as in *Sinapis alba*, &c. When it is broad, it is called silicule (*silicula*). *l.* Legume (*legumen*). A dry, elongated pericarp, consisting of two valves, to the margins of the under suture of which the seeds are attached. *α.* Torolose (*torolosum*). When both valves are round and thick. *m.* Lo-

ment (*lomentum*). An elongated pericarp, which never bursts. It is divided into small cells, each of which contains a seed attached to the under suture. η. Case (*theca*). The fruit of the frond of mosses. It opens in the middle with a lid. α. Calyptre (*calyptra*). A tender skin that covers the top of the theca. β. Lid (*operculum*.) A round body that closes the theca, and falls off when the seed ripens. γ. Fringe (*fimbria, annulus*), a narrow, sinuated, and dentated membrane, that lies within the operculum, and serves to throw it off from the theca. δ. Mouth (*peristoma, peristomium*.) The membranaceous rim that surrounds the mouth of the theca. ε. Epiphragm (*epiphragma*). The thin membrane which stretches over the mouth of the theca, in the genus *Polytrichum*. Seed-column (*sporangidium, columnula*). A slender filament passing through the middle of the theca, and supporting the seed. θ. Apophysis (*apophysis*). A fleshy body that is placed at the base of the theca. There are also other productions of the parts of fructification, which receive particular names, as they differ from the true pericarp. α. Strobile (*strobilus*). A catkin, the scales of which have become woody. β. False capsule (*capsula spuria*). As in *Rumex*. γ. False nut (*nux spuria*). When the calyx becomes hard. δ. False drupe (*drupa spuria*). Where a nut is half sunk in a fleshy receptacle, as in the *Taxus baccata*. ε. False berry (*bacca spuria*). When the foliola of a catkin become fleshy, and assume the appearance of a berry.

263. Base (*basis*), the part on which the flower and the fruit stands. 1. Receptacle (*receptaculum*), an extended body, on which the parts of fructification stand. *a.* Simple (*proprium*). Not much raised, as in *Fragaria vesca*. *b.* Common (*commune*). More extended, and contains many flowers. — 2. Fruit-bed (*thalamus*), an extended body that encloses and conceals the fruit. If minutely divided, the seed cases may be seen by the help of a microscope. *a.* Target (*pelta*). A round or oblong fruit-bed, chiefly found in the genus *peltidea*. *b.* Shield (*scutella*). A plate-shaped fruit-bed, common to the *Algæ*. *c.* Tubercle (*tuberculum*). A convex fruit-bed, without a raised margin, also in the *Algæ*. *d.* Trica (*trica, gyroma*). Having the appearance of a saucer. *e.* Lirella (*lirella*). A linear fruit-bed furrowed in the middle. In the genus *Opegrapha*. *f.* Cistilla (*cistilla*). Shaped like a ball, within which is a powdery substance. *g.* Orbicule (*orbiculus*). A round fruit-bed, compressed on the sides, as in *Nidularia*.

Chap. III.

Phytography, or the Nomenclature and Description of Plants.

264. Before botany became a regular science, plants were named as individual beings, without regard to any relation which they had to one another. But from the great number of names to be retained on the memory, and the obvious affinities existing among certain individuals or natural families, some method was soon found necessary, and it was then deemed requisite to give such composite names as might recal to mind something of the individuals to which they were applied. Thus we have *Anagalis flore cæruleo*. *Mespilus aculeata pyrifolia*, &c. But in the end the length of these phrases became inconvenient, and Linnæus, struck with this inconvenience, proposed that the names of plants should henceforth consist of two words only, the one the generic or family name, and the other the specific or individual name.

The names of classes and orders were originally primitive, or without meaning, as the *Grasses* of Tragus, *Poppies* of Bauhin, &c.; and afterwards so compounded as to be long and complex, as the *Polloplostemonopetalæ*, *Eleutheromacrastemones*, &c. of Wachendorf. Linnæus decided, that the names of classes and orders should consist of a single word, and that word not simple or primitive, but expressive of a certain character or characters, found in all the plants which compose it.

In applying names to plants, three rules are laid down by botanists: 1st. That the languages chosen should be fixed and universal, as the Greek and Latin. 2d. That these languages should be used according to the general laws of grammar, and compound words always composed from the same language, and not of entire words, &c. 3d. That the first who discovers a being, and enregisters it in the catalogue of nature, has the right of giving it a name; and that that name ought to be received and admitted by naturalists, unless it belong to a being already existing, or transgress the rules of nomenclature. Every one that discovers a new plant may not be able to enregister it according to these laws, and in that case has no right to give it his name; but the botanist who enregisters it, and who is in truth the discoverer, may give it the name of the finder, if he chooses.

The whole vegetable kingdom is divided into classes, orders, genera, species, and varieties. A class is distinguished by some character which is common to many plants; an order is distinguished by having some character limited to a few plants belonging to a class; a still more limited coincidence constitutes a genus; and each individual of a genus is called a species, which continues unchanged when raised from seed. A variety is formed by an accidental deviation from the specific character, and easily returns by seed to the particular species from which it arose. We shall notice the principles and manner of naming each of these divisions.

Sect. I. *Names of Classes and Orders.*

265. Passing over the names of the classes and orders of the earlier botanists, we shall notice those only of Linnæus and Jussieu, as being exclusively used at the present time.

The names of the Linnæan classes and orders, are, as far as practicable, expressive of some common character belonging to all the plants which compose them, and consist only of one word for the class, and another for the order, both compounded from the Greek. There are exceptions, however, to the first rule in several of the classes of the sexual system, as in *Icosandria, Monoæcia, Diæcia,* which contain plants that have not the circumstances expressed in the title. Richard (*Nouv. Elem. de Bot.* 1819), has given some new names, which he proposes to substitute for the least perfect of those fixed on by Linnæus, but they are not likely to be generally received, at least in this country.

Linnæus and Jussieu agree, that in natural methods, the names of orders may be taken from such genera as may serve to recall the general relations of each tribe or order. The name of the order and generic name, however, are at no time to be precisely the same; from the manifest impropriety and confusion of arranging a thing under itself. Thus in the natural method of Linnæus, the order Palmæ has no genus of that name. In the method of Jussieu, the name of an order is composed from the name of one of the most characteristic genera of that order, as *Rosaceæ*, a natural order of dicotyledonous plants, containing the well known genus *Rosa*, &c.

Names of classes and orders are not to be derived from the habit, virtues, and sensible qualities of plants, nor from the form, situation, and other circumstances of the roots and leaves; as such appellations are not in the spirit of systematic arrangement. To this censure is subjected the *Cordiales, Dorsiferæ,* and *Succulentæ* of some botanists; the *Capillares* of Morison and Ray; the *Bulbosæ* of Cæsalpinus; the *Asperifoliæ* of Ray; and the *Verticellatæ* and *Stellatæ* of the same author.

Sect. II. *Names of Genera.*

266. The essential character of a genus is a short description of it, which contains only the character which essentially distinguishes it from every other genus. The Factitious character, which as Sir J. E. Smith observes, can never stand alone, is an essential character, but where the number of parts not of essential importance are included. All these points are admirably discussed by Linnæus in his *Philosophica Botanica*, and are enumerated (*in loco*) in Milne's Botanical Dictionary.

Botanists of the Linnæan school admit no generic names from any other language than the Greek or Latin, all others being esteemed barbarous. Without this rule we should be overwhelmed, not only with a torrent of uncouth and unmanageable words, but we should be puzzled where to fix our choice, as the same plant may have fifty different original denominations in different parts of the world, and we might happen to choose one by which it is least known.

Excellent Greek or Latin names, (according to Sir J. Smith,) are such as indicate some striking peculiarity in the genus: as *Glycyrrhiza*, a sweet root for the liquorice; *Amaranthus*, without decay, for an everlasting flower; *Helianthus*, a sun-flower; *Lithospermum*, a stony seed; *Eriocalia*, a flower with a singularly woolly base or cup; *Origanum*, an ornamental mountain plant; *Hemerocallis*, beauty of a day; *Arenaria*, a plant that inhabits sandy places; and *Gypsophila*, one that loves a chalky soil. Such as mark the botanical character of the genus, when they can be obtained for a nondescript plant, are peculiarly desirable; as *Ceratopetalum*, from the branched horn-like petals; *Lasiopetalum*, from the very singularly woolly corolla; *Calceolaria*, from the shoe-like figure of the same part; *Conchium*, from the exact resemblance of its fruit to a bivalve shell.

In all ages it has been customary to dedicate certain plants to the honour of distinguished persons. Thus *Euphorbia* commemorates the physician of Juba a Moorish prince, and *Gentiana*, immortalizes a king of Illyria. The scientific botanists of modern times have adopted the same mode of preserving the memory of benefactors to their science; and though the honor may have been sometimes extended too far, that is no argument for its total abrogation. Some uncouth names thus unavoidably deform our botanical books; but this is often effaced by the merits of their owners, and it is allowable to model them into grace as much as possible. Thus the elegant Tournefort made *Gundelia*, from Gundelscheimer; which induced Sir J. E. Smith to choose *Goodenia*, for his honoured friend Dr. Goodenough, now Bishop of Carlisle, though it has, when too late, been suggested that *Goodenovia* might have been preferable. Some difficulty has arisen respecting French botanists on account of the additional names by which their grandeur, or at least their vanity, was displayed during the existence of the monarchy. Hence *Pittonia* was applied to the plant consecrated to Pitton de Tournefort; but Linnæus preferred the name by which alone he was known out of his own country, or in learned language, and called the same genus *Tournefortia.*

Linnæus, in his entertaining book, *Critica Botanica,* (p. 79.) has in several instances, drawn a fanciful analogy between botanists and their appropriate plants, thus: " *Bauhinia,* after the two distinguished brothers John and Caspar Bauhin, has a two-lobed or twin leaf. " *Scheuchzeria,* a grassy alpine plant, commemorates the two Scheuchzers, one of whom excelled in the knowledge of alpine productions, the other in that of grasses. " *Dorstenia,* with its obsolete flowers, devoid of all beauty, alludes to the antiquated and uncouth book of Dorstenius. *Hernandia,* an American plant, the most beautiful of all trees in its foliage, but furnished with trifling blossoms, bears the name of a botanist highly favoured by fortune, and allowed an ample salary for the purpose of investigating the natural history of the Western world, but whose labors have not answered the expense. On the contrary, " *Magnolia,* with its noble leaves and flowers, and " *Dilenia,* with its beautiful blossoms and fruit, serve to immortalise two of the most meritorious among botanists. " *Linnæa,* ' a depressed abject, Lapland plant, long overlooked, flowering at an early age, was named by Gronovius after its prototype Linnæus.' " In pursuance of the same idea, *Dicksonia,* a beautiful and curious fern, is well devoted to our great cryptogamist.

Sect. III. *Names of Species.*

267. The generic name being fixed, the specific one is next to be considered. With respect to this, Rivinus was the first to contrive naming each plant in two words. But his names were meant for specific definitions, for which they are totally inadequate. Linnæus, in constructing his more accurate and full specific characters, intended the latter should serve as names, and therefore called them *nomina specifica.* When he, most fortunately for the science, and for the popularity of his whole System of Nature, invented the present simple specific names, he called them *nomina trivialia,* trivial, or for common use; but that term is now superfluous.

Specific names should be formed on similar principles to the generic ones; but some exceptions are allowed, not only without inconvenience, but with great advantage. Such as express the essential specific character are unexceptionable, as *Banksia serrata, integrifolia, dentata,* &c.; but perhaps those which express something equally certain, but not comprehended in that character, are still more useful, as conveying additional information, like *Ixora alba* and *coccinea, Scleranthus annuus* and *perennis, Aletris fragrans, Saxifraga cernua,* &c.; for which reason it is often useful, that vernacular names should not be mere translations of the Latin ones. Comparative appellations are very good, as *Banksia ericifolia, Andromeda salicifolia, Saxifraga bryoides, Milium cimicinum, Elymus Hystrix, Pedicularis Sceptrum.* Names which express the local situations of different species are excellent, such as *Melampyrum arvense, pratense, nemorosum* and *sylvaticum, Carex arenaria, uliginosa* and *sylvatica,* as well as *aquatica, maritima, rupestris, alpina, nivalis,* used for many plants. But names derived from particular countries or districts are liable to much exception, few plants being sufficiently local to justify their use. Thus *Ligusticum cornubiense* is found, not only in Cornwall, but in Portugal, Italy, and Greece; *Schwenkia americana,* grows in Guinea as well as in South America. Such therefore, though suffered to remain on the authority of Linnæus, will seldom or never be imitated by any judicious writer, unless *Trollius europæus* and *asiaticus,* may justify our naming the third species of that genus, lately brought from America, *americanus.* The use of a plant is often commodiously expressed in its specific name, as *Brassica oleracea, Papaver somniferum, Inocarpus edulis;* so is likewise its time of flowering, as *Primula veris, Leucojum vernum, æstivum* and *autumnale,* and *Helleborus hyemalis.*

When a plant has been erroneously made a distinct genus, the name so applied to it may be retained for a specific appellation, as *Lathræa, Phelypæa,* and *Bartsia Gymnandra;* which may also be practised when a plant has been celebrated, either in botanical, medical, or any other history, by a particular name, as *Origanum, Dictamnus-Artemisia, Dracunculus, Laurus Cinnamomum, Selinum Carvifolia, Carica Papaya.* In either case the specific name stands as a substantive, retaining its own gender and termination, and must begin with a capital letter.

Botanists occasionally adapt a specific name to some historical fact belonging to the plant or to the person whose name it bears, as *Linnæa borealis,* from the great botanist of the north; *Murraea exotica*, after one of his favourite pupils, a foreigner; *Browallia demissa* and *elata*, from a botanist of humble origin and character, who afterwards became a lofty bishop. In like manner *Buffonia tenuifolia*, is well known to be a satire on the *slender* botanical pretensions of the great French zoologist.

It is generally agreed among mankind, that names of countries, places, or things, sanctioned by general use, should be sacred; and the study of natural history is, from the multitude of objects with which it is conversant, necessarily so encumbered with names, that students require every possible assistance to facilitate the attainment of those names, and have a just right to complain of every needless impediment. The grateful Hollanders named the island of Mauritius after the hero, who had established their liberty and prosperity; and it ill became the French, at that period dead to such feelings, to change it, when in their power, to *Isle de France*. In our science the names established throughout the works of Linnæus, are become current coin, nor can they be altered without great inconvenience. Those who alter names, often for the worse, according to arbitrary rules of their own, or in order to aim at consequence, which they cannot otherwise attain, are best treated with silent neglect.

When, however, solid discoveries and improvements are made in the science; when species or genera have been confounded by Linnæus himself, and new ones require to be separated from them, the latter must necessarily receive appropriate appellations; as also when a totally wrong and absurd name has by mistake been given, as *Begonia capensis*. In such cases names must give place to things, and alterations proceeding from such causes must be submitted to. *Smith's Introduction, &c.* Ch. 22.

Sect. IV. *Names of Varieties and Subvarieties.*

268. A plant changed in aspect or properties, by some accidental cause, which, on being removed, the mutation disappears, and the species is restored to its original state, is called a variety. As many plants of different form and appearance as are produced from seed of the same species, are to be regarded as genuine varieties, and in all cases to be distinguished with great accuracy from the species.

In the form and disposition of the parts of each individual of the same species, there exists, in general, a constant uniformity. Different causes, however, as culture, climate, exposure, age, diseases, luxuriance or poverty of nourishment, contusions, and other circumstances, produce monstrous appearances and accidental varieties in the parts of plants.

The names which botanists give to varieties are of the simplest description; they always convey an idea of the variation which has taken place, and are used in addition to the specific name. Thus we have *Calthra palustris*, the species, and *palustris flore pleno*, the double-flowered *caltha*, &c. As a series of species are commonly numbered 1, 2, 3, &c. so the varieties of a species, are generally, for distinction sake, designated by the letters of the Greek alphabet, thus: *Brassica oleracea*, α. *Capitata.* β. *Rubra.* γ. *Sabauda.* δ. *Sabellica*, &c.

269. Subvarieties of plants are accidental modifications of varieties of a very temporary and fluctuating nature. They are generally produced by culture, and are more especially known in garden fruits, culinary vegetables, and what are called florists' flowers. The differences among subvarieties are generally so slight, or so difficult to define, as not to admit of the application of characteristic names. Botanists, therefore, pay no attention to them; but gardeners, to whom they are of considerable importance, have found it necessary in some way or other to distinguish them, and generally apply the name of the person or place by whom, or where they were originated. Thus Pyrus malus is the crab or apple. P. malus var. domestica, the cultivated apple. Pyrus malus var. domestica subvar. Downton pippin; apple raised from seed at Downton. P. m. v. d. subvar. Kirk's fame, &c. Brassica oleracea var. capitata, common white cabbage. B. o. var. c. subvar. Battersea early common cabbage; an early variety raised at Battersea. Dianthus caryophyllus, is the clove pink. D. c. var. flore pleno, is the carnation Dian. cary. var. fl. pl. subvar. Hogg's seedling, a variety of carnation raised by Hogg. D. c. fl. pl. subvar. Lady Jane Grey, a variety of carnation named after Lady Jane Grey. A refinement on this sort of nomenclature consists in adding the name of the person who originated the subvariety, to the name of the person or place after whom or which it is named; thus, Hogg's Lady Jane Grey, Duncan's Cheshire hero, &c. To raise a fine new variety of any florist's flower, to name it after some great personage, and with that name, to couple your own, is the greatest honor, says Emmerton, (*Treatise on the Auricula*,) which a florist can aspire to.

In general, it may be observed with respect to subvarieties of fruits or culinary plants, that names which indicate something of their properties, as black July-grape, June-eating-apple, &c. or such as indicate the place or time when they were originated or abound, as Deptford onion, Claremont nuptials primrose, or the Afflicted queen carnation, are preferable to mere names, as conveying ideas which may prove useful as to the qualities of the variety. Thus the first and second names convey some idea of the time of ripening; the third, some idea of the soil and climate in which the plant thrives; the fourth and fifth, the date, and consequently the age of the variety.

Sect. V. *Descriptions of Plants.*

270. For the purposes of recording and communicating botanical knowledge, plants are described by the use of language alone, or by language and figures models or dried plants, conjoined. The description of plants may be either abridged or complete. The shortest mode of abridgment is that employed in botanical catalogues, as in those of Donn or of Sweet. A complete description, according to Decandolle, ought to proceed in the following order.

1. The admitted name.
2. The characteristic phrase.
3. The synonyms.
4. The description, comprehending the organs, beginning with the root.
5. The history, that is, the country, duration, station, habitual time of foliation and exfoliation, of flowering, and of ripening the seed.
6. Application, which includes the culture and uses.
7. Critical or incidental observations.

The descriptions are, in general, written in Latin, the names in the nominative, and followed by epithets which mark their modifications, and which are not united by a verb, unless that becomes necessary to explain any circumstance which is not provided for in the ordinary form of the terms. Doubts as to the received ideas on the plant described, or any other miscellaneous matters, are to be placed under the last article.

Collections of botanical descriptions form books, which may be of different sorts, as under.

1. Monographs, or descriptions of one genus, tribe, or class, as Lindley's *Monographia Rosarum.*
2. Floras, or an enumeration of the plants of any one district or country, as Smith's *Flora Britannica.*
3. Gardens, or an enumeration, descriptive or nominal, of the plants cultivated in any one garden, as *Aiton's Hortus Kewensis.*
4. General works, in which all known plants are described, as Wildenow's *Species Plantarum*, and Persoon's *Synopsis Plantarum.*

All these classes of books may be with or without plates or figures; and these again, may be of part or of the whole plant, and colored or plain, &c. Some botanists have substituted dried specimens for figures, which is approved of in cases of difficult tribes or genera, as in the grasses, ferns, geraniums, ericas, &c.

Sect. VI. *Of forming and preserving Herbariums.*

271. The most exact descriptions, accompanied with the most perfect figures, leave still something to be desired by him who wishes to know completely a natural being. This nothing can supply but the autopsy or view of the object itself. Hence the advantage of being able to see plants at pleasure, by forming dried collections of them, in what are called herbariums.

A good practical botanist, Sir J. E. Smith observes, must be educated among the wild scenes of nature, while a finished theoretical one requires the additional assistance of gardens and books, to which must be superadded the frequent use of a good herbarium. When plants are well dried, the original forms and positions of even their minutest parts, though not their colours, may at any time be restored by immersion in hot water. By this means the productions of the most distant and various countries, such as no garden could possibly supply, are brought together at once under our eyes, at any season of the year. If these be assisted with drawings and descriptions, nothing less than an actual survey of the whole vegetable world in a state of nature, could excel such a store of information.

With regard to the mode or state in which plants are preserved, desiccation, accompanied by pressing, is the most generally used. Some persons, Sir J. E. Smith observes, recommend the preservation of specimens in weak spirits of wine, and this mode is by far the most eligible for such as are very juicy; but it totally destroys their colours, and often renders their parts less fit for examination than by the process of drying. It is, besides, incommodious for frequent study, and a very expensive and bulky way of making an herbarium.

The greater part of plants dry with facility between the leaves of books, or other paper, the smoother the better. If there be plenty of paper, they often dry best without shifting; but if the specimens are crowded, they must be taken out frequently, and the paper dried before they are replaced. The great point to be attended to is, that the process should meet with no check. Several vegetables are so tenacious of their vital principle, that they will grow between papers; the consequence of which is, a destruction of their proper habit and colors. It is necessary to destroy the life of such, either by immersion in boiling water or by the application of a hot iron, such as is used for linen, after which they are easily dried. The practice of applying such an iron, as some persons do, with great labor and perseverance, till the plants are quite dry, and all their parts incorporated into a smooth flat mass is not approved of. This renders them unfit for subsequent examination, and destroys their natural habit, the most important thing to be preserved. Even in spreading plants between papers, we should refrain from that precise and artificial disposition of their branches, leaves, and other parts, which takes away from their natural aspect, except for the purpose of displaying the internal parts of some one or two of their flowers, for ready observation. The most approved method of pressing is by a box or frame, with a bottom of cloth or leather, like a square sieve. In this, coarse sand or small shot may be placed, in any quantity. Very little pressing is required in drying specimens; what is found necessary should be applied equally to every part of the bundle under the operation.

Hot-pressing, by means of steel net-work heated, and placed in alternate layers with the papers, in the manner of hot pressing paper, and the whole covered with the equalizing press, above described, would probably be an improvement; but we have not heard of its being tried. At all events, pressing by screw presses, or weighty non-elastic bodies, must be avoided, as tending to bruise the stalks and other protuberant parts of plants.

"After all we can do," Sir J. E. Smith observes, "plants dry very variously. The blue colours of their flowers generally fade, nor are reds always permanent. Yellows are much more so, but very few white flowers retain their natural aspect. The snowdrop and parnassia, if well dried, continue white. Some greens are much more permanent than others; for there are some natural families whose leaves, as well as flowers, turn almost black by drying, as melampyrum, bartsia, and their allies, several willows, and most of the orchideæ. The heaths and firs in general cast off their leaves between papers, which appears to be an effort of the living principle, for it is prevented by immersion of the fresh specimen in boiling water."

The specimens being dried, are sometimes kept loose between leaves of paper; at other times wholly gummed or glued to paper, but most generally attached by one or more transverse slips of paper, glued on one end and pinned at the other, so that such specimens can readily be taken out, examined, and replaced. On account of the aptitude of the leaves and other parts of dried plants to drop off, many glue them entirely, and such seems to be the method adopted by Linnæus, and recommended by Sir J. E. Smith. "Dried specimens," the professor observes, "are best preserved by being fastened, with weak carpenter's glue, to paper, so that they may be turned over without damage. Thick and heavy stalks require the additional support of a few transverse strips of paper, to bind them more firmly down. A half sheet, of a convenient folio size, should be allotted to each species, and all the species of a genus may be placed in one or more whole sheets or folios. On the latter outside should be written the name of the genus, while the name of every species, with its place of growth, time of gathering, the finder's name, or any other concise piece of information, may be inscribed on its appropriate paper. This is the plan of the Linnæan herbarium."

The specimens fixed to papers are next to be arranged, and the most simple and obvious mode is that of the order of their flowering, or that in which they are gathered, and this may be adopted during the summer season, but in winter, they ought to be put into some scientific method, either natural or artificial. They may be kept in a cabinet, consisting of a collection of drawers for each order, and the relative as well as absolute size of these drawers, will depend on the proposed extent of the collection. As whether of British plants only, of hardy plants only, or of all plants introduced to this country. In the chapter on the vegetable geography will be found data for the size of the drawers under every case.

The fungi cannot, in general, be dried so as to retain the habit and character of the vegetating plant; but this defect is supplied by models, of which, excellent collections are prepared for sale by Sowerby, the well-known botanical engraver and author.

272. "One great and mortifying impediment to the perfect preservation of an herbarium arises from the attacks of insects. A little beetle, called *Ptinus fur*, is more especially the pest of collectors, laying its eggs in the germens or receptacles of flowers, and others of the more solid parts, which are speedily devoured by the maggots when hatched, and by their devastations, paper and plants are alike involved in ruin. The most bitter and acrid tribes, as euphorbia, gentiana, prunus, the syngenesious class, and especially willows, are preferred by these vermin. The last mentioned family can

scarcely be thoroughly dried before it is devoured. Ferns are scarcely ever attacked, and grasses but seldom. To remedy this inconvenience, a solution of corrosive sublimate of mercury in rectified spirits of wine, about two drams to a pint, with a little camphor, will be found perfectly efficacious. It is easily applied with a camel-hair pencil when the specimens are perfectly dry, not before; and if they are not too tender, it is best done before they are pasted, as the spirit extracts a yellow dye from many plants, and stains the paper. A few drops of this solution should be mixed with the glue used for pasting. This application not only destroys or keeps off all vermin, but it greatly revives the colors of most plants, giving the collection a most pleasing air of freshness and neatness. After several years' experience, no inconvenience has been found from it whatever, nor can any dried plants be long preserved without it. The herbarium is best kept in a dry room without a constant fire. Linnæus had a stone building for his museum, remote from his dwelling-house, into which neither fire nor candle was ever admitted, yet nothing can be more free than his collection from the injuries of dampness, or other causes of decay." *Smith's Introduction*, ch. 24.

Sect. VII. *Of Methods of Study.*

273. There are two methods of acquiring botanical knowledge, analogous to those by which languages are usually acquired. The first is the natural method, which begins with the great and obvious classes of vegetables, and distinguishes trees, grasses, &c. next individuals among these, and afterwards their parts or organs. This knowledge is acquired insensibly, as one acquires their mother tongue. The second is the artificial method, and begins with the parts of plants, as the leaves, roots, &c. ascending to nomenclature and classification, and is acquired by particular study, aided by books or instructors, as one acquires a dead or foreign language. This method is the fittest for such as wish to attain a thorough knowledge of plants, so as to be able to describe them; the other mode is easier, and the best suited for cultivators, whose object does not go beyond that of understanding their descriptions, and studying their physiology, history, and application. We shall therefore suggest what we conceive to be an easy and expeditious mode for gardeners to know plants and study the vegetable kingdom.

1. Acquire the names of a great number of individuals. Supposing the plants growing in a named collection, or that you have any person to tell you their names, then take any old book, and begin at any point (in preference the beginning) of the collection, border, or field, and taking a leaf from the plant whose name you wish to know, put it between the two first leaves of the book, writing the name with a pencil, if you are gathering from a named collection, or if not, merely write a number, and get the name inserted by your instructor afterwards. Gather, say, a dozen the first day, carry the book in your pocket, and fix these names in your memory, associated with the form and color of the leaves, by repeatedly turning to them during the moments of leisure of one day. Then, the second day, proceed to the plants, and endeavour to apply the names to the entire plant. To assist you, take them in the order in which you gathered them, and refer to the book when your memory fails. To aid in recollecting the botanic names, endeavour, after you have gathered the leaves, either by books or your instructor, to learn the etymology of the name, and something of the history of the plant, &c. Attach the leaves by two transverse cuts in the paper, or by any simple process, so as the first set may not fall out when you are collecting another. Having fixed the first fasciculus in your memory, form a second, which you may increase according to your capacity of remembering. Proceed as before during the second day; and the beginning of the third day, begin at your first station, and recall to memory the names acquired during both the first and second day. In this way go on till you have acquired the names of the great majority of the plants in the garden or neighbourhood where you are situated. Nothing is more easily remembered than a word when it is associated with some visible object, such as a leaf or a plant; and the more plants we know, the more easy does it become to increase our knowledge. A person who knows only ten plants will require a greater effort of memory to recollect two more, than one who knows a thousand will to remember an additional two hundred. That gardener must have little desire to learn who cannot, in two or three weeks, acquire the names of a thousand plants, if already arranged. If to be collected in the fields, it is not easy getting a thousand leaves or specimens together; but, in general, every gardener requires to charge his memory with the names and ideas, or images of between 500 and 1000 plants; as being those in general cultivation as agricultural plants, forest-trees, and field-shrubs, horticultural plants, plants of ornament, and those requiring eradication as weeds.

2. Acquire the glossology, by cutting a leaf or other part from the plants indicated in Ch. II. as affording examples of each term. You will not be able to get at all the examples; but if you get at one-tenth of them, it will prepare you for the next step, which is —

3. Acquire a knowledge of the classes and orders. This is easily done by selecting

the blossoms of plants, whose class, &c. is designated in a catalogue. Begin with class 1, order 1. On looking at any proper catalogue, such as Sweet's or Donn's, you will find that there are but few plants in this class, and only one British example which flowers in May. Unless you take that month, therefore, or enjoy the advantages of inspecting hot-house plants, you can do nothing with this class. Proceed to the next order, and so on, examining as many flowers as possible in each class and order, in connection with the descriptions, as given in the following chapter, in order that you may be perfectly familiarized with all the classes, and the whole or the greater number of the orders.

4. Study the descriptions of plants, with the plants before you. For this purpose, procure any good Species Plantarum or Flora, in Latin, if you know a little of that language, as the *Hortus Kewensis*, Smith's *Flora Britannica*; or in English, as Withering's *Arrangement of British Plants*, Murray's *British Flora*, or Miller's *Dictionary*, in which last are short descriptions both in English and Latin. Persevere in this practice, collecting an herbarium, and writing the complete description of each specimen under it, till all the parts of plants are familiar to you. When that is the case, you will be able, on a plant's being presented to you which you never saw before, to discover (that is, if it be in flower) first its class and order, and next, by the aid of proper books, its generic and specific name; and this, as far as respects the names of plants, is to attain the object in view.

5. But to know the name of an object is not to know its nature; therefore having stored up a great many names in your memory, and become familiarised with the plants by which you are surrounded, and with the art of discovering the names of such as may be brought to you, by the Linnæan method; the next thing is to study plants according to their natural affinities, by referring them to their natural orders, and observing the properties common to each order. Then proceed to study their anatomy, chemistry, and physiology; and lastly, their history and application. For these purposes Smith's *Introduction to Botany*, Keith's *Vegetable Physiology*, and Wildenow's *Species Plantarum*, may be reckoned standard works. Books of figures, such as Sowerby's *Exotic and English Botany*, or Curtis's *Magazine*, are eminently useful for the first department, but they can only come into the hands of a few. Those who understand French will find the elementary works of Deçandolle, Richard, and Gerardin, of a superior description.

Chap. IV.

Taxonomy, or the Classification of Plants.

274. It is very evident, that, without some arrangement, the mind of man would be unequal to the task of acquiring even an imperfect knowledge of the various objects of nature. Accordingly, in every science, attempts have been made to classify the different objects that it embraces, and these attempts have been founded on various principles. Some have adopted artificial characters; others have endeavoured to detect the natural relations of the beings to be arranged, and thus to ascertain a connection by which the whole may be associated. In the progress of zoology and physiology, the fundamental organs on which to found a systematic arrangement have been finally agreed on. In both, those which are essential, and which discover the greatest variety, form the basis of classification. Animals are found to differ most from each other in the organs of nutrition, and plants in the organs of reproduction.

Botanists have distinguished two kinds of methods in arranging vegetables; the natural and the artificial.

A natural method is that, which, in its distribution, retains all the natural classes; that is, such into which no plants enter that are not connected by numerous relations, or that can be disjoined without doing a manifest violence to nature.

An artificial method is that whose classes are not natural, because they collect together several genera of plants which are not connected by numerous relations, although the agree in the characteristic mark or marks, assigned to that particular class or assemblage to which they belong. An artificial method is easier than the natural, as in the latter it is nature, in the former the writer, who prescribes to plants the rules and order to be observed in their distribution. Hence, likewise, as nature is ever uniform, there can be only one natural method: whereas artificial methods may be multiplied almost *ad infinitum*, according to the several different relations under which bodies are viewed.

The object of the natural method is to promote our knowledge of the vegetable kingdom by generalising facts and ideas; the object of the artificial method is to facilitate the knowledge of plants as individual objects. The merits of the former method consist in the perfection with which plants are grouped together in natural families or orders, and these families grouped among themselves; the merits of the latter consist in the perfection with which they are arranged according to certain marks by which their names may be discovered. Plants arranged according to the natural method may be compared to words arranged according to their roots or derivations; arranged according to an artificial method they may be compared to words in a dictionary.

The success attending attempts at botanical arrangement, both naturally and artificially, has been singularly striking.

Linnæus has given the most beautiful artificial system that has ever been bestowed by genius on mankind; and Jussieu has, with unrivalled ability, exhibited the natural affinities of the vegetable kingdom.

The following TABLES exhibit an outline of both methods.

275. *According to the* LINNÆAN *Method all Vegetables are furnished with* FLOWERS *which are either*

	IN NUMBER,	CLASSES.	EXAMPLES.
Visible,			
Stamina and pointal in the same flower,			
Male and female organs distinct,			
Stamina not united either above or below,			
Generally of equal length,			
	One, - - -	1. *Monandria,*	Ginger, turmerick.
	Two, - - -	2. *Diandria,* -	Jessamine, privet, olive.
	Three, - - -	3. *Triandria,* -	Valerian, iris, grasses.
	Four, - - -	4. *Tetrandria,*	Scabious, teazel, holly.
	Five, - -	5. *Pentandria,*	Bell-flower, bind-weed, mullein, thorn-apple.
	Six, - - -	6. *Hexandria,*	Snow-drop, tulip, aloe.
	Seven, - - -	7. *Heptandria,*	Horse-chestnut.
	Eight, - - -	8. *Octandria,* -	Indian-cress, heath.
	Nine, - - -	9. *Enneandria,*	Bay, rhubarb.
	Ten, - - -	10. *Decandria,* -	Fraxinella, rue, lychnis.
	Twelve, - - -	11. *Dodecandria,*	Purslane, house-leek.
	Many, frequently twenty, attached to the calyx, - - -	12. *Icosandria,*	Peach, medlar, apple, rose, cinquefoil.
	Many, generally upwards of twenty, not attached to the calyx,	13. *Polyandria,*	Herb-christopher, poppy, lark-spur, columbine.
Of unequal length,			
Two long, and two short,		14. *Didynamia,*	Savory, hyssop, ground-ivy, balm, fox-glove.
Four long, and two short,		15. *Tetradynamia*	Scurvy-grass, candy-tuft, water-cress, stock, woad.
Stamina united,			
by the filaments, into one body,		16. *Monadelphia,*	Geranium, mallow tribe.
into two bodies,		17. *Diadelphia,*	Fumatory, milk-wort.
into many bodies,		18. *Polyadelphia,*	Orange, chocolate-nut.
by the anthers or tops, into a cylinder,		19. *Syngenesia,*	Compound flowers, as dandelion, thistle, tansey.
Male organs, (stamina) attached to, and standing upon the female (pistillum),		20. *Gynandria,*	Orchis, ladies-slipper, arum, vanelloe, birthwort, passion-flower.
Stamina and pointal in different flowers,			
on the same plant, - -		21. *Monoecia,* -	Mulberry, nettle, oak, fir.
on different plants, - -		22. *Dioecia,* -	Willow, hop, juniper.
on the same, or different plants along with hermaphrodite flowers, - - -		23. *Polygamia,*	White hellebore, pellitory, orach, fig.
Or lie concealed from view, and cannot be distinctly described, - -		24. *Cryptogamia*	Ferns, mosses, mushrooms, flags.

276. *According to the Method of* Jussieu *all Vegetables are furnished with* Seeds, *which are either*

				Classes.	Orders.	
Cotylydoneæ; furnished with two or more cotyledons, or seed-lobes, - -	Dicotyledoneæ, having the calyx and corolla distinct, -	Thalamifloreæ with distinct petals inserted in the receptacle,	Pistils numerous, and stamens opposite, -	1. - -	8.	Ranunculaceæ, Magnoliaceæ, &c.
			Pistils solitary, or adhering together, - -	2. - -	12.	Papaveraceæ, Crucifereæ, &c.
			Ovary solitary, placenta central, -	3. - -	16.	Caryophylleæ, Linneæ, &c.
			Fruit in scattered cells, but joined on the same base, - -	4. - -	2.	Samaroubeæ et Ochriaceæ.
		Pistils free, or more or less adhering together, always inserted in the calyx, - - - -		5. Calycifloreæ,	36.	Terebinthaceæ, Legumenoseæ, &c.
		Stamens adhering to a corolla, which is not attached to the calyx, -		6. Corolifloreæ,	16.	Oleineæ Jasmineæ, &c.
	Calyx and corolla forming only a single envelope, - - -			7. Monochlamydeæ,	16.	Plumbagineæ, Plantagineæ, &c.
Monocotyledoneæ furnished with only one cotyledon, or seed-lobe, -	In which the fructification is visible,			8. Phancrogameæ,	18.	Cycadeæ, Hydræharideæ, &c.
	In which the fructification is concealed, - - - - - -			9. Cryptogameæ,	5.	Naiades, Marsiliaceæ, &c.
Acotyledoneæ; vegetable beings composed of a cellular tissue unprovided with vessels, and of which the embryo is without cotyledons, -	With leafy expansions, and known sexes, - - - - - -			10. Foliaceæ, -	2.	Musci et Hepaticeæ.
	Without leafy expansions, and not of known sexes, - - -			11. Aphylleæ, -	4.	Licheneæ, Hyponyloneæ, Agariceæ, et Algeæ.

The names of the classes are of very little consequence in this method, and the number of orders is not to be considered as fixed. That part of a system so new and so comprehensive necessarily admits of much improvement by perfecting the groups, the progress to which will more frequently be attained by subdividing than by uniting. The names of the orders indicate at the same time examples of each, as Ranunculus of Ranunculaceæ, &c.

Sect. I. *Artificial System of Linnæus.*

277. The most superficial observer, Sir J. E. Smith observes, must perceive something of the classification of nature. The grasses, umbelliferous plants, mosses, sea-weeds, ferns, liliaceous plants, orchises, compound flowers, each constitute a family strikingly similar in form and qualities among themselves, and no less evidently distinct from all others. If the whole vegetable kingdom could with equal facility be distributed into tribes or classes, the study of botany on such a plan would be no less easy than satisfactory. But as we proceed in this path, we soon find the natural orders and families of plants approach one another by so many points, as to bewilder instead of directing us.

In the mean while, therefore, Linnæus, well aware that a natural classification was scarcely ever to be completely discovered, and that if discovered it would probably be too difficult for common use, contrived an artificial system, by which plants might conveniently be arranged, like words in a dictionary, so as to be most readily found.

The basis of this system is the diversity which prevails among reproductive organs of plants, that is, the stamens or male organs, and the pistils or female organs. The classes are twenty-four, and their distinctions are founded on the number, situation, or proportion of the stamens. The orders are founded either on the number of the pistils, or on some circumstance of their situation or connection.

The first eleven classes are characterised solely by the number of the stamens. From the twelfth to the twenty-third class inclusive, situation, connection, and other circumstances are considered along with number, and in the twenty-fourth and last class, the stamens and pistils are not distinctly visible. All these classes are designated by compound Greek words expressive of their characteristics.

The Linnæan orders, are, in the first thirteen classes, founded on the number of the styles, or stigmas; the orders of the remaining classes are founded on the fruit and other circumstances, and designated by Greek compounds, like the classes.

Those genera, of which there are species indigenous to Britain, are distinguished by an asterisk.

Class I. *Monandria.* Stamen 1. Containing only two Orders.	*Gen.*	*Sp.*
1. *Monogynia.* Style 1. Containing of the natural order of Jussieu, *Canneæ*, the genera Canna, Maranta, Thalia, Phrynium; of the beautiful order *Scitamineæ*, Hedychium, Alpinia, Hellenia, Zingiber, Elettaria, Costus, Kæmpferia, Amomum, Curcuma, Globba; of *Junceæ*, Philydrum; of *Onagrariæ*, Lopezia; of *Nyctagines*, Boerhaavia; of ………… Pollichia; of *Chenopodeæ*, *Salicornia; of *Naiades*, *Hippuris ……………………	20	65
2. *Digynia.* Styles 2. Containing of *Chenopodeæ*, Corispermum and Blitum; of *Naiades*, *Callitriche ……………………	3	5
Class II. *Diandria.* Stamens 2. Orders 3.		
1. *Monogynia.* This, the most natural and numerous order, comprehends the elegant and fragrant *Jasmineæ*, the Jasmine, Lilac, Olive, &c; also *Veronica*, and a few labiate flowers with naked seeds, as *Salvia*, Rosemary, &c. natural allies of the fourteenth class; but having only two stamens, they are necessarily ranged here in the artificial system. — It contains of *Jasmineæ*, Nyctanthes, Jasminium; of ………… Galipea; of *Oleinæ*, *Ligustrum, Olea, Notelæa, Chionanthus, Linociera, Ornus, Syringa; of *Bignoniaceæ*, Catalpa; of *Thymeleæ*, Pimelea; of ………… Fontanesia; of *Onagrariæ*, *Circæa; of *Scrophularinæ*, *Veronica, Gratiola, Schwenkia, Calceolaria; *Acanthaceæ*, Elytraria, Justicia, Eranthemum; of *Lentibulariæ*, *Pinguicula, *Utricularia; of *Verbenaceæ*, Ghinia, Stachytarpheta; of *Labiatæ*, *Lycopus, Amethystea, Cunila, Ziziphora, Hedeoma, Monarda, Rosmarinus, *Salvia, Collinsonia; of *Dipsaceæ*, Morina; of *Rosaceæ*, Acæna ……………………	36	276
2. *Digynia*, consists only of *Gramineæ*, * Anthoxanthum, a grass which, having but two stamens, is separated from its natural family in the third class ……	1	2
3. *Trigynia.* It contains only of *Urticæ?* Piper ……………………	1	28
Class III. *Triandria.* Stamens 3. Orders 3.		
1. *Monogynia.* *Valeriana* is placed here because most of its species have three stamens. Here also we find the sword-leaved plants, *Iris*, *Gladiolus*, *Ixia*, &c., also *Crocus*, and numerous grass-like plants, *Schœnus*, *Cyperus*, *Scirpus*, &c. — It contains of *Dipsaceæ*, *Valeriana, Fedia; of *Nyctagines*, Oxybaphus; of *Terebintaceæ*, Cneorum, Comocladia; of *Cucurbitaceæ*, Melothria; of *Caryophyllea*, Ortegia, Lœflingia; of *Chenopodeæ*, Polycnemum; of *Aceræ*, Hippocratea; of *Irideæ*, *Crocus, Trichonema, Geis-		

Gen. *Sp.*

sorhiza, Hesperantha, Sparaxis, * Ixia, Anomatheca, Tritonia, Watsonia, Gladiolus, Melasphærula, Antholyza, Babiana, Aristea, Witsenia, Lapeyrousia, Moræa, * Iris, Marica, Pardanthus; of *Commelineæ*, Commelina, Aneilema, Callisia; of .... Leptanthus; of *Hæmodoraceæ*, Wachendorfia, Xiphidium, Dilatris, Hæmodorum; of *Restiaceæ*, Xyris; of *Cyperaceæ*, Mariscus, Kyllinga, * Cyperus, Isolepis, * Scirpus, Eleocharis, Rhynchospora, * Schœnus, Cladium, Trichophorum, * Eriophorum; of *Gramineæ*, * Nardus, Lygeum, Cornucopiæ, Cenchrus, * Sesleria, Limnetis, *56* 346

2. *Digynia.* This important order consists of the true Grasses. Their habit is more easily perceived than defined; their value, as furnishing herbage for cattle, and grain for man, is sufficiently obvious. No poisonous plant is found among them, except the *Lolium temulentum*, said to be intoxicating and pernicious in bread. Their genera are not easily defined. Linnæus, Jussieu, and most botanists, pay regard to the number of florets in each spikelet; but in *Arundo* this is of no moment. Magnificent and valuable works on this family have been published in Germany by the celebrated Schreber and by Dr. Host. The *Fl. Græca* also is rich in this department, to which the late Dr. Sibthorp paid great attention. Much is to be expected from scientific agriculturists; but nature so absolutely, in general, accommodates each grass to its own soil and station, that nothing is more difficult than to overcome their habits, insomuch that few grasses can be generally cultivated at pleasure. — It contains of *Gramineæ*, Trichodium, Sporobolus, * Agrostis, * Knappia, Perotis, * Polypogon, * Stipa, Trisetum, * Avena, * Bromus, * Festuca, * Triticum, * Secale, * Hordeum, * Elymus, * Lolium, Kœleria, Glyceria, * Poa, Triodia, Calamagrostis, * Arundo, * Aira, * Melica, Echinaria, Lappago, Eleusine, Chrysurus, * Cynosurus, Beckmannia, * Dactylis, Uniola, * Briza, Cynodon, * Milium, * Lagurus, * Alopecurus, * Phleum, Crypsis, * Phalaris, Tozettia, Paspalum, Digitaria, * Panicum, Orthopogon, Pennisetum, Saccharum, Rotbollia, Michrochlea, Leersia *50* 314

3. *Trigynia* is chiefly composed of little pink-like plants, or, *Caryophyllæ*, as *Holosteum.* — *Tillæa muscosa* has the number proper to this order, but the rest of the genus bears every part of the fructification in fours. This, in Linnæan language, is expressed by saying the flower of *Tillæa* is *quadrifidus*, four-cleft, and *T. muscosa* excludes, or lays aside one-fourth of the fructification. — It contains of *Restiaceæ*, * Eriocaulon; of *Portulaceæ*, * Montia; of *Polygoneæ*, Kœnigia; of *Caryophylleæ*, * Holosteum, * Polycarpon, Mollugo, Minuartia, Queria, Lechea 9 12

Class IV. *Tetrandria.* Stamens 4. Orders 3.

1. *Monogynia.* A very numerous and various order, of which the *Proteaceæ* make a conspicuous part; *Plantago*, remarkable for its *capsula circumscissa*, a membranous capsule, separating by a complete circular fissure into two parts, as in *Centunculus*, *Rubia*, and others of its natural order, whose stipulation is rémarkable, and the curious *Epimedium*, are found here. — It contains of *Proteaceæ*, Petrophila, Isopogon, Protea, Leucospermum, Mimetes, Serruria, Nivenia, Sorocephalus, Spatalla, Persoonia, Grevillea, Hakea, Lambertia, Xylomelum, Telopea, Lomatia, Rhopala, Banksia, Dryandra; of *Globulariæ*, Globularia, Adina; of *Rubiaceæ*, Cephalanthus; of *Dipsaceæ*, * Dipsacus, * Scabiosa, Knautia; of *Nyctagineæ*, Allionia, Opercularia, Cryptospermum; of *Rubiaceæ*, Spermacoce, * Sherardia, * Asperula, Houstonia, * Galium, Crucianella, * Rubia, Catesbæa, Ixora, Pavetta, Bouvardia, Siderodendrum, Chomelia, Mitchella, Coccocypsilum, Manettia, Oldenlandia; of .... Zieria, Witheringia, Penæa, Monetia, Curtisia, Chloranthus; of *Verbenaceæ*, Ægiphila, Callicarpa; of *Ericeæ*, Blæria; of *Scrophularineæ*, Buddlea, Scoparia; of *Gentianeæ*, Exacum, Sebæa, Frasera; of *Plantagineæ*, * Plantago; of *Primulaceæ*, Centunculus; of *Rosaceæ*, * Sanguisorba, * Alchemilla; of *Vites*, Cissus; of *Berberides*, Epimedium; of *Caprifoliæ*, * Cornus; of *Terebintaceæ*, Fagara, Ptelea; of *Onagrariæ*, Ludwigia, Isnardia; of *Salacariæ*, Ammannia; of *Hydrocharideæ*, * Trapa; of *Urticeæ*, Dorstenia; of *Aroideæ*, Pothos; of *Elæagni*, Elæagnus; of *Santalaceæ*, Santalum; of *Thymelææ*, Struthiola; of *Chenopodeæ*, Rivina, Camphorosma 78 420

2. *Digynia.* It contains of *Caryophylleæ*, Buffonia; of *Berberides?* Hamamelis; of *Papaveraceæ*, Hypecoum 3 5

Gen. *Sp.*

3. *Tetragynia.* — It contains of *Rhamni*, Myginda, * Ilex, sometimes furnished with a few barren flowers; of *Boragineæ*, Coldenia; of *Alismaceæ*, *Potamogeton; of *Naiades*, *Ruppia; of *Caryophylleæ*, *Sagina, Mœnchia; of *Sempervivæ*, * Tillæa; of ...., * Radiola 9 35

Class V. *Pentandria.* A very large class. Stamens 5. Orders 6.

1. *Monogynia.* 1 Style. One of the largest and most important orders of the whole system. — It contains of *Boragineæ*, Heliotropium, * Myosotis, Lappula, *Lithospermum, Batschia, Onosmodium, * Anchusa, *Cynoglossum, *Pulmonaria, * Symphytum, Cerinthe, Onosma, * Borago, Trichodesma, *Asperugo, *Lycopsis, *Echium, Tournefortia, Cordia, Bourreria, Ehretia, Hydrophyllum, Ellisia; Nolana? of *Primulaceæ*, Aretia, Androsace, *Primula, Cortusa, Soldanella, Dodecatheon, *Cyclamen, *Hottonia, *Lysimachia, * Anagallis, *Samolus, Coris; of *Ericeæ*, Diapensia, Pyxidanthera, Cyrilla, Brossæa; of *Rhodoraceæ*, *Azalea; of *Epacrideæ*, Sprengelia, Andersonia, Lysinema, Epacris, Monotoca, Leucopogon, Stenanthera, Astroloma, Styphelia; of *Plumbagineæ*, Plumbago; of *Convolvulaceæ*, *Convolvulus, Calystegia, Ipomœa, Retzia; of *Bignoniaceæ*, Cobœa; of *Polemoniaceæ*, *Polemonium, Phlox, Vestia, Ipomopsis; of .... Caldasia, Lasiopetalum, Galax, Calodendrum, Scopolia; of *Campanulaceæ*, Lightfootia, * Campanula, Roella, Phyteuma, Trachelium, Jasione, * Lobelia, Cyphia; of *Goodenoviæ*, Goodenia, Euthales, Scævola, Dampiera; of *Rubiaceæ*, Cinchona, Pinckneya, Mussænda, Portlandia, Genipa, Gardenia, Oxyanthus, Randia, Webera, Erithalis, Morinda, Nauclea, Cephaelis, Hamellia, Rondeletia, Macrocnemum, Vanguiera, Dentella, Serissa, Psychotria, Coffea, Chiococca, Pæderia, Plocama; of *Caprifoliæ*, * Lonicera, Symphoria, Diervilla, Triosteum, * Hedera; of *Combretaceæ*, Conocarpus; of *Santalaceæ*, Thesium; of *Nyctagineæ*, Mirabilis; of *Solaneæ*, Ramonda, *Verbascum, * Datura, Brugmansia, * Hyoscyamus, Nicotiana, Mandragora, *Atropa, Solandra, Physalis, Nicandra, Solanum, Capsicum, Cestrum, Lycium; of *Myrsineæ*, Ardisia; of *Sapoteæ*, Jacquinia, Achras, Chrysophyllum, Sideroxylon, Sersalisia, Bumelia; of *Verbenaceæ*, Tectona; of *Rhamni*, Elæodendrum, * Rhamnus, Zizyphus, Celastrus, Senacia, * Euonymus, Hovenia, Ceanothus, Pomaderris, Phylica? Brunia, Staavia, Plectronia; of *Diosmeæ*, Adenandra, Barosma, Diosma, Agathosma; of *Pittosporeæ*, Bursaria, Billardiera, Pittosporum; of *Saxifrageæ*, Itea; of *Meliæ?* Cedrela, Leea; of *Terebintaceæ*, Mangifera; of *Rosaceæ*, Hirtella; of *Cacti*, * Ribes; of *Vites*, Vitis; of *Cucurbitaceæ*, Gronovia; of *Geraniæ?* * Impatiens; of *Umbelliferæ*, Lagæcia; of *Portulaceæ*, Claytonia; of *Violeæ*, * Viola, Ionidium; of *Musaceæ*, Heliconia, Strelitzia; of *Amaranthaceæ*, Gomphrena, Philoxerus, Achyranthes, Pupalia, Deeringia, Celosia, Lestibudesia, Alternanthera, Ærua, Illecebrum, Paronychia, Anychia, Mollia; of *Chenopodeæ*, Chenolea; of *Salicariæ*, * Glaux; of *Gentianeæ?* * Menyanthes, *Villarsia, Logania, Spigelia, Lisianthus, * Chironia, Sabbatia, Erythræa, Eustoma; of *Malvaceæ*, Buttneria, Ayenia; of *Apocyneæ*, Strychnos, Gelsemium, Rauwolfia, Carissa, Arduina, Cerbera, Allamanda, * Vinca, Nerium, Wrightia, Echites, Ichnocarpus, Plumeria, Cameraria, Tabernæmontana, Amsonia... 209 1080

2. *Digynia.* 3 Styles. — It contains of *Apocyneæ*, Apocynum, Melodinus; *Asclepiadeæ*, Periploca, Hemidesmus, Secamone, Microloma, Sarcostemma, Dæmia, Cynanchum, Oxystelma, Gymnema, Calotropis, Xysmalobium, Gomphocarpus, *Asclepias, Gonolobus, Pergularia, Marsdenia, Hoya, Stapelia, Piaranthus, Huernia, Caralluma; of *Amaranthaceæ*, Herniaria; of *Chenopodeæ*, * Chenopodium, * Beta, *Salsola, Kochia, Anabasis, Bosea; of *Amentaceæ*, * Ulmus; of *Saxifrageæ*, Heuchera; of *Caryophylleæ*, Velezia; of *Gentianeæ*, * Swertia, *Gentiana; of *Convolvulaceæ*, Falkia, Dichondra, Evolvulus, Hydrolea, *Cuscuta; of *Rubiaceæ*, Phyllis; of *Araliæ*, Cussonia.

Umbelliferæ. These are mostly herbaceous; the qualities of such as grow on dry ground are aromatic, while the aquatic species are among the most deadly poisons; according to the remark of Linnæus, who detected the cause of a dreadful disorder among horned-cattle in Lapland, in their eating young leaves of *Cicuta virosa*, under water. — It contains *Eryngium, *Hydrocotyle, Spananthe, *Sanicula, *Astrantia, *Bupleurum, * Echinophora, Hasselquistia, * Tordylium, * Caucalis, Artedia, Dau-

	Gen.	Sp.
cus, Visnaga, *Ammi, *Bunium, *Conium, *Selinum, *Athamanta, Peucedanum, *Crithmum, Cachrys, Ferula, Laserpitium, *Heracleum, *Ligusticum, *Angelica, *Sium, *Sison, Bubon, *Cuminum, *Œnanthe, *Phellandrium, *Cicuta, *Æthusa, Meum, *Coriandrum, Myrrhis, *Scandix, Oliveria, Anthriscus, *Chærophyllum, *Imperatoria, Seseli, Thapsia, *Pastinaca, *Smyrnium, *Anethum, *Carum, *Pimpinella, *Apium, *Ægopodium	93	487
3. _Trigynia._ It contains of _Terebintaceæ,_ Rhus, Spathelia; of _Caprifoliæ,_ *Viburnum, *Sambucus; of _Rhamni,_ Cassine, Staphylea; of _Portulaceæ,_ *Tamarix, Turnera, Telephium, Corrigiola, Portulacaria; of _Euphorbiæ,_ Xylophylla; of _Caryophylleæ,_ Pharnaceum, Drypis; of _Chenopodeæ,_ Basella	15	85
4. _Tetragynia._ It contains of _Capparides?_ *Parnassia	1	3
5. _Pentagynia._ — It contains of _Araliæ,_ Aralia; of _Plumbagineæ,_ *Armeria, *Statice, a beautiful maritime genus, with a kind of everlasting calyx; of _Caryophylleæ?_ *Linum; of _Capparides?_ *Drosera; of _Portulaceæ,_ Gisekia; of _Sempervivеæ,_ Larochea, Crassula, a numerous succulent genus; of _Tiliaceæ?_ Mahernia; of ...., Commersonia; of _Rosaceæ,_ *Sibbaldia	11	131
6. _Polygynia._ — It contains of _Ranunculaceæ,_ *Myosurus, a remarkable instance of few stamens (though they often exceed five) to a multitude of pistils; also Ceratocephalus, Zanthorhiza	3	3
CLASS VI. _Hexandria._ Stamens 6. Orders 4.		
1. _Monogynia._ This, as usual, is the most numerous. The Liliaceous family, with or without a _spatha,_ called by Linnæus the nobles of the vegetable kingdom, constitute its most splendid ornament. The beautiful White Lily is commonly chosen by popular writers to exemplify the stamens and pistils. It contains of _Musaceæ,_ Musa, Urania; of _Bromeliæ,_ Bromelia, Pitcairnia, Tillandsia, Agave, Furcrœa; of _Commelineæ,_ Tradescantia; of _Asphodeleæ?_ Pontederia; Eucomis, Aphyllanthes, Sowerbæa, *Allium, Albuca, Xanthorrhœa, Thysanotus, Eriospermum, Gagea, *Ornithogalum, *Scilla, Massonia, *Asphodelus, *Anthericum, Arthropodium, Phalangium, Chlorophytum, Cæsia, *Narthecium, Dianella, Eustrephus, *Asparagus, Drimia, Uropetalon, *Hyacinthus, Muscari, Lachenalia, Dracæna, Phylloma, Alstrœmeria, Phormium, Hypoxis, Curculigo, Cyanella; of _Amaryllideæ,_ Hæmanthus, *Galanthus, *Leucojum, Strumaria, Crinum, Cyrtanthus, Brunsvigia, Amaryllis, *Narcissus, Pancratium, Eucrosia, Doryanthes, Gethyllis; of _Hermerocallideæ,_ Blandfordia, Agapanthus, *Hemerocallis, Aletris, Tritoma, Veltheimia, Polianthes, Sanseviera, Tulbagia, Brodiæa? Aloe; of _Liliæ,_ *Fritillaria, *Lilium, *Tulipa, Erythronium, Gloriosa, Yucca; of _Melanthaceæ,_ Bulbocodium, Uvularia; of .... Peliosanthes, Buonapartea, Diphylleia, Nandina; of _Smilaceæ,_ Streptopus, *Convallaria, Smilacina, *Polygonatum, Ophiopogon; of _Hæmodoraceæ,_ Lophiola, Lanaria, Anigozanthos; of _Berberides,_ Leontice, Caulophyllum, *Berberis; of _Aroideæ,_ *Acorus, Orontium, Tupistra; Tacca? of _Palmæ,_ Corypha, Licuala, Thrinax, Calamus; of _Junceæ,_ *Juncus, *Luzula; of _Rhamni,_ Prinos; of _Rubiaceæ,_ Hillia, Richardia; of _Campanulaceæ,_ Canarina; of _Caryophylleæ,_ Frankenia; of _Salicariæ,_ *Peplis; of _Gramineæ,_ Bambusa, Ehrharta	106	730
2. _Digynia_ has but few genera. — It contains of _Gramineæ,_ Oryza, the Rice, of which there now seems to be more than one species; of _Convolvulaceæ,_ Falkia; _Polygoneæ,_ Atraphaxis	3	4
3. _Trigynia._ It contains of _Polygoneæ,_ *Rumex; of _Junceæ?_ Flagellaria; of _Alismaceæ,_ *Scheuchzeria, *Triglochin; of _Melanthaceæ,_ *Tofieldia, Melanthium, *Colchicum, Helonias, Nolina; of _Smilaceæ?_ Myrsiphyllum; Medeola, Trillium; of _Naiades,_ Aponogeton; of _Palmæ,_ Sabal	14	175
4. _Polygynia._ It contains of _Menispermæ,_ Wendlandia; of _Hydrocharideæ,_ Damosonium; of _Alismaceæ,_ *Actinocarpus, *Alisma	4	9
CLASS VII. _Heptandria._ Stamens 7. Orders 4.		
1. _Monogynia._ It contains of _Primulaceæ,_ *Trientalis; of _Pediculares,_ Disandra; of _Nyctagines,_ Pisonia; of _Chenopodeæ,_ *Petiveria; of _Aceræ,_ Æsculus; of .... Jonesia; of _Aroideæ,_ Dracontium, Calla	8	21
2. _Digynia._ It contains of _Portulaceæ,_ Limeum	1	1

Gen. Sp.

3. *Tetragynia.* It contains of *Naiades*, * Saururus 1 1

4. *Heptagynia.* It contains of *Sempervivæ*, Septas 1 3

Class VIII. *Octandria.* Stamens 8. Orders 4.

1. *Monogynia.* A very various and rich order, consisting of the well-known *Tropæolum*, or Nasturtium, whose original Latin name, given from the flavor of the plant, like garden-cresses, is now become its English one in every body's mouth. The elegant and fanciful Linnæan appellation, equivalent to a *trophy plant*, alludes to its use for decorating bowers, and the resemblance of its peltate leaves to shields, as well as of its flowers to golden helmets, pierced through and through, and stained with blood. *Epilobium*, with its allies, makes a beautiful part of this order; but above all are conspicuous the favourite *Fuchsia*, the American genus *Vaccinium*; the immense and most elegant genus *Erica*, so abundant in southern Africa, but not known in America; and the fragrant *Daphne*, of which last the Levant possesses many charming species. — It contains of *Geraniæ ?* Tropæolum; of *Melastomæ*, Osbeckia, Rhexia; of *Onagrariæ*, * Œnothera, Gaura, * Epilobium; of *Salicariæ*, Grislea, Lawsonia; of .... Roxburghia, Boronia, Tetratheca, Jambolifera; of *Diosmaceæ*, Corræa; of *Sapoteæ*, Mimusops; of *Sapindi*, Ornitrophe, Dimocarpus, Melicocca, Blighia, Ephielis, Koelreuteria ? of *Meliæ*, Guarea; of *Terebintaceæ*, Amyris; Dodonæa ? of *Aurantiæ*, Ximenia; of *Santalaceæ*, Fuchsia, Memecylon; of *Myrti*, Bæckia; of *Gentianeæ*, * Chlora; of *Campanulaceæ*, Michauxia; of *Papaveraceæ*, Jeffersonia; of *Ericeæ*, * Oxycoccus, Calluna, * Erica; of *Rhodoraceæ*, * Menziesia; of *Thymelææ*, Lagetta, * Daphne, Dirca, Gnidia, Stellera, Passerina, Lachnæa 41 163

2. *Digynia* has a few plants, but little known; among them are *Galenia africana*, and *Moehringia muscosa.* The former belongs to *Chenopodeæ*, and the latter to *Caryophylleæ* 2 2

3. *Trigynia.* *Polygonum* is a genus whose species differ in the number of their stamens and styles, and yet none can be more natural. Here therefore the Linnæan system claims our indulgence. *Paullinia* and *Cardiospermum* are more constant. — It contains of *Polygoneæ*, * Polygonum, Coccoloba; of *Sapindi*, Paullinia, Seriana, Cardiospermum, Sapindus 6 50

4. *Tetragynia.* Here we find the curious *Paris* and *Adoxa.* — It contains of *Sempervivæ*, Calanchoe, Bryophyllum; of *Smilaceæ*, * Paris; of *Saxifrageæ*, * Adoxa; of *Caryophylleæ*, Elatine; of *Onagrariæ*, Haloragis; of *Urticeæ*, Forskohlea 7 10

Class IX. *Enneandria.* Stamens 9. Orders 3.

1. *Monogynia.* Here we find the precious genus *Laurus*, including the Cinnamon, Bay, Sassafras, Camphor, and many other noble plants. — It contains of *Laurinæ*, Laurus; of *Terebintaceæ*, Anacardium; of *Polygoneæ*, Eriogonum 3 20

2. *Trigynia.* It contains of *Polygoneæ*, Rheum 1 7

3. *Hexagynia.* Containing of *Hydrocharideæ*, * Butomus 1 1

Class X. *Decandria.* Stamens 10. Orders 5.

1. *Monogynia.* A numerous and fine assemblage, beginning with a tribe of flowers more or less correctly papilionaceous and leguminous. — It contains of *Leguminosæ*, Edwardsia, Sophora, Ormosia, Anagyris, Thermopsis, Virgilia, Cyclopia, Baptisia, Podalyria, Chorizema, Podolobium, Oxylobium, Callistachys, Brachysema, Gompholobium, Burtonia, Jacksonia, Viminaria, Sphærolobium, Aotus, Dillwynia, Eutaxia, Sclerothamnus, Gastrolobium, Euchilus, Pultenæa, Daviesia, Mirbelia, Cercis, Bauhinia, Hymenæa, Cynometra, Cassia, Cathartocarpus, Parkinsonia, Poinciana, Cæsalpinia, Guilandina, Hyperanthera, Hoffmanseggia, Adenanthera, Cadia, Prosopis, Hæmatoxylon, Copaifera, Schotia; of *Rutaceæ*, Guaiacum, Zygophyllum, Fagonia, Tribulus, Dictamnus, Ruta; of .... Crowea, Codon, Monotropa, Dionæa, Garuga, Samyda; of *Guttiferæ*, Gomphia; of *Magnoliæ ?* Quassia; of *Aurantiæ*, Limonia, Murraya, Cookia; of *Malpighiaceæ*, Gærtnera; of *Meliæ*, Trichilia, Ekebergia, Heynea, Melia, Swietenia; of *Onagreæ*, Jussieua; of *Combretaceæ*, Getonia, Quisqualis; of *Thymelææ*, Dais; of *Melastomeæ*, Melastoma; of *Salicariæ*, Acisanthera; of *Rhodoraceæ*, Kalmia, Ledum, Rhodora, * Rhododendron, Epigæa; of *Ericeæ*, * Vaccinium, * Andromeda, Enkianthus, Gaul-

	Gen.	Sp.
theria, * Arbutus, Clethra, Mylocaryum, * Pyrola, Chimaphila; of *Santalaceæ*, Bucida; of *Sapoteæ?* Inocarpus; of *Ebenaceæ*, Styrax	92	448
2. *Digynia.* Here we find *Saxifraga*, remarkable for having the germen inferior, half inferior, and superior, in different species. — It contains of *Ebenaceæ*, Royena; of *Portulaceæ*, Trianthema, Scleranthus; of *Cunoniaceæ*, Cunonia; of *Saxifrageæ*, Hydrangea, * Chrysosplenium, * Saxifraga, Tiarella, Mitella; of *Caryophylleæ*, Gypsophila, * Saponaria, * Dianthus	12	160
3. *Trigynia.* Contains of *Caryophylleæ*, * Cucubalus, * Silene, * Stellaria, * Arenaria, * Cherleria; of *Polygoneæ*, Brunnichia; of *Ranunculaceæ*, Garidella; of *Malpighiaceæ*, Malpighia, Banisteria?	9	158
4. *Pentagynia.* Containing of *Terebintaceæ?* Averrhoa; Spondias; of *Semperviva*, * Cotyledon, * Sedum, Penthorum; of .... Grielum; of *Geraniæ?* * Oxalis; of *Caryophylleæ*, * Agrostemma, * Lychnis, * Cerastium, * Spergula	1	6
5. *Decagynia.* Containing of *Chenopodeæ*, Phytolacca	11	164
CLASS XI. *Dodecandria.* Stamens 12 to 19. Orders 6.		
1. *Monogynia.* A rather numerous and very various order, with scarcely any natural affinity between the genera. Some of them have twelve, others fifteen or more stamens, which should be mentioned in their characters. It contains of *Aristolochiæ*, * Asarum; of *Papaveraceæ*, Bocconia; of *Sapoteæ*, Bassia; of *Melastomeæ*, Blakea; of *Rhodoraceæ*, Bejaria; of *Guttiferæ*, Garcinia; of *Ebenaceæ*, Halesia; of *Myrti*, Decumaria; of .... Aristotelia; of *Meliæ*, Canella; of *Capparides*, Cratæva; of *Tiliaceæ*, Triumfetta; of *Rutaceæ*, Peganum; of *Ericeæ?* Hudsonia; of *Ficoideæ*, Nitraria; of *Portulaceæ*, Portulaca, Talinum, Anacampseros; of *Salicariæ*, * Lythrum, Cuphea; of *Malvaceæ*, Kleinhofia	22	54
2. *Digynia.* Containing of *Cunoniaceæ*, Callicoma; of *Tiliaceæ*, Heliocarpus; of *Rosaceæ*, * Agrimonia	3	8
3. *Trigynia.* Containing of *Capparides?* * Reseda; of *Euphorbiæ*, * Euphorbia; of *Ebenaceæ*, Visnea	3	139
4. *Tetragynia.* Containing of *Polygoneæ*, Calligonum	1	1
5. *Pentagynia.* Containing of *Ficoideæ*, Glinus	1	1
6. *Dodecagynia.* Containing of *Semperviva*, * Sempervivum	1	17
CLASS XII. *Icosandria.* Stamens 20 or more, inserted into the Calyx. Orders 3.		
1. *Monogynia* consists of fine trees, bearing for the most part stone-fruits, as the Peach, Plum, Cherry, &c. though the leaves and other parts are bitter, acrid, and, sometimes very dangerous, owing to a peculiar essential oil, known by its bitter-almond flavor. The Myrtle tribe, so plentiful in New Holland, is another natural order, comprehended chiefly under *Icosandria Monogynia*, abounding in a fragrant and wholesome aromatic oil. — It contains of *Cacti*, Cactus, Rhipsalis; of *Loaseæ*, Bartonia; of *Myrti*, Philadelphus, Leptospermum, Fabricia, Metrosideros, Psidium, Eugenia, Caryophyllus, Myrtus, Calyptranthes, Eucalyptus, Punica; of *Rosaceæ*, Amygdalus, * Prunus, Armeniaca, Chrysobalanus	18	178
2. *Di-Pentagynia.* In this order it is most convenient to include such plants as have from two to five styles, and occasionally, from accidental luxuriance only, one or two more. *Pyrus* is an example of it. *Spiræa*, nearly allied to it, stands here, most of its species having five styles, though some have a much greater number. Here is *Mesembryanthemum*, a vast and brilliant exotic genus, of a succulent habit, abounding in alkaline salt. — It contains of *Rosaceæ*, Waldsteinia, * Mespilus, * Pyrus, * Cydonia, * Spiræa; of *Ficoideæ*, Sesuvium, Tetragonia, Mesembryanthemum, Aizoon	9	308
3. *Polygynia.* An entirely natural order of genuine Rosaceous flowers. Here we find *Rosa, Rubus, Fragaria, Potentilla, Tormentilla, Geum, Dryas,* and *Comarum*, all elegant plants, agreeing in the astringent qualities of their roots, bark and foliage, and in their generally eatable, always innocent fruit. The vegetable kingdom does not afford a more satisfactory example of a natural order, composed of natural genera, than this; and Linnæus has well illustrated it in the *Flora Lapponica.* — It contains of *Rosaceæ*, * Rosa, * Rubus, Dalibarda, * Fragaria, * Comarum, * Potentilla, * Tormentilla, * Geum, * Dryas, Calycanthus	10	240

Gen. Sp.

Class XIII. *Polyandria.* Stamens numerous, inserted into the Receptacle. Orders 5.

1. *Monogynia.* The genera of this order form a numerous and various assemblage of handsome plants, but many are of a suspected quality. Among them are the Poppy, the Caper-shrub, the *Sanguinaria canadensis*, remarkable for its orange-juice, like our Celadine; also the beautiful genus *Cistus*, with its copious but short-lived flowers, some of which have irritable stamens; and the splendid aquatic tribe of *Nymphæa.* — It contains of *Capparides*, Capparis; Marcgravia? of *Ranunculaceæ*, * Actæa; of *Papaveraceæ*, Sanguinaria, Podophyllum, * Chelidonium, * Glaucium, * Papaver, Argemone; of .... Sarracenia; of *Hydrocharideæ*, * Nymphæa, Nuphar, Euryale; of *Tiliaceæ?* Bixa, Sloanea, Aubletia, Sparmannia, Muntingia, Grewia, * Tilia, Corchorus; of *Guttiferæ*, Grias, Calophyllum, Mammea, Ochna, Elæocarpus; of *Myrti*, Alangium; of *Loaseæ*, Mentzelia; of *Salicariæ*, Lagerstrœmia; of *Aurantiæ*, Ægle; of *Cisti*, Cistus, * Helianthemum 32 161
2. *Digynia.* Containing of .... Bauera; of *Amentaceæ*, Fothergilla; of *Magnoliæ?* Curatella; of *Ranunculaceæ*, Pæonia 4 21
3. *Trigynia.* Containing of *Magnoliæ?* Hibbertia; of *Ranunculaceæ*, * Delphinium, Aconitum 3 36
4. *Pentagynia.* Containing of *Ranunculaceæ*, Cimicifuga, * Aquilegia, Nigella; of *Ficoideæ*, Reaumuria 4 18
5. *Polygynia.* An order for the most part natural, comprehending some fine exotic trees, as *Dillenia*, *Liriodendron*, the Tulip-tree, the noble *Magnolia*, &c. To these succeed a family of plants, either herbaceous or climbing, of great elegance, but of acrid and dangerous qualities, as *Anemone*, in a single state the most lovely, in a double one the most splendid ornament of our parterres in the spring; *Atragene* and *Clematis*, so graceful for bowers; *Thalictrum*, *Adonis*, *Ranunculus*, *Trollius*, *Helleborus* and *Caltha*, all conspicuous in our gardens or meadows, which, with a few less familiar, close this class. — It contains of *Hydrocharideæ*, Nelumbium; of *Magnoliæ?* Dillenia, Illicium, Liriodendron, Magnolia, Michelia; of *Annonæ*, Uvaria, Annona, Porcelia, Xylopia; of *Ranunculaceæ*, * Hepatica, * Anemone, * Pulsatilla, Atragene, * Clematis, * Thalictrum, * Adonis, Knowltonia, * Ficaria, * Ranunculus, * Trollius, Isopyrum, Eranthis, * Helleborus, Coptis, * Caltha, Hydropeltis, Hydrastis 28 185

Class XIV. *Didynamia.* Stamens 2 long and 2 short. Orders 2, each on the whole very natural.

1. *Gymnospermia.* Seeds naked, in the bottom of the calyx, four, except in *Phryma*, which has a solitary seed. — Corolla monopetalous and irregular, a little inflated at the base, and holding honey, without any particular nectary. Stamens in two pairs, incurved, with the style between them, so that the impregnation rarely fails. The plants of this order are mostly aromatic, and none, I believe, poisonous. The calyx is either in five nearly equal segments, or two-lipped. Most of the genera afford excellent essential characters, taken frequently from the corolla, or from some other part. — It contains of *Labiatæ*, * Ajuga, Anisomeles, * Teucrium, Westringia, Satureia, Thymbra, Hyssopus, Pycnanthemum, * Nepeta, Elsholtzia, Lavandula, Sideritis, Bystropogon, * Mentha, Perilla, Hyptis, Lepechinia, * Glechoma, * Lamium, * Galeopsis, * Galeobdolon, * Betonica, * Stachys, * Ballota, * Marrubium, * Leonurus, Phlomis, Leucas, Leonotis, Moluccella, * Clinopodium, * Origanum, * Thymus, Acynos, Calamintha, Melissa, Dracocephalum, * Melittis, Ocymum, Plectranthus, Trichostema, Prostanthera, * Scutellaria, * Prunella, Cleonia, Prasium, Phryma; of *Verbenaceæ*, Selago 48 279
2. *Angiospermia.* Seeds in a capsule, and generally very numerous. The plants of this order have the greatest possible affinity with some families in *Pentandria Monogynia.* Some species even vary from one class to the other, as *Bignonia radicans*, and *Antirrhinum Linaria*, in which the irregular corolla becomes regular, and the four unequal stamens are changed to five equal ones; nor does this depend, as has been asserted, on the action of any extraneous pollen upon the stigmas of the parent plant, neither are the seeds always abortive. No method of arrangement, natural or artificial, could provide against such anomalies as these, and therefore imperfections must be expected in every system. — It contains of *Verbenaceæ*,

Gen. Sp.

Hebenstretia, Clerodendrum, Volkameria, Holmskioldia, Vitex, Cornutia, Hosta, Gmelina, Petræa, Citharexylum, Duranta, Lantana, Spielmannia, Zapania, Priva, Aloysia, * Verbena; of *Myoporinæ*, Myoporum, Stenochilus, Bontia, Avicennia; of *Pedalinæ*, Pedalium; of *Bignoniaceæ*, Bignonia, Sesamum, Penstemon, Chelone, Tourrettia, Martinia, Gloxinia, Gesneria; of *Orobancheæ*, * Lathræa, * Orobanche; of *Acanthaceæ*, Acanthus, Thunbergia, Barleria, Ruellia, Blechum, Aphelandra, Crossandra; of *Scrophularinæ*, Limosella, Browallia, Stemodia, Mazus, Lindernia, Herpestis, Capraria, Teedia, Besleria, Trevirana, Columnea, Russelia, Dodartia, Halleria, Mimulus, Hornemannia, * Digitalis, * Scrophularia, Maurandia, Cymbaria, Nemesia, Anarrhinum, * Antirrhinum, * Linaria, * Gerardia, * Pedicularis, * Melampyrum, * Rhinanthus, * Bartsia, Castilleja, * Euphrasia, Buchnera, Manulea, Erinus, * Sibthorpia; of *Solaneæ?* Brunfelsia, Crescentia, Celsia, Alonsoa, Anthocercis; of *Caprifoliæ*, * Linnæa; of *Rutaceæ*, Melianthus .... 81 346.

Class XV. *Tetradynamia*. Stamens 4 long and 2 short. Orders 2, perfectly natural. Flowers cruciform.

1. *Siliculosa*. Fruit a roundish pod, or pouch. In some genera it is entire, as *Draba*; in others notched, as *Thlaspi*, and *Iberis*. — It contains of *Cruciferæ*, * Cakile, * Crambe, * Myagrum, Euclidium, Rapistrum, Bunias, * Coronopus, Biscutella, Peltaria, Clypeola, * Isatis, Succowia, Vella, Anastatica, Æthionema, * Thlaspi, * Hutchinsia, * Teesdalia, * Iberis, * Lepidium, * Cochlearia, * Subularia, * Draba, Petrocallis, Camelina, * Alyssum, Farsetia, Vesicaria, Lunaria, Ricotia 30 120

2. *Siliquosa*. Fruit a very long pod. Some genera have a *calyx clausus*, its leaves slightly cohering by their sides, as *Raphanus*, and *Cheiranthus*. Others have a spreading or gaping calyx, as *Cardamine*, and *Sisymbrium*.

Cleome is a very irregular genus, allied in habit, and even in the number of stamens of several species, to the *Polyandria Monogynia*. Its fruit, moreover, is a capsule of one cell, not the real two-celled pod of this order. Most of its species are fœtid and very poisonous, whereas scarcely any plants properly belonging to this class are remarkably noxious. Sir J. E. Smith has great doubts concerning the disease called *Raphania*, attributed by Linnæus to the seeds of *Raphanus Raphanistrum*.

The cruciform plants are vulgarly called antiscorbutic, and supposed to be of an alkalescent nature. Their essential oil, which is generally obtainable in very small quantities by distillation, smells like volatile alkali, and is of a very acrid quality. Hence the fœtid scent of water in which cabbages, or other plants of this tribe, have been boiled.

It contains of *Cruciferæ*, Heliophila, * Cardamine, * Arabis, Macropodium, * Turritis, * Barbarea, * Nasturtium, * Sisymbrium, * Erysimum, Notoceras, * Cheiranthus, * Mathiola, Malcomia, * Hesperis, Erucaria, * Brassica, * Sinapis, * Raphanus, Chorispermum; of *Capparides*, Cleome 20 164

Class XVI. *Monadelphia*. Stamens united by their filaments into one tube. Orders 8, distinguished by the number of their stamens.

1. *Triandria*. This order contains the singular Cape plant *Aphyteia*, consisting of a large flower and succulent fruit, springing immediately from the root, without stem or leaves. — It contains of *Leguminosæ*, Tamarindus; of *Irideæ*, Patersonia, Ferraria, Tigridia, Galaxia 5 11
2. *Pentandria*. Containing of *Tiliaceæ?* Waltheria, Hermannia; of *Malvaceæ*, Melochia, Melhania, Ochroma; of *Passifloræ*, Passiflora; of *Geraniæ*, * Erodium 7 92
3. *Heptandria*. Contains of *Geraniæ*, Pelargonium 1 175
4. *Octandria*. Contains of *Meliæ*, Aitonia 1 1
5. *Decandria*. Contains of *Geraniæ*, * Geranium; of *Leguminosæ?* Brownea 2 41
6. *Dodecandria*. Contains of *Geraniæ*, Monsonia; of *Malvaceæ*, Helicteres, Dombeya, Pentapetes, Pterospermum 5 13
7. *Polyandria*, a very numerous and magnificent order, comprising, of *Malvaceæ*, Carolinea, Adansonia, Bombax, Lagunea, Napæa, Sida, Cristaria, Palavia, Malachra, * Althæa, * Malva, * Lavatera, Ruizia, Malope, Kitaibelia, Urena, Gossypium, Hibiscus, Pavonia, Achania, Myrodia, Gordonia; of *Tiliaceæ*, Stuartia; of *Aurantiæ*, Camellia; of *Myrti*, Barringtonia, Gustavia; of .... Careya 27 210

Gen. Sp.

CLASS XVII. *Diadelphia.* Stamens united by their filaments into two parcels, both sometimes cohering at the base. Orders 4, distinguished by the number of their stamens. Flowers almost universally papilionaceous.

1. *Pentandria.* Containing of .... Monnieria; of *Leguminosæ*, Petalostemum 2 5

2. *Hexandria.* Containing of *Papaveraceæ*, Corydalis, Cysticapnos, *Fumaria 3 19

3. *Octandria.* Containing of *Pediculares*, *Polygala; of *Leguminosæ*, Securidaca 2 29

4. *Decandria* is by far the most numerous, as well as natural order of this class, consequently the genera are difficult to characterise.

The genera are arranged in sections, variously characterised.

(*a*) *Stamens all united*, that is, all in one set; as *Spartium*.

(*b*) *Stigma downy*, without the character of the preceding section; as *Pisum*.

(*c*) *Legume imperfectly divided into two cells*, always, as in all the following, without the character of the preceding sections; as *Astragalus*.

(*d*) *Legume with scarcely more than one seed;* as *Psoralea*.

(*e*) *Legume composed of single-valved joints, which are rarely solitary;* as *Hedysarum*.

(*f*) *Legume of one cell, with several seeds;* as *Melilotus*.

Leguminous plants are rarely noxious to the larger tribes of animals, though some species of *Galega* intoxicate fish. The seeds of *Cytisus Laburnum* have of late been found violently emetic, and those of *Lathyrus sativus* have been supposed at Florence to soften the bones, and cause death; we know of no other similar instances in this class, which is one of the most abundant in valuable esculent plants. The negroes have a notion that the beautiful little scarlet and black seeds of *Abrus precatorius*, so frequently used for necklaces, are extremely poisonous, insomuch that half of one is sufficient to kill a man. This is totally incredible. Linnæus however asserts, Sir J. E. Smith thinks rather too absolutely, that "among all the leguminous or papilionaceous tribe, there is no deleterious plant to be found."

It contains of *Leguminosæ*, Nissolia, Dalbergia, Pongamia, Pterocarpus, Amerimnum, Dipterix, Abrus, Erythrina, Butea, Piscidia, Borbonia, *Spartium, *Genista, Lebeckia, Rafnia, Aspalathus, Sarcophyllum, Spartium, *Genista, Lebeckia, Rafnia, Aspalathus, Sarcophyllum, Stauracanthus, * Ulex, Amorpha, Platylobium, Bossiæa, Scottia, Templetonia, Goodia, Loddigesia, Wiborgia, Crotalaria, Hovea, *Ononis, *Anthyllis, Arachis, Lupinus, Carpopogon, Phaseolus, Dolichos, Stizolobium, Glycine, Apios, Kennedia, Cylista, Clitoria, Galactia, * Pisum, Ochrus, *Orobus, Lathyrus, *Vicia, * Ervum, * Cicer, Liparia, Cytisus, Mullera, Geoffroya, Robinia, Colutea, Swainsona, Sutherlandia, Lessertia, Glycyrrhiza, Sesbana, Coronilla, *Ornithopus, * Hippocrepis, Scorpiurus, Smithia, Æschynomene, Hallia, Lespedeza, * Hedysarum, Zornia, Flemingia, Indigofera, Tephrosia, Galega, Phaca, Oxytropis, *Astragalus, Biserula, Dalea, Psoralea, Melilotus, Lupinaster, * Trifolium, * Lotus, Dorycnium, Trigonella, * Medicago 88 800

CLASS XVIII. *Polyadelphia.* Stamens united by their filaments into more than two parcels. Orders 3, distinguished by the number or insertion of their stamens, which last particular Linnæus here overlooked.

1. *Decandria.* Ten stamens. Contains of *Malvaceæ*, the Theobroma, or Chocolate-nut-tree 1 2

2. *Dodecandria.* Stamens, or rather anthers, from twelve to twenty, or twenty-five, their filaments unconnected with the calyx. — It contains of *Malvaceæ*, Bubroma, Abroma 2 3

3. *Icosandria.* Stamens numerous, their filaments inserted (in several parcels) into the calyx. — It contains of *Myrti*, Melaleuca, Tristania, Calothamnus, Beaufortia 4 32

4. *Polyandria.* Stamens very numerous, unconnected with the calyx. — It contains of *Ebenaceæ*, Hopea; of *Aurantiæ*, Citrus; of .... Xanthochymus; of *Hypericinæ*, * Hypericum, Ascyrum 5 65

Gen. Sp.

Class XIX. *Syngenesia.* Anthers united into a tube. Flowers compound. Orders 5.

This being truly a natural class, its orders are most of them equally so, though some are liable to exceptions.

1. *Polygamia æqualis.* In this each floret, taken separately, is perfect or united, being furnished with its own perfect stamens and pistil, and capable of bringing its seed to maturity without the assistance of any other floret. The order consists of three sections.

(*a*) *Florets all ligulate,* or *strap-shaped,* called by Tournefort *semiflosculous.* These flowers are generally yellow, sometimes blue, very rarely reddish. They expand in a morning, and close towards noon or in cloudy weather. Their herbage is commonly milky and bitter; as in *Leontodon, Tragopogon, Hieracium,* and *Cichorium.*

(*b*) *Flowers globose, generally uniform and regular, their florets all tubular, five-cleft, and spreading;* as *Carduus.*

(*c*) *Flowers discoid, their florets all tubular, regular, crowded and parallel, forming a surface nearly flat, or exactly conical.* Their colour is most generally yellow, in some cases pink. *Santolina* and *Bidens* are examples of this section.

It contains of *Cichoraceæ,* Geropogon, * Tragopogon, Troximon, Arnopogon, Scorzonera, Picridium, * Sonchus, * Lactuca, Chondrilla, * Prenanthes, * Leontodon, * Apargia, * Thrincia, * Picris, * Hieracium, * Crepis, * Helminthia, Tolpis, Andryala, Rothia, Krigia, Hyoseris, Hedypnois, Seriola, * Hypochæris, * Lapsana, Zacintha, Rhagadiolus, Catananche, * Cichorium, Scolymus; of *Cynarocephalæ,* * Arctium, * Serratula, * Carduus, * Cnicus, * Onopordum, Berardia, Cynara, Carlina, Atractylis, Acarna, Stokesia, Stobæa, Carthamus, Stæhelina, Pteronia; of *Corymbiferæ,* Vernonia, Liatris, Mikania, * Eupatorium, Ageratum, Stevia, Cephalophora, Hymenopappus, Melananthera, Marshallia, Spilanthes, * Bidens, Lagasca, Lavenia, Cacalia, Kleinia, Ethulia, Piqueria, * Chrysocoma, Tarchonanthus, Calea, Humea, Cæsulia, Ixodia, * Santolina, Athanasia, Balsamita, Pentzia 74 274

2. *Polygamia superflua.* Florets of the disk perfect or united; those of the margin furnished with pistils only; but all producing perfect seed.

(*a*) *Discoid,* the florets of the margin being obsolete or inconspicuous, from the smallness or peculiar form of the corolla; as *Artemisia.*

(*b*) *Ligulate, two-lipped,* of which *Perdicium,* a rare exotic genus, is the only instance.

(*c*) *Radiant,* the marginal florets ligulate, forming spreading, conspicuous rays; as in *Bellis.* This seems an approach of the third section of the former order towards what is equivalent to becoming double in other tribes. Accordingly, the *Anthemis nobilis,* with *Chrysanthemum, Leucanthemum,* and some others, occasionally have their whole disk changed to ligulate florets, destitute of stamens, and consequently abortive. Such are actually called double flowers in this class, and very properly. Many exotic species so circumstanced are met with in gardens. A few very strange anomalies occur in this section; one, *Sigesbeckia,* having but three stamens, instead of five, the otherwise universal number in the class; and *Tussilago hybrida,* as well as *Paradoxa* of Retzius, having distinct anthers. Nature therefore, even in this most natural class, is not quite without exceptions.

It contains of *Corymbiferæ,* * Tanacetum, * Artemisia, * Gnaphalium, Xeranthemum, Elichrysum, Carpesium, Baccharis, * Conyza, Madia, * Erigeron, * Tussilago, * Senecio, * Aster, * Solidago, * Cineraria, * Inula, Grindelia, Podolepis, Arnica, Doronicum, Perdicium, Tetragonotheca, Ximenesia, Helenium, * Bellis, Bellium, Dahlia, Tagetes, Heterospermum, Schkuhria, Pectis, Leysera, Relhania, Zinnia, * Chrysanthemum, * Pyrethrum, * Matricaria, Boltonia, Lidbeckia, Cenia, Cotula, Grangea, Anacyclus, * Anthemis, Sanvitalia, * Achillea, Balbisia, Amellus, Starkea, Eclipta, Chrysanthellum, Siegesbeckia, Verbesina, Synedrella, Galinsogea, Acmella, Zaluzania, Pascalia, Heliopsis, Buphthalmum 60 673

3. *Polygamia frustanea.* Florets of the disk, as in the preceding, perfect or united; those of the margin neuter, or destitute of pistils as well as of stamens; only some few genera having the rudiments of pistils in their radiant florets. This order is, still more evidently than the last, analogous to double flowers of other classes. — It contains of *Corymbiferæ,* Helianthus, Galardia, Rudbeckia, Cosmea, Coreopsis, Osmites, Pallasia,

Gen. _Sp._

Sclerocarpus, Cullumia, Berckheya, Didelta, Gorteria, Gazania, Cryptostemma, Arctotheca, Sphenogyne; of _Cynarocephalæ_, Zœgea, * Centaurea, Galactites 19 177

4. _Polygamia necessaria._ Florets of the disk furnished with stamens only; those of the margin or radius, only with pistils; so that both are necessary to each other. — It contains of _Corymbiferæ_, Milleria, Flaveria, Baltimora, Silphium, Alcina, Polymnia, Melampodium, Chaptalia, Calendula, Arctotis, Osteospermum, Othonna, Hippia, Gymnostyles, Psiadia, Eriocephalus, Filago, Micropus, Parthenium? Iva? 20 100

5. _Polygamia segregata._ Several flowers, either simple or compound, but with united tubular anthers, and with a partial calyx, all included in one general calyx. — It contains of _Corymbiferæ_, Elephantopus, Œdera, Stœbe, Nauenburgia? of .... Cassinia; of _Cynarocephalæ?_ Sphæranthus, Echinops, Rolandra, Brotera, Gundelia 10 17

Class XX. _Gynandria._ Stamens inserted either upon the style or germen. Orders 3.

1. _Monandria._ Stamen, or sessile anther, one only. — It contains of _Orchideæ_, * Orchis, Gymnadenia, * Aceras, * Herminium, Habenaria, Bartholina, Serapias, * Ophrys, * Satyrium, Disa, Pterygodium, Disperis, Goodyera, Neottia, Ponthieva, Diurus, Thelymitra, * Listera, Epipactis, Pogonia, Caladenia, Glossodia, Pterostylis, Caleya, Calopogon, Arethusa, Bletia, Geodorum, Calypso, Malaxis, Corallorrhiza, Isochilus, Ornithidium, Stelis, Pleurothallis, Octomeria, Aerides, Cryptarrhena, Dendrobium, Gomesa, Cymbidium, Brassia, Oncidium, Cyrtopodium, Brassavola, Broughtonia, Epidendrum, Vanilla 48 122

2. _Diandria._ Containing of _Orchideæ_, * Cypripedium; of _Stylideæ_, Stylidium; of _Urticeæ?_ Gunnera 3 10

3. _Hexandria._ Containing of _Aristolochiæ_, * Aristolochia 1 19

Class XXI. _Monoecia._ Stamens and Pistils in separate flowers, but both growing on the same individual plant. Orders 9.

1. _Monandria._ Contains of _Naiades_, Zannichellia, * Chara; of _Chenopodeæ_, Ceratocarpus; of _Urticeæ_, Artocarpus; of _Coniferæ_, Casuarina 5 16

2. _Diandria._ Contains of _Cucurbitaceæ_, Anguria; of _Naiades_, * Lemna ... 2 5

3. _Triandria._ Contains of _Aroideæ_, * Typha, * Sparganium; of _Gramineæ_, Zea, Tripsacum, Coix, Olyra; of _Cyperaceæ_, * Carex; of _Amentaceæ_, Comptonia; of _Chenopodeæ_, Axyris; of _Euphorbiaceæ_, Tragia; of _Laurinæ?_ Hernandia 11 101

4. _Tetrandria._ Contains of _Rhamni?_ Aucuba; of _Diosmaceæ_, Empleurum; of _Onagrariæ_, Serpicula; of _Plantagineæ_, * Littorella; of _Amentaceæ_, * Alnus; of _Euphorbiaceæ_, Cicca, * Buxus, Pachysandra; of _Chenopodeæ_, Diotis; of _Urticeæ_, * Urtica, Bœhmeria, Morus 12 41

5. _Pentandria._ Contains of _Menispermeæ?_ Schisandra; of _Corymbiferæ?_ Nephelium, Xanthium, Ambrosia, Franseria; _Cucurbitaceæ_, Luffa; _Amaranthaceæ_, Amaranthus 7 48

6. _Hexandria._ Contains of _Gramineæ_, Zizania, Pharus; of _Rubiaceæ_, Guettarda; of _Palmæ_, Cocos, Bactris, Elate, Sagus 7 11

7. _Polyandria._ Stamens more than seven. Contains of _Naiades_, * Ceratophyllum, * Myriophyllum; of _Alismaceæ_, * Sagittaria; of _Hydrocharideæ_, Begonia; of .... Acidoton, Salisburia, Pariana; of _Urticeæ_, Thelygonum; of _Rosaceæ_, * Poterium; of _Terebintaceæ?_ Juglans; of _Amentaceæ_, * Quercus, * Fagus, * Castanea, * Betula, * Carpinus, Ostrya, * Corylus, Platanus, Liquidambar; of _Aroideæ_, * Arum, Caladium; of _Palmæ_, Caryota 22 189

8. _Monadelphia._ Contains of _Palmæ_, Areca; of _Coniferæ_, * Pinus, Thuja, Cupressus, Podocarpus; of _Euphorbiaceæ_ Plukenetia, Dalechampia, Acalypha, Croton, Jatropha, Ricinus, Omphalea, Hippomane, Sapium, Phyllanthus, Stillingia, Aleurites, Hura; of _Sterculiaceæ_, Sterculia; of .... Heretiera; of _Cucurbitaceæ_, Trichosanthes, Momordica, Cucurbita, Cucumis, * Bryonia, Sicyos 26 158

9. _Gynandria._ Contains of _Euphorbiaceæ_, Andrachne 1 1

Class XXII. _Dioecia._ Stamens and pistils in separate flowers, situated on two separate plants. Orders 13.

1. _Monandria._ Contains of _Pandaneæ_, Pandanus 1 4

	Gen.	*Sp.*
2. *Diandria*. Contains of *Urticeæ*, Cecropia; of *Amentaceæ*, * Salix; of *Euphorbiaceæ*, Borya	3	87
3. *Triandria*. Contains of *Ericeæ?* * Empetrum; of .... Stilago; of *Santalaceæ?* Osyris; of *Restiaceæ*, Willdenovia, Restio, Elegia; of *Palmæ*, Phœnix	7	12
4. *Tetrandria*. Contains of *Rubiaceæ*, Anthospermum; of .... Trophis, Schæfferia, Picramnia, Antidesma; of *Onagrariæ*, Montinia; of *Caprifoliæ*, * Viscum; of *Terenbintaceæ*, Brucea; of *Urticeæ*, Broussonetia; of *Elæagni*, Hippophæ; of *Amentaceæ*, * Myrica; of *Proteaceæ*, Aulax, Leucodendron	13	46
5. *Pentandria*. Contains of *Terebintaceæ*, Pistacia, Zanthoxylum? of *Euphorbiaceæ*, Securinega; of *Amaranthaceæ*, Iresine; of *Chenopodeæ*, * Spinacia, Acnida; of *Urticeæ*, * Cannabis, * Humulus	8	18
6. *Hexandria*. Contains of *Smilaceæ*, Smilax; * Tamus? of *Dioscoreæ*, Rajania, Dioscorea; of *Ebenaceæ*, Maba; of *Palmæ*, Elais, Chamædorea, Borassus	8	36
7. *Octandria*. Stamens 8. Contains of *Amentaceæ*, * Populus; of *Sempervivæ*, * Rhodiola	2	15
8. *Enneandria*. Stamens 9. Contains of *Euphorbiaceæ*, * Mercurialis; of *Hydrocharideæ*, * Hydrocharis	2	6
9. *Decandria*. Stamens 10. Contains of *Cucurbitaceæ?* Carica; of *Leguminosæ*, Gymnocladus; of *Euphorbiaceæ*, Kiggelaria; of *Terebintaceæ*, Schinus; of .... Coriaria	5	9
10. *Dodecandria*. Stamens 11. Contains of *Hydrocharideæ*, * Stratiotes; of .... Hyænanche, Euclea, Datisca; of *Menispermeæ*, Menispermum, Cocculus	6	12
11. *Icosandria*. Stamens 12. Contains of *Tiliaceæ*, Flacourtia; of .... Gelonium, Rottlera	3	6
12. *Polyandria*. Stamens numerous. Contains of .... Trewia; of *Ebenaceæ*, Embryopteris; of *Rosaceæ*, Cliffortia; of *Cycadeæ*, Cycas, Zamia ...	5	26
13. *Monadelphia*. Stamens united. Contains of *Coniferæ*, Araucaria, * Juniperus, * Taxus, * Ephedra; of *Menispermeæ*, Cissampelos; of *Euphorbiaceæ*, Excœcaria, Adelia; of .... Loureira, Nepenthes; of *Myristiceæ*, Myristica; of *Smilaceæ?* * Ruscus; of *Palmæ*, Latania	12	40
14. *Gynandria*. Stamens inserted in the style. Contains of *Euphorbiaceæ*, Cluytia	1	8
Class XXIII. *Polygamia*. Stamens and Pistils separate in some flowers, united in others, either on the same plant or on two or three distinct ones; such difference in the essential organs being moreover accompanied with a diversity in the accessory parts of the flowers. Orders 2.		
1. *Monoecia*. United flowers accompanied with barren or fertile, or both, all on one plant. — It contains of *Musaceæ*, Musa; of *Melanthaceæ*, Veratrum; of *Gramineæ*, Andropogon, Chloris, Penicillaria, Sorghum, * Holcus, Ischæmum, Ægilops, Manisuris; of *Rubiaceæ*, Valantia; of *Urticeæ*, * Parietaria; of *Chenopodeæ*, * Atriplex, Rhagodia; of *Combretaceæ*, Terminalia; of *Santalaceæ*, Fusanus; of *Proteaceæ*, Brabejum; of .... Feronia; of *Terebintaceæ*, Ailanthus; of *Guttiferæ*, Clusia; of *Apocyneæ*, Ophioxylon; of *Acereæ*, * Acer; of *Amentaceæ*, Celtis; of *Rhamni?* Gouania; of *Umbelliferæ*, Hermas; of *Leguminosæ*, Inga, Mimosa, Schrankia, Desmanthus, Acacia; of *Palmæ*, Rhapis	31	204
2. *Dioecia*. The different flowers on two different plants. Contains of *Leguminosæ*, Gleditschia, Ceratonia; of *Oleinæ*, * Fraxinus; of .... Brosimum, Hamiltonia, Laurophyllus; of *Ebenaceæ*, Diospyros; of *Myrsineæ*, Myrsine; of *Santalaceæ?* Nyssa; of *Terebintaceæ*, Bursera; of *Umbelliferæ?* Arctopus; of *Araliæ*, Panax; of *Urticeæ*, Ficus; of *Palmæ*, Chamærops	14	76
Class XXIV. *Cryptogamia*. Stamens and pistils either not well ascertained, or not to be numbered with any certainty. Orders 10.		
1. *Gonopterides*. Fructification in a terminal catkin. Contains of *Equisetaceæ*, * Equisetum	1	7
2. *Stachyopterides*. Fructification in a spike. Contains of *Lycopodineæ*, * Lycopodium, Psilotum; of *Filices*, * Ophioglossum, * Botrychium	4	18
3. *Poropterides*. Capsules opening by a pore. Contains of *Filices*, Marattia ...	1	1

	Gen.	*Sp.*
4. *Filices.* Fructification on the back, summit, or near the base of the frond. — This order contains of *Filices*, Acrostichum, Hemionitis, Meniscium, Grammitis, * Polypodium, * Woodsia, Nephrodium, Allantodia, * Aspidium, * Asplenium, * Scolopendrium, Diplazium, * Pteris, Vittaria, Onoclea, * Blechnum, Woodwardia, Doodia, * Adiantum, Cheilanthes, Lonchitis, Davallia, Dicksonia, * Cyathea, * Trichomanes, * Hymenophyllum	26	120
5. *Hydropterides.* Fructification nearly radical. Contains of *Marsileaceæ*, * Isoetes, * Pilularia	2	2
6. *Schismatopterides.* Fructification in branched spikes. Contains of *Filices*, Lygodium, Anemia, * Osmunda	3	9
7. *Musci.* Mosses. These are really herbs with distinct leaves, and frequently as distinct a stem. — It contains of the natural order of the same name, and described in Smith's *Flora Britannica*, * Andræa, * Bartramia, * Bryum, * Buxbaumia, * Encalypta, * Fontinalis, * Funaria, * Grimmia, * Gymnostomum, * Hookeria, * Hypnum, * Minium, * Neckera, * Orthotrichum, * Phascum, * Polytrichum, * Pterogonium, * Sphagnum, * Splachnum, * Tetraphis * Tortula, * Trichostomum, and numerous others, amounting by estimate to See *Turner's Historia Muscorum.*		460
8. *Hepaticæ.* Liverworts. Of these the herbage is commonly frondose, the fructification originating from what is at the same time both leaf and stem. This character, however, proves less absolute than one founded on their capsules, which differ essentially from those of the preceding order in having nothing like a lid or *operculum.* The *corolla*, or veil, of some of the genera is like that of Mosses, but usually bursts at the top. The barren flowers in some are similar to the stamens of the last-mentioned plants, as in *Jungermania*, (see Hooker's *monograph* of this genus); in others they are of some peculiar conformation, as in *Marchantia*, where they are imbedded in a disk like the seeds of lichens, in a manner so contrary to all analogy, that botanists can scarcely agree which are the barren and which the fertile flowers of this genus. Linnæus comprehended this order under the following one, to which, says Sir J. E. Smith, it is most assuredly far less akin than to the foregoing. British species estimated at		85
9. *Algæ.* Flags. In this order the herbage is frondose, sometimes a mere crust, sometimes of a leathery or gelatinous texture. The seeds are imbedded, either in the frond itself, or in some peculiar receptacle. The barren flowers are but imperfectly known. The aquatic or submersed *Algæ* form a distinct and peculiar tribe. Some of these abound in fresh water, others in the sea, whence the latter are commonly denominated seaweeds. British species		18
10. *Lichenes.* Herbage frondose and leathery; seeds generally in the frond. This order was included by Linnæus under the former one. Estimated number of British species		373

11. *Fungi.* Mushrooms. These cannot properly be said to have any herbage. Their substance is fleshy, generally of quick growth and short duration, differing in firmness, from a watery pulp to a leathery or even woody texture. By some naturalists they have been thought of an animal nature, chiefly because of their fœtid scent in decay, and because little white bodies like eggs are found in them at that period. But these are truly the eggs of flies, laid there by the parent insect, and destined to produce a brood of maggots, to feed on the decaying *fungus*, as on a dead carcase. Ellis's beautiful discoveries, relative to corals and their inhabiting polypes, led to the strange analogical hypothesis that these insects formed the *fungus*, which Munchausen and others have asserted. Some have thought *fungi* were composed of the sap of corrupted wood, transmuted into a new sort of being; an idea as unphilosophical as the former, and unsupported by any semblance of truth.

Dryander, Schæffer and Hedwig have, on much better grounds, asserted their vegetable nature, detected their seeds, and in many cases explained their parts of fructification. In fact they propagate their species as regularly as any other organised beings, though, like others, subject to varieties. Their sequestered and obscure habitations, their short duration, their mutability of form and substance, render them indeed more difficult of inves-

Gen. Sp.

tigation than common plants, but there is no reason to suppose them less perfect, or less accurately defined. Splendid and accurate works, illustrative of this order, have been given to the world by Schœffer, Bulliard, and Sowerby, which are the more useful, as the generality of *fungi* cannot well be preserved. The most distinguished writer upon them, indeed the only good systematic one, is Persoon, who has moreover supplied us with some exquisite figures. See his *Synopsis Methodica Fungorum.* Estimated number of species, natives of Britain 800

Sect. II. *Natural Method of Jussieu.*

278. The method of A. L. de Jussieu has for its object the arrangement of plants, according to their greater or lesser degree of resemblance, both externally and internally. The seed is considered the most important part of the plant, as being destined for its re-production and continuance in the world. The fundamental divisions of this arrangement are therefore founded on the characters of seeds. The first grand division is derived from the presence or absence of seed-lobes; the next on the union or division of the seed-lobes in such as have them. Thus we have the three primitive divisions of cotylodoneæ, monocotyledoneæ, and acetyledoneæ. These were originally subdivided by Jussieu into fifteen classes; but they have been reduced by Decandolle (*Theorie de la Botanique,* 2d edit. 1819.) to eleven, as in the table already given. (276.) In determining the orders, the primary consideration is the resemblance of the greatest number of parts; and the second their relative value: a character of superior value being considered equivalent to several of inferior value. The definitions of these orders are too long for admission in this work, and their nature precludes abridgment. We can only therefore refer to Sir J. E. Smith's "Grammar of Botany," in which will be found a translation of Jussieu's delineations of his orders, with some remarks on the additional orders and sub-orders of Brown, Decandolle, and other botanists.

Every one allows, Decandolle observes, (art. *Bot* in *Cours d'Agricultur Complet, &c.* 1809.) that plants which resemble each other by their exterior forms, resemble each other also in their internal structure, their mode of vegetation, and their properties. Hence the study of the natural affinities of plants, well understood, furnishes useful indications of plants which may be substituted for others in medicine or general economy, enables us to predict, with tolerable certainty, the properties of new or unknown plants; to determine as to alliances by grafting or fecundation, and even to guide us in their culture and management.

Class I. Dicotyledoneæ. *Thalamifloreæ,* sect. 1. with numerous pistils, and stamens opposite to the petals. Five Orders.

Order 1. *Ranunculaceæ,* contains of *Pent. Polyg.* Myosurus, Cerotocephalus, Zanthorhiza; of *Decand. Trigy.* Garidella; of *Polyand. Monog.* Actæa; of *Polyan. Digy.* Pœonia; of *Polyand. Trig.* Delphinium, Aconitum; of *Polyand. Pentag.* Cimicifuga, Aquilegia Nigella; of *Polyand. Polyg.* Hepatica, Anemone, Pulsatilla, Atragene, Clematis, Thalictrum, Adonis, Knowltonia, Ficaria, Ranunculus, Trollius, Isopyrum, Eranthis, Helleborus, Coptis, Caltha, Hydropeltis, Hydrastis. 29 Gen. 214 Sp.

2. *Magnoliaceæ,* contains *Decand. Monogynia.* Quassia? of *Polyand. Digy.* Curatella? of *Polyand. Trig.* Hibbertia? of *Polyand. Polyg.* Dillenia? Illicium, Magnolia, Michelia. 8 Gen. 26 Sp.

3. *Annoneæ,* or Anonaceæ, contains of *Polyand. Poly.* Uvaria, Annona, Porcelia, Xylopia. 4 Gen. 16 Sp.

4. *Menispermeæ,* contains of *Hept. Polyg.* Wendlandia; of *Monœcia Pent.* Schizandra; of *Diœc. Dodecan.* Menispermum, Cocculus; of *Diœc. Monad.* Cissampelos. 5 Gen. 11 Sp.

5. *Berberides,* or Berberideæ, contains of *Tetrand. Monog.* Epimedium; of *Tetrand. Digy.* Hamamelis; of *Hexand. Monog.* Leontice, Caullophyllum, Berberis. 5 Gen. 11 Sp.

Class II. Dicotyledoneæ. *Thalamifloreæ,* sect. 2. with pistils solitary, or adhering together, placentas equal. Six Orders.

Order 1. *Papavaraceæ,* contains of *Tetrand. Digy.* Hypecoum; of *Octand. Monog.* Jeffersonia; of *Dodecand. Monog.* Bocconia; of *Polyand. Monog.* Sanguinaria, Podophyllum, Chelidonium, Glaucium, Papaver, Argemone; of *Diadelph. Hexand.* Corydalis, Cystycapnos, Fumaria. 12 Gen. 46 Sp.

2. *Cruciferæ,* contains of *Tetradynamia, Siliculosa.* Cakile, Crambe, Myagrum, Euclidium, Rapistrum, Bunias, Coronopus, Biscutella, Peltaria, Clypeola, Isatis, Succowia, Vella, Anastatica, Æthionema, Thlaspi, Hutchinsia, Teesdalia, Iberis, Lepi-

dium, Cochlearia, Subularia, Draba, Petrocallis, Camelina, Alyssum, Farsetia, Vesicaria, Lunaria, Ricotia; of *Tetrady. Siliqu.* Heliophila, Cardamine, Arabis, Macropodium, Turritis, Barbarea, Nasturtium, Sisymbrium, Erysimum, Notoceras, Cheiranthus, Mathiola, Malcomia, Hesperis, Erucaria, Brassica, Sinapis, Raphanus, Chorispermum. 49 Gen. 281 Sp.

3. *Capparides*, or Capparideæ, contains of *Pentand. Tetragy.* Parnassia? of *Pentand. Pentagy.* Drosera; of *Dodecand. Monogy.* Cratæva; of *Dodecand. Trig.* Reseda; of *Polyand. Monog.* Capparis, Marcgravia? of *Tetradyn. Siliquosa.* Cleome. 7 Gen. 51 Sp.
4. *Passifloreæ*, contains of *Monadelph. Pentand.* Passiflora. 1 Gen. 24 Sp.
5. *Violeæ*, or Violaceæ, contains of *Pentand. Monogy.* Viola, Ionidium. 2 Gen. 41 Sp.
6. *Cisti*, or Cistinæ, contains of *Polyand. Monagyn.* Cistus, Helianthemum. 2 Gen 66 Sp.

CLASS III. DICOTYLEDONEÆ. *Thalamifloræ*, sect. 3. with ovary solitary, placent central. Sixteen Orders.

Order 1. *Caryophylleæ*, contains of *Triand. Monogyn.* Ortegia, Lœflingia; of *Triand. Trigyn.* Holosteum, Polycarpon, Mollugo, Minuartia, Queria, Lechea; of *Tetrand. Digyn.* Buffonia; of *Tetrand. Tetragy.* Sagina, Mœnchia; of *Pentand. Digyn.* Velezia, Pharnaceum; of *Pentand. Trigyn.* Drypis; of *Pentrand. Pentagyn.* Linum; of *Hexand. Monogyn.* Frankenia? *Octand. Monogyn.* Mœhringia; of *Octand. Tetragyn.* Elatine; of *Decand. Digyn.* Gypsophila, Saponaria, Dianthus; of *Decand. Trigyn.* Cucubalus, Silene, Stellaria, Arenaria, Cherleria; of *Decand. Pentagyn.* Agrostemma, Lychnis, Cerastium, Spergula. 30 Gen. 289 Sp.
2. *Malvaceæ*, contains of *Pentand. Monogy.* Buttneria, Ayenia; of *Decand. Monogyn.* Kleinhofia; of *Monadelph. Pentand.* Melhania, Ochroma; of *Monadelph. Dodecand.* Helicteres, Dombeya, Pentapetes, Pterospermum; of *Monadelph. Poly.* Adansonia, Bombax, Lagunea, Napæa, Sida, Cristaria, Palavia, Malachra, Althæa, Malva, Lavatera, Ruizia, Malope, Kitaibelia, Urena, Gossypium, Hibiscus, Pavonia, Achania, Myrodia, Gordonia; of *Polyadelph. Decand.* Bubroma, Abroma. 35 Gen. 217. Sp.
3. *Sterculiaceæ*, contains of *Monæcia Monadelph.* Sterculia. 1 Gen. 5 Sp.
4. *Tiliaceæ*, contains of *Pentand. Pentagy.* Mahernia; of *Dodecand. Monogy.* Triumfetta; of *Dodecand. Digyn.* Heliocarpus; of *Polyandr. Monogyn.* Bixa, Sloanla, Aubletia, Sparmannia, Muntingia, Grewia, Tilia, Corchorus; of *Monadelph. Pentandr.* Waltheria? Hermannia? of *Monadelph. Polyand.* Stuartia; of *Diæc. Icosandr.* Flacourtia. 15 Gen. 80 Sp.
5. *Sapindi*, or *Sapindiaceæ*, contains of *Octand. Monogy.* Ornitrophe, Dimocarpus, Melicocca, Blighia, Ephielis? Kœlreuteria; of *Octand. Trigy.* Paullinia, Seriana, Cardiospermum, Sapindus. 10 Gen. 20 Sp.
6. *Acereæ*, contains of *Triandr. Monogyn.* Hippocratea; of *Heptand. Monogyn.* Æsculus; of *Polygam. Monæc.* Acer. 3 Gen. 24 Sp.
7. *Malpighiaceæ*, contains of *Decandr. Monogyn.* Gærtnera; of *Decandr. Trigyn.* Malpighia, Bannisteria. 3 Gen. 27 Sp.
8. *Pittospereæ*, contains of *Pentand. Monogyn.* Bursaria, Billardiera, Pittosporum. 3 Gen. 10 Sp.
9. *Hypericinæ*, contains of *Polyadelph. Polyand.* Hypericum, Ascyrum. 2 Gen. 54 Sp.
10. *Guttiferæ*, contains of *Decandr. Monogyn.* Gomphia; of *Dodecandr. Monogyn.* Garcinia; of *Polyandr. Monogyn.* Grias, Calophyllum, Mammea, Ochna? Elæocarpus? of *Polygam. Monæc.* Clusia. 8 Gen. 15 Sp.
11. *Vites*, contains of *Tetrandr. Monogyn.* Cissus; of *Pentand. Monogyn.* Vitis. 2 Gen. 21 Sp.
12. *Geraniæ*, or *Geraniaceæ*, contains of *Pentand. Monogyn.* Impatiens? of *Octandr. Monogy.* Tropœolum? of *Decandr. Pentagy.* Oxalis, of *Monodelph. Pentand.* Erodium; of *Monadelph. Heptand.* Pelargonium; of *Monadelph. Decandr.* Geranium; of *Monadelph. Dodecand.* Monsonia. 7 Gen. 314 Sp.
13. *Meliæ*, or *Meliaceæ*, contains of *Pentand. Monogyn.* Cedrella? Leea; of *Octandr. Monogy.* Gaurea; of *Decand. Monogyn.* Trichilia, Ekebergia, Heynea, Melia, Swietenia; of *Dodecand. Monogy.* Canella; of *Monadelph. Octandr.* Aitonia. 10 Gen. 16 Sp.
14. *Aurantiæ*, or *Hesperideæ*, contains of *Octandr. Monogyn.* Ximenia; of *Decand. Monog.* Limonia, Murraya, Cookia; of *Polyand. Monogyn* Ægle; of *Monadelph. Polyand.* Camellia; of *Polyadelph. Polyand.* Citrus. 7 Gen. 21 Sp.
15. *Rutaceæ*, contains of *Decandr. Monogy.* Guiaicum, Zygophyllum, Fagonia, Tribulus, Dictamnus, Ruta, of *Dodecandr. Monogy.* Peganum; of *Didynam. Angiosp.* Melianthus? 8 Gen. 23 Sp.
16. *Diosmeæ*, contains of *Pentandr. Monogy.* Adenandra, Barosma, Diosma, Agathosma; of *Octandr. Monogy.* Corræa; of *Monæc. Tetrandr.* Empleurum. 6 Gen. 32 Sp.

Class IV. Dicotyledoneæ. *Thalamifloreæ*, sect. 4. with fruit in scattered cells, but joined on the same base. Two Orders, but no examples in British Gardens.

Class V. Dicotyledoneæ. *Calycifloreæ*, with petals free, or more or less adhering together, always inserted in the calyx. Thirty-two Orders.

Order 1. *Terebintaceæ*, contains of *Triandr. Monogy.* Coeorum, Comocladia; of *Tetrand. Monogy.* Fagara, Monetia; of *Pentand. Monogy.* Mangifera; of *Pentandr. Trigyn.* Rhus, Spathelia; of *Octandr. Monogy.* Amyris, Dodonæa? of *Enneandr. Monogy.* Anacardium; of *Decandr. Pentagyn.* Averrhoa, Spondias; of *Monæc. Polyandr.* Juglans; of *Diæc. Tetrandr.* Brucea; of *Diæc. Pentandr.* Pistacia; Zanthoxylum; of *Diæc. Decandr.* Schinus; of *Polygam. Monæc.* Ailanthus; of *Polygam. Diæc.* Bursera. 19 Gen. 75 Sp.

2. *Rhamni*, or *Rhamneæ*, contains of *Tetrandr. Tetragyn.* Myginda, Ilex; of *Pentand. Monogyn.* Elæodendrum, Rhamnus, Zizyphus, Celastrus, Senacia, Euonymus, Hovenia, Ceanothus, Pomaderris, Phylica, Brunia? Staavia, Plectronia; of *Pentandr. Trigy.* Cassine, Staphylea; of *Hexandr. Monogyn.* Prinos; of *Monæc. Tetrandr.* Aucuba; of *Polygam. Monæc.* Gouania. 20 Gen. 126 Sp.

3. *Leguminosæ*, contains of *Decandr. Monogyn.* Edwardsia, Sophora, Ormosia, Anagyris, Thermopsis, Virgilia, Cyclopia, Baptisia, Podalyria, Chorizema, Podolobium, Oxylobium, Callistachys, Brachysema, Gompholobium, Burtonia, Jacksonia, Viminaria, Sphœrolobium, Aotus Dillwynia, Eutaxia, Sclerothamnus, Gastrolobium, Euchilus, Pultenia, Daviesia, Mirbelia, Cercis, Bauhinia, Hymenæa, Cynometra, Cassia, Cathartocarpus, Parkinsonia, Poinciana, Cæsalpinia, Guilandina, Hyperanthera, Hoffmanseggia, Adenanthera, Cadia, Prosopis, Hæmatoxylon, Copaifera, Schotia; of *Monadelph. Triandr.* Tamarindus; of *Diadelph. Pentandr.* Petalostemum; of *Diadelph. Octandr.* Securidaca; of *Diadelph. Decandr.* Nissolia, Dalbergia, Pongamia, Pterocarpus, Amerimnum, Dipterix, Abrus, Erythrina, Butea, Piscidia, Borbonia, Spartium, Genista, Lebeckia, Raffnia, Aspalathus, Sarcophyllum, Stauracanthus, Ulex, Amorpha, Platylobium, Bossiæa, Scottia, Templetonia, Goodia, Loddigesia, Wiborgia, Crotalaria, Hovea, Ononis, Anthyllis, Arachis, Lupinus, Carpopogon, Phaseolus, Dolichos, Stizolobium, Glycine, Apios, Kennedia, Cylista, Clitoria, Galactia, Pisum, Ochrus, Orobus, Lathyrus, Vicia, Ervum, Cicer, Liparia, Cytisus, Mullera, Geoffroya, Robinia, Colutea, Swainsonia, Sutherlandia, Lessertia, Glycyrhiza, Sesbana, Coronilla, Ornithopus, Hippocrepis, Scorpiurus, Smithia, Æschynomene, Hallia, Lespedeza, Hedysarum, Zornia, Flemingia, Galega, Indigofera, Tephrosia, Phaca, Oxytrophis, Astragalus, Biserrula, Dalea, Psoralia, Melilotus, Lupinaster, Trifolium, Lotus, Dorycnium, Trigonella, Medicago; of *Diæc. Decandr.* Gymnocladus; of *Polygam. Monæc.* Inga, Mimosa, Schrankia, Desmanthus, Acacia; of *Polygam. Diæc.* Gleditschia, Ceratonia. 145 Gen. 1085 Sp.

4. *Rosaceæ*, contains of *Diandr. Monogy.* Acæna; of *Tetrand. Monogy.* Sanguisorba, Alchemilla; of *Pentand. Monogy.* Hirtella; of *Pentand. Pentagyn.* Sibbaldia; of *Dodecandr. Digyn.* Agrimonia; of *Icosandr. Monogy.* Amygdalus; Prunus, Armeniaca, Chrysobalanus, Waldsteinia, Mespilus, Pyrus, Cydonia, Spiræa; of *Icosandr. Polygam.* Rosa, Rubus, Dalibarda, Fragaria, Comarum, Potentilla, Tormentilla, Geum, Dryas, Calycanthus? of *Monæc. Polyandr.* Poterium; of *Diæc. Polyandr.* Cliffortia. 27 Gen. 316 Sp.

5. *Salicariæ*, contains of *Tetrand. Monogy.* Ammannia; of *Pentandr. Monogy.* Glaux; of *Hexand. Monogy.* Peplis; of *Octand. Monogyn.* Grislea, Lawsonia; of *Decand. Monogy.* Acisanthera; of *Dodecand. Monogy.* Lythrum, Cuphæa; of *Polyand. Monogy.* Lagerstræmia. 9 Gen. 23 Sp.

6. *Melastomæ*, or *Melastomaceæ*, contains of *Octandr. Monogy.* Osbeckia, Rhexia; of *Decand. Monogy.* Melastoma; of *Dodecand. Monogy.* Blakea. 4 Gen. 24 Sp.

7. *Myrti*, or *Myrtaceæ*, contains of *Octandr. Monogyn.* Bæckia; of *Dodecand. Monogy.* Decumaria; of *Icosandr. Monogyn* Philadelphus, Leptospermum, Fabricia, Metrosideros, Psidium, Eugenia, Caryophyllus, Myrtus, Calyptranthes, Eucalyptus, Punica; of *Polyandr. Monogyn.* Alangium; of *Monadelph. Polyandr.* Barringtonia, Gustavia; of *Polyadelph. Icosandr.* Melaleuca, Tristania, Calothamnus, Beaufortia. 20 Gen. 121 Sp.

8. *Combretaceæ*, contains of *Pentandr. Monogy.* Conocarpus; of *Decandr. Monogy.* Combretum, Getonia, Quisqualis; of *Polygam. Monæc.* Terminalia. 5 Gen. 10 Sp.

9. *Cucurbitaceæ*, contains of *Triand. Monogyn.* Melothria; of *Pentand. Monogyn.* Gronovia; of *Monæc. Diand.* Anguria; of *Monœcia Pentand.* Luffa; of *Monœcia Monadelph.* Trichosanthes, Momordica, Cucurbita, Cucumis, Bryonia, Sicyos; of *Diœcia Decand.* Carica. 11 Gen. 48 Sp.

10. *Loaseæ*, contains of *Icosand. Monogyn.* Bartonia; of *Polyand. Monogyn.* Mentzelia. 2 Gen. 4 Sp.

11. *Onagrariæ*, contains of *Monand. Monogyn.* Lopezia; of *Diand. Monogyn.*

Circæa; of *Tetradyn. Monogy.* Ludwigia, Isnardia; of *Octand. Monog.* Œnothera, Gaura, Epilobium; of *Octand. Tetragy.* Haloragis; of *Decand. Monogyn.* Jussieua; of *Diœcia Tetrand.* Montinia. 10 Gen. 54 Sp.

12. *Ficoidea*, contains of *Dodecandr. Monog.* Nitraria; of *Dodecandr. Pentagyn.* Glinus; of *Icosandr. Pentagyn* Sesuvium, Tetragonia, Mesembryanthemum, Aizoon; of *Polyand. Pentagyn.* Reaumuria. 7 Gen. 229 Sp.

13. *Sempervivæ*, contains of *Tetrandr. Tetragyn.* Tillæa; of *Pentandr. Pentagyn.* Larochea, Crassula; of *Heptand. Heptag.* Septas; of *Octandr. Tetragyn.* Calanchoe, Bryophyllum; of *Decand. Pentag.* Cotyledon, Sedum, Penthorum; of *Decand. Decagyn.* Sempervivum; of *Diœcia Pentandr.* Rhodiola. 11 Gen. 126 Sp.

14. *Portulaceæ*, contains of *Tetrand. Tetragyn.* Montia; of *Pentandr. Monogy.* Claytonia; of *Pentandr. Trigyn.* Tamarix, Turnera, Telephium, Corrigiola, Portulacaria; of *Pentandr. Pentagyn.* Gisekia; of *Heptand. Digyn.* Limeum; of *Decandr. Digyn.* Trianthema, Scleranthus; of *Dodecand. Monogyn.* Portulacea, Talinum, Anacampseros, 14 Gen. 39 Sp.

15. *Cacti*, contains of *Pentand. Monogyn.* Ribes; of *Icosandr. Monogyn.* Cactus, Rhipsalis. 3 Gen. 81 Sp.

16. *Saxifrageæ*, contains of *Pentand. Monogyn.* Itea; of *Pentand Digyn.* Heuchera; of *Octandr. Tetragy.* Adoxa; of *Decandr. Digyn.* Hydrangea; Chrysosplenium, Saxifraga, Tiarella, Mitella. 8 Gen. 94 Sp.

17. *Cunoniaceæ*, contains of *Decandr. Digyn.* Cunonia; of *Dodecan. Digyn.* Callicoma, Bauera. 2 Gen. 3 Sp.

18. *Araliæ*, or *Araliaceæ*, contains of *Pentandr. Digyn.* Cussonia; of *Pentandr. Pentagyn.* Aralia; of *Polygam. Diœc.* Panax. 3 Gen. 12 Sp.

19. *Caprifoleæ*, contains of *Tetrandr. Monogyn.* Cornus; of *Pentand. Monogy.* Lonicera, Symphorea, Diervilla, Triosteum, Hedera; of *Pentand. Trigyn.* Viburnum, Sambucus; of *Didynam. Angiosp.* Linnæa; of *Diœcia Tetran.* Viscum. 10 Gen. 60 Sp.

20. *Umbelliferæ*, contains of *Pentandr. Monog.* Lagœcia; of *Pentand. Digyn.* Eryngium, Hydroctyle, Spananthe, Sanicula, Astrantia, Bupleurum, Echinophora, Hasselquistia, Tordylium, Caucalis, Artedia, Daucus, Visnaga, Ammi, Bunium, Conium, Selinum, Arthemanta, Peucedanum, Crithmum, Cachrys, Ferula, Laserpitium, Heracleum, Ligustrum, Angelica, Sium, Sison, Bubon, Cuminum, Œnanthe, Phellandrium, Cicuta, Æthusa, Meum, Coriandrum, Myrrhis, Scandix, Oliveria, Anthriscus, Chærophyllum, Imperatoria, Seseli, Thapsia, Pastinaca, Smyrnium, Anethum, Carum, Pimpinella, Apium, Ægopodium; of *Polygam. Monœcia*, Hermas; of *Polygam. Diœcia*, Arctopus? 54 Gen. 282 Sp.

21. *Corymbiferæ*, contains of *Syngenes. Polygam. Æqualis*, Vernonia, Liatris, Mikania, Eupatorium, Ageratum, Stevia, Cephalophora, Hymenopappus, Melananthera, Marshallia, Spilanthes, Bidens, Lagasca, Lavenia, Cacalia, Kleinia, Ethulia, Piqueria, Chrysocoma, Tarchonanthus, Calea, Humia, Cæsulea, Ixodia, Santolina, Athanasia, Balsamita, Pentzia; of *Sygenes. Polygam. Superflua*, Tanacetum, Artemesia, Gnaphalium, Xeranthemum, Helichrysum, Carpesum, Baccharis, Conyza, Madia, Erigeron, Tussilago, Senecio, Aster, Solidago, Cineraria, Inula, Grindelia, Podolepis, Arnica, Doronicum, Perdicium, Tetragonotheca, Ximensia, Helenium, Bellis, Bellium, Dahlia, Tagetes, Heterospermum, Schkuhria, Pectis, Leysera, Relhania, Zinnia, Chrysanthemum, Pyrethrum, Matricaria, Boltonia, Lidbeckia, Cenia, Cotula, Grangea, Anacyclus, Anthemis, Sanvitalia, Achillea, Balbisia, Amellus, Starkia, Eclipta, Chrysanthellum, Siegesbeckia, Syndrella, Galingsoga, Acmella, Zaluzania, Pascalia, Heliopsis, Buphthalmum; of *Syngenes. Polygam. Frustan.* Helianthus, Galardia, Rudbeckia, Cosmea, Coreopsis, Osmites, Pallasia, Sclerocarpus, Cullumia, Berckheya, Didelta, Gorteria, Gazania, Cryptostemma, Arctotheca, Sphenogyne; of *Syngen. Polygam. Necessar.* Milleria, Flaveria, Baltimora, Sylphium, Alcina, Polymnia, Melampodium, Chaptalia, Calendula, Arctotis, Osteospermum, Othonna, Hippia, Gymnostyles, Eriocephalus, Filago, Micropus, Parthenium, Iva; of *Syngenes. Polygam. Segregata*, Elephantopus, Œdera, Stæbe, Nauenbergia; of *Monæc. Pentandr.* Nepheleum, Xanthuem, Ambrosia, Franseria. 131 Gen. 998 Sp.

22. *Rubiaceæ*, contains of *Tetandr. Monogy.* Cephalanthus, Spermacoce, Sherardia, Asperula, Houstonia, Gallium, Crucianella, Catesbæa, Ixora, Pavetta, Bouvardia, Siderodendron, Chomelia, Mitchella, Coccocypsilum, Manettia; of *Pentandr. Monogy.* Cinchona, Pinckneya, Mussænda, Portlandia, Genipa, Gardenia, Oxyanthus, Randea, Webera, Erithalis, Morinda, Nauclea, Cephælis, Hamellia, Rondeletia, Macronemum, Vanguiera, Dentella, Serissa, Psychotria, Coffea, Chiococca, Pæderia, Plocama; of *Pentandr. Digyn.* Phyllis; *Hexand. Monogyn.* Hillia, Richardia; of *Monæc. Hexandr.* Guettarda; of *Diœc. Tetrandr.* Anthospermum; of *Polygam. Monæc.* Valantia. 47 Gen. 145 Sp.

23. *Cynarocephalæ*, contains of *Syngenes. Polyg. Æqualis*, Arctium, Serratula, Carduus, Cnicus, Onopordum, Berardia, Cynara, Carlina, Atractylis, Acarna, Stokesia, Stobœa, Carthamus, Stæhelina, Pteronia; of *Syngenes. Polygam. Frustan.* Zœgea, Centaurea, Galactites; of *Syngenes. Polygam. Segrega.* Sphæranthus, Echinops, Rolandra, Brotera, Gundelia. 23 Gen. 221 Sp.

24. *Dipsaceæ*, contains of *Diandr. Monogyn.* Morina; of *Triand. Monogy.* Valeriana, Fedia; of *Tetrand. Monog.* Dipsacus, Scabiosa, Knautia. 6 Gen. 70 Sp.

25. *Gentianeæ*, contains of *Tetrandr. Monogy.* Exacum, Sebæa, Frasera; of *Pentandr. Monogyn.* Menyanthes, Villarsia, Logania, Spigelia, Lisianthus, Chironia, Sabbatia, Erythræa, Eustoma; of *Pentandr. Digyn.* Swertia, Gentiana; of *Octandr. Monogy.* Chlora. 15 Gen. 21 Sp.

26. *Cichoraceæ*, contains of *Syngen. Polygam. Æqualis*, Geropogon, Tragopogon, Troximon, Arnopogon, Scorzonera, Picridium, Sonchus, Lactuca, Chondrilla, Prenanthes, Leontodon, Apargia, Thrincia, Picris, Hieracium, Crepis, Helminthia, Tolpis, Andryala, Rothia, Krigia, Hyoseris, Hedypnois, Seriola, Hypochæris, Lapsana, Zacintha, Rhagadiolus, Catananche, Cichorium, Scolymus. 31 Gen. 214 Sp.

27. *Campanulaceæ*, contains of *Pentandr. Monogy.* Lightfootia, Campanula, Roella, Phyteuma, Trachelium, Jasione, Lobelia, Cuphea; of *Hexand. Monogyn.* Canarina; of *Octandr. Monogyn.* Michauxia. 10 Gen. 121 Sp.

28. *Stylideæ*, contains of *Gynandr. Diand.* Stylidium. 1 Gen. 3 Sp.

29. *Rhodoraceæ*, contains of *Pentandr. Monogyn.* Azalea, Menziesia; of *Decandr. Monogyn.* Kalmia, Ledum, Rhodora, Rhododendron, Epigæa, of *Dodecand. Monogyn.* Bejaria. 8 Gen. 40 Sp.

30. *Goodenoviæ*, contains of *Pentandr. Monogyn.* Goodenia, Euthales, Scævola, Dampiera. 4 Gen. 8 Sp.

31. *Ericeæ*, contains of *Tetrand. Monogy.* Blæria, Diapensia, Pixidanthera; of *Pentand. Monogyn.* Cyrilla, Brossæa; of *Octand. Monog.* Oxycoccus, Calluna, Erica; of *Decandr. Monog.* Vaccinium, Andromeda, Enkianthus, Gaultheria, Arbutus, Clethra, Mylocarium, Pyrola, Chimaphila; of *Dodecand. Monogyn.* Hudsonia; of *Diœc. Triandr.* Empetrum. 19 Gen. 410 Sp.

32. *Epacrideæ*, contains of *Pentandr. Monogy.* Sprengelia, Andersonia, Lysinema, Epacris, Monotoca, Leucopogon, Stenanthera, Astroloma, Styphelia. 9 Gen. 20 Sp.

Class VI. Dicotyledoneæ. *Cordifloræ*, with Stamens adhering to a Corolla, which is not attached to the Calyx. Twenty-two Orders.

Order 1. *Myrsineæ*, contains of *Pentandr. Monogyn.* Ardisia; of *Polygam. Diœc.* Myrsine. 2 Gen. 11 Sp.

2. *Sapoteæ*, contains of *Pentandr. Monogyn.* Jacquinia, Achras, Chrysophyllum, Sideroxylon, Sersalisia, Bumelia; of *Octand. Monogyn.* Mimusops; of *Decandr. Monogyn.* Inocarpus; of *Dodecandr. Monog.* Bassia. 9 Gen. 22 Sp.

3. *Ebenaceæ*, contains of *Decandr. Monogyn.* Styrax; of *Decandr. Digyn.* Royena; of *Dodecandr. Monogy.* Halesia; of *Dodecandr. Trigyn.* Visnea; of *Polyadelph. Polyandr.* Hopea; of *Diœc. Hexand.* Maba; of *Diœc. Polyan.* Embryopteris; of *Polygam. Diœc.* Diospyras. 8 Gen. 27 Sp.

4. *Oleinæ*, contains of *Diandr. Monogyn.* Ligustrum; Olea, Notelæa, Chionanthus, Linociera, Ornus, Syringa; of *Polygam. Diœc.* Fraxinus. 8 Gen. 40 Sp.

5. *Jasmineæ*, contains of *Diand. Monogyn.* Nyctanthes, Jasminum. 2 Gen. 14 Sp.

6. *Verbenaceæ*, contains of *Diandr. Monog.* Ghinia, Stachytarpheta; of *Tetrand. Monogyn.* Ægiphila, Callicarpa; of *Pentand. Monogyn.* Tectona; of *Didynam. Gynosperm.* Selago; of *Didynam. Angiosperm.* Hebenstretia, Clerodendrum, Volkameria, Holmskioldia, Vitex, Cornutia, Hosta, Gmelina, Petræa, Citharexylum, Duranta, Lantana, Spielmannia, Zapania, Priva, Aloysia, Verbena. 23 Gen. 96 Sp.

7. *Asclepiadeæ*, contains of *Pentand. Digyn.* Periploca, Hemidesmus, Secamone, Microloma, Sarcostemma, Dæmia, Cynanchum, Oxystelma, Gymnema, Calotropis, Xismalobium, Gomphocarpus, Asclepias, Gonolobus, Pergularia, Marsdenia, Hoya, Stapelia, Piaranthus, Huernia, Caralluma. 21 Gen. 126 Sp.

8. *Apocyneæ*, contains of *Pentandr. Monogyn.* Strychnos, Gelesmium, Rauwolfia, Carissa, Arduina, Cerbera, Allamanda, Vinca, Nerium, Wrightia, Echites, Ichnocarpus, Plumeria, Cameraria, Tabernæmonta, Amsonia; of *Pentand. Digyn.* Apocynum, Melodinus; of *Polygam. Monœc.* Ophioxylon. 19 Gen. 61 Sp.

9. *Bignoniaceæ*, contains of *Diandr. Monogyn.* Catalpa; of *Pentandr. Monogy.* Cobœa, of *Didynam. Angiosperm.* Bignonia, Sesamum? Pentstemon, Chelone, Tourrettia? Martynia? Gloxinia? Gesneria? 10 Gen. 49 Sp.

10. *Pedalinæ*, contains of *Didynam. Angios.* Pedalium. 1 Gen. 1 Sp.

11. *Polemoniaceæ*, contains of *Pentandr. Monog.* Polemonium, Phlox, Vestia, Ipomopsis. 4 Gen. 23 Sp.

12. *Convolvulaceæ*, contains of *Pentandr. Monogy.* Convolvulus, Calystegia, Ipomæa, Retzia; of *Pentand. Digy.* Falkia, Dichondra, Evolvulus, Hydrolea, Cuscuta, 9 Gen. 91 Sp.

13. *Boragineæ*, contains of *Pentand. Monogyn.* Coldenia, Heliotropium, Myosotis, Lappula, Lithospermium, Batschia, Onosmodium, Anchusa, Cynoglossum, Pulmonaria, Symphytum, Cerinthe, Onosma, Borago, Trichodesma, Asperugo, Lycopsis, Echium, Tournefortia, Cordia, Bourreria, Ehretia, Hydrophyllum, Elisia, Nolana. 25 Gen. 143 Sp.

14. *Solaneæ*, contains of *Pentandr. Monogy.* Ramondia, Verbascum, Datura, Brugmansia, Hyoscyamus, Nicotiana, Mandragora, Atropa, Solandra, Physalis, Nicandra, Solanum, Capsicum, Cestrum, Lycium; of *Didynam. Angiosperm.* Brundfelsia? Crescentia, Celsia, Alonsoa, Anthocercis. 20 Gen. 175 Sp.

15. *Scrophularinæ*, contains of *Diand. Monogyn.* Veronica, Gratiola, Schwenkia, Calceolaria; of *Tetrand. Monogyn.* Buddlea, Soparia; of *Didynam. Angiosperm.* Limosella, Browallia, Stemodia, Mazus, Lindernia, Herpestis, Capraria, Teedia, Besleria, Trevirana, Columnea, Russelia, Dodartia, Halleria, Mimulus, Hornemannia, Digitalis, Scrophularia, Maurandia, Cymbaria, Nemesia, Anarrhinum, Antirrhinum, Linaria, Gerardia, Pedicularis, Melampyrum, Rhinanthus, Bartsia, Castilleja, Euphrasia, Buchnera, Manulea, Erinus, Sibthorpia, Disandra. 41 Gen. 242 Sp.

16. *Orobancheæ*, contains of *Didynam. Angiosperm.* Lathræa, Orobanche. 2 Gen. 7 Sp.

17. *Labiatæ*, contains of *Diand. Monogyn.* Lycopus, Amethystea, Cunila, Ziziphora, Hedeoma, Monarda, Rosmarinus, Salvia, Collinsonia; of *Didynam. Gymnosperm.* Ajuga, Anisomeles, Teucrium, Westringia, Satureja, Thymbra, Hyssopus, Pycnanthemum, Nepeta, Elsholtzia, Lavandula, Sideritis, Bystropogon, Mentha, Perilla, Hyptis, Lepechinia, Glechoma, Lamium, Galeopsis, Galeobdolon, Betonica, Stachys, Ballota, Marrubium, Leonurus, Phlomis, Leucas, Leonotis, Moluccella, Clinopodium, Origanum, Thymus, Acynos, Calamintha, Melissa, Dracocephalum, Melittis, Ocymum, Plectranthus, Prostanthera, Scutellaria, Prunella, Cleonia, Prasium, Phryma. 57 Gen. 493 Sp.

18. *Myoporinæ*, contains of *Didynam. Angiosp.* Myoporum, Stenochilus, Bontia, Avicennia. 4 Gen. 11 Sp.

19. *Acanthaceæ*, contains of *Diandr. Monogyn.* Elytraria, Justicia, Eranthemum; of *Didynam. Angiosperm.* Acanthus, Thunbergia, Barleria, Ruellia, Blechum, Aphelandra, Crossandra. 10 Gen. 61 Sp.

20. *Lentibulareæ*, contains of *Diandr. Monogyn.* Pinguicula, Utricularia. 2 Gen. 8 Sp.

21. *Primulaceæ*, contains of *Tetrand. Monogy.* Centunculus; of *Pentand. Monogyn.* Aretia, Androsace, Primula, Cortusa, Soldanella, Dodecatheon, Cyclamen, Hottonia, Lysimachia, Anagallis, Samolus, Coris; of *Heptand. Monogyn.* Trientalis. 14 Gen. 66 Sp.

22. *Globulariæ* contains of *Tetrand. Monogyn.* Globularia, Adina. 2 Gen. 7 Sp.

CLASS VII. DICOTYLEDONEÆ. *Monochlamydeæ*, in which the Calyx and the Corolla form only a single envelope. Seventeen Orders.

Order 1. *Plumbagineæ*, contains of *Pentand. Monogyn.* Plumbago; of *Pentandr. Pentagy.* Armeria, Statice. 3 Gen. 44 Sp.

2. *Plantagineæ*, contains of *Pentand. Monogy.* Plantago; of *Monæc. Tetrand.* Littorella. 2 Gen. 38 Sp.

3. *Nyctagineæ*, contains of *Monand. Monogy.* Boerhavia; of *Triand. Monogy.* Oxybaphus; of *Tetrand. Monogyn.* Allionia, Opercularia, Cryptospermum; of *Pentand. Monogy.* Mirabilis; of *Heptandr. Monogyn.* Pisonia. 7 Gen. 18 Sp.

4. *Amaranthraceæ*, contains of *Pentand. Monogy.* Gomphrena, Philoxerus, Achyranthes, Pupalia, Dieringia, Celosia, Lestibudesia, Alternanthera, Ærua, Illecebrum, Paronychia, Anychia, Mollia; of *Pentand. Digyn.* Herniaria; of *Monæc. Pentand.* Amaranthus; of *Diæc. Hexandr.* Iresine. 16 Gen. 78 Sp.

5. *Chenopodeæ*, contains of *Diandr. Monogy.* Salicornia; of *Diand. Digyn.* Corispermum, Blitum; of *Triand. Monogyn.* Polycnemum; of *Tetrandr. Tetrag.* Rivina, Camphorosma; of *Pentandr. Monogyn.* Chenolea; of *Pentandr. Digyn.* Chenopodium, Beta, Salsola, Kochia, Anabasis, Bosea; of *Pentandr. Tetragyn.* Basella; of *Heptandr. Monogyn.* Petiveria; of *Octandr. Digyn.* Galenia; of *Decandr. Decagyn.* Phytolacca; of *Monæc. Monandr.* Ceratocarpus; of *Monæc. Triandr.* Axyris; of *Monæc. Tetrandr.* Diotis; of *Diæc. Pentandr.* Spinacia; of *Polygam. Monæc.* Atriplex, Rhagodia. 23 Gen. 100 Sp.

6. *Polygoneæ*, contains of *Triand. Trigyn.* Kœnigia; of *Hexandr. Digyn.* Atraphaxis, of *Hexand. Trigyn.* Rumex; of *Octand. Trigyn.* Polygonum, Coccoloba; of *Enneand. Monogyn.* Eriogonum; of *Enneand. Trigyn.* Rheum; of *Decandr. Trigyn.* Brunnichia; of *Dodecandr. Tetragyn.* Calligonum. 9 Gen. 80 Sp.

7. *Laurinæ*, contains of *Enneandr. Monogyn.* Laurus; of *Monœc. Tetrand.* Hernandia? 2 Gen. 18 Sp.

8. *Myristicinæ*, contains of *Diœc. Monadelph.* Myristica. 1 Gen. 2 Sp.

9. *Proteaceæ*, contains of *Tetrand. Monogyn.* Petrophila, Isopogon, Protea, Leucospermum, Mimetes, Serruria, Nivenia, Sorocephalus, Spatalla, Persoonia, Grevillea, Hakea, Lambertia, Xylomelum, Telopea, Lomatia, Rhopala, Banksia, Dryandra; of *Diœc. Tetrandr.* Aulax, Leucadendron; of *Polygam. Monœc.* Brabejum. 22 Gen. 191 Sp.

10. *Thymeleæ*, contains of *Diandr. Monogyn.* Pimelea; of *Tetrandr. Monogyn.* Struthiola; of *Octandr. Monogyn.* Lagetta, Daphne, Dirca, Gnidia, Stellera, Passerina, Lachnea; of *Decandr. Monogyn.* Dais. 10 Gen. 47 Sp.

11. *Santalaceæ*, contains of *Triand. Monogyn.* Santalum; of *Pentandr. Monogyn.* Thesium; of *Octandr. Monogyn.* Fuchsia, Memecylon; of *Decandr. Monogyn.* Bucida; of *Diœc. Triandr.* Osyris; of *Polygam. Monœc.* Fusanus, Nyssa. 8 Gen. 17 Sp.

12. *Eleagneæ*, contains of *Tetrand. Monogyn.* Eleagnus; of *Diœc. Tetrand.* Hippophae. 2 Gen. 6 Sp.

13. *Aristolochiæ*, contains of *Dodecandr. Monogyn.* Asarum; of *Gynandr. Hexandr.* Aristolochia. 2 Gen. 22 Sp.

14. *Euphorbiaceæ*, contains of *Pentandr. Trigyn.* Xylophila; of *Dodecand. Trigyn.* Euphorbia; of *Monœc. Triandr.* Tragia; of *Monœc. Tetrandr.* Cicca, Buxus, Pachysandra; of *Monœc. Monadelph.* Plukenetia, Dalechampia, Acalypha, Croton, Jatropha, Ricinus, Omphalea, Hippomane, Sapium, Phyllanthus, Stillingia, Aleurites, Hura; of *Diœc. Diandr.* Borya; of *Diœc. Pentand.* Securinega; of *Diœc. Enneandr.* Mercurialis; of *Diœc. Decandr.* Kiggelaria; of *Diœc. Monadelph.* Eccaria, Adelia; of *Diœc. Gynand.* Cluytia. 26 Gen. 220 Sp.

15. *Urticeæ*, contains of *Diandr. Trigy.* Piper; of *Tetrandr. Monogy.* Dorstenia; of *Octandr. Tetragyn* Forskohlea; of *Gynand. Driand.* Gunnera; of *Monœc. Monand.* Artocarpus; of *Monœc. Tetrand.* Urtica, Boehmeria, Morus; of *Monœc. Polyandr.* Thelygonum; of *Diœc. Diandr.* Cecropia; of *Diœc. Pentandr.* Cannabis, Humulus; of *Polygam. Monœc.* Parietaria; of *Polyg.* Diœcia, Ficus. 14 Gen. 103 Sp.

16. *Amentaceæ*, contains of *Pentand. Digyn.* Ulmus; of *Polyandr. Digyn.* Fothergilla; of *Monœc. Triandr.* Comptonia; of *Monœc. Tetrand.* Alnus; of *Monœc. Polyand.* Quercus, Fagus, Castanea, Betula, Carpinus, Ostrya, Corylus, Platanus, Liquidambar; of *Diœc. Diandr.* Salix; of *Diœc. Octand.* Populus; of *Polygam. Monœc.* Celtis. 16 Gen. 191 Sp.

17. *Coniferæ*, contains of *Monœc. Monand.* Casuarina, Pinus, Thuja, Cupressus, Podocarpus; of *Diœc. Monodelph.* Araucaria, Juniperus, Taxus, Ephedra. 9 Gen. 74 Sp.

CLASS VIII. MONOCOTYLEDONEÆ. *Phanerogameæ*, or Plants with one Seed lobe, in which the fructification is visible. Twenty-five Orders.

Order 1. *Cycadeæ*, contains of *Diœc. Polyand.* Cycas, Zamia. 2 Gen. 13 Sp.

2. *Hydrocharideæ*, contains of *Tetrand. Monogyn.* Trapa; of *Heptandr. Monogyn.* Damasonium; of *Enneandr. Hexagyn.* Butomus; of *Polyandr. Monogyn.* Nymphæa, Nuphar, Euryale; of *Polyand. Polygyn.* Nelumbium; of *Diœc. Enneandr.* Hydrocharis; of *Diœc. Dodecand.* Stratiotes. 10 Gen. 32 Sp.

3. *Alismaceæ*, contains of *Pentandr. Monogyn.* Potamogeton; of *Hexand. Trigyn.* Scheuchzeria, Triglochin; of *Hexandr. Polyg.* Actinocarpus, Alisma; of *Monœc. Polyandr.* Sagittaria. 6 Gen. 30 Sp.

4. *Orchideæ*, contains of *Gynand. Monandr.* Orchis, Gymnadenia, Aceras, Herminium, Habenaria, Bartholina, Serapias, Ophrys, Satyrium, Disa, Pterygodium, Disperis, Goodyera, Neottia, Ponthieva, Diurus, Thelymitra, Listera, Epipactis, Pogonia, Caledonia, Glossodia, Pterostylis, Caleya, Calopogon, Arethusa, Bletia, Geodorum, Calypso, Malaxis, Corallorrhiza, Isochirlus, Ornithodium, Stelis, Pleurothallis, Octomeria, Aerides, Cryptarrhena, Dendrobium, Gomesa, Cymbidium, Brassia, Oncidium, Cyrtodium, Brassavola, Broughtonia, Epidendrum, Vanilla; of *Gynand. Diandr.* Cypripedium. 49 Gen. 128 Sp.

5. *Musaceæ*, contains of *Pentandr. Monogyn.* Heliconia, Strelitzia; of *Hexand. Monogyn.* Musa, Urania. 4 Gen. 14 Sp.

6. *Irideæ*, contains of *Triandr. Monogyn.* Crocus, Trichonema, Geissorhiza, Hesperantha, Sparaxis, Ixia, Anomatheca, Tritonia, Watsonia, Gladiolus, Melasphærula, Antholyza, Babiana, Aristea, Witsenia, Lapeyrousia, Moræa, Iris, Marica, Pardan-

thus; of *Monadelph. Triandr.* Patersonia, Ferraria, Tigridia, Galaxia. 24 Gen. 224 Sp.

7. *Hæmodoraceæ*, contains of *Triand. Monogyn.* Wachendorfia, Xiphidium, Dilatris, Hæmodorum; of *Hexandr. Monogyn.* Lophiola, Lanaria, Anigozanthus. 7 Gen. 13 Sp.

8. *Amaryllideæ*, contains of *Hexand. Monogyn.* Hæmanthus, Galanthus, Leucojum, Strumaria, Crinum, Cyrtanthus, Brunsvigia, Amaryllis, Narcissus, Pancratium, Eucrosia, Doryanthes, Gethyllis. 13 Gen. 110 Sp.

9. *Hemerocallideæ*, contains of *Hexandr. Monogyn.* Blandfordia, Hemerocallis, Aletris, Tritoma, Veltheimia, Polianthes, Sanseviera, Tulbagia, Brodœa, Aloe. 11 Gen. 110 Sp.

10. *Dioscoreæ*, contains of *Diæc. Hexand.* Rajania, Dioscoria. 2 Gen. 9 Sp.

11. *Smilaceæ*, contains of *Hexand. Monogyn.* Streptopus, Convallaria, Smilacina, Polygonatum, Ophiopogon; of *Hexandr. Trigyn.* Myrsiphyllum? Medeola, Trillium; of *Octand. Tetragyn.* Paris; of *Diæc. Hexandr.* Smilax, Tamus; of *Monæc. Monadelph.* Ruscus. 12 Gen. 59 Sp.

12. *Lilia*, or *Liliaceæ*, contains of *Hexandr. Monogyn.* Fritillaria, Lilium, Tulipa, Erythronium, Gloriosa, Yucca. 6 Gen. 47 Sp.

13. *Bromeleæ*, contains of *Hexandr. Monogyn.* Bromelia, Pitcairnia, Tillandsia, Agave, Furcrœa, Buonapartea. 6 Gen. 39 Sp.

14. *Asphodeleæ*, contains of *Hexandr. Monogyn.* Pontederia? Eucomis, Aphyllanthes, Sowerbæa, Allium, Albuca, Xanthorrhæa, Thysanotus, Eriospermum, Gagea, Ornithogalum, Scilla; Massonia, Asphodelus, Anthericum, Arthropodium, Phalangium, Chlorophytum, Cæsia, Narthecium, Dianella, Eustrephus, Asparagus, Drimia, Uropetalun, Hyacinthus, Muscari, Lachenalia, Dracæna, Phylloma, Alstrœmeria, Phormium, Hypoxis, Curculigo, Cyanella. 35 Gen. 277 Sp.

15. *Melanthaceæ*, contains of *Hexandr. Monogyn.* Bulbocodium, Uvularia; of *Hexand. Trigyn.* Tofieldia, Melanthium, Colchicum, Helonias, Nolina; of *Polygam. Monæc.* Veratrum. 8 Gen. 37 Sp.

16. *Junceæ*, contains of *Diandr. Monogyn.* Philydrum; of *Hexand. Monogyn.* Juncus, Luzula; of *Hexand. Trigyn.* Flagellaria? 4 Gen. 30 Sp.

17. *Restiaceæ*, contains of *Triand. Monogyn.* Xyris; of *Triandr. Trigyn.* Eriocaulon; of *Diæc. Triandr.* Willdenovia, Restio, Elegia. 5 Gen. 7 Sp.

18. *Commelineæ*, contains of *Triandr. Monogyn.* Commelina, Aneilema, Callisia; of *Hexandr. Monogy.* Tradescantia. 4 Gen. 22 Sp.

19. *Palmæ*, contains of *Hexandr. Monogyn.* Corypha, Liccuala, Thrinax, Calamus; of *Hexandr. Trigyn.* Sabal; of *Monæc. Hexandr.* Cocus, Bactris, Elate, Sagus; of *Monæc. Polyandr.* Caryota; of *Monæc. Monadelph.* Areca; of *Diæc. Triandr.* Phœnix; of *Diæc. Hexandr.* Elais, Chamædorea, Borassus; of *Diæc. Monadelph.* Latania; of *Polygam.* Rhaphis; of *Polygam. Diæc.* Chamærops. 18 Gen. 29 Sp.

20. *Canneæ*, contains of *Monand. Monagyn.* Canna, Maranta, Thalia, Phrynium. 4 Gen. 15 Sp.

21. *Pandaneæ*, contains of *Diæc. Monand.* Pandanus. 1 Gen. 4 Sp.

22. *Scitamineæ*, contains of *Monandr. Monogyn.* Hedychium, Alpinia, Hellenia, Zinziber, Elettaria, Costus, Kæmpferia, Amomum, Curcuma, Globba. 10 Gen. 35 Sp.

23. *Cyparaceæ*, contains of *Triandr. Monogyn.* Mariscus, Kyllingia, Cyperis, Isolepis, Scirpus, Eleocharis, Rynchospora, Schœnus, Cladium, Trichophorum, Eriophorum; of *Monæc. Triandr.* Carex. 12 Gen. 133 Sp.

24. *Aroideæ*, contains of *Tetrand. Monogyn.* Pothos; of *Hexand. Monogyn.* Acorus, Orontium, Tupistra, Tacca; of *Heptand. Monogyn.* Dracontium, Calla; of *Monæc. Triandr.* Typha, Sparganium; of *Monæc. Polyand.* Arum, Caladium. 11 Gen. 61 Sp.

25. *Gramineæ*, contains of *Diandr. Digyn.* Anthoxanthum; of *Triand. Monogyn.* Nardus, Lygeum, Cornucopiæ, Cenchrus, Sesleria, Limnetis; of *Triandr. Trigyn.* Trichodium, Sporabolus, Agrostis, Knappia, Pterotis, Polypogon, Stipa, Trisetum, Avena, Bromus, Festuca, Triticum, Secale, Hordeum, Elymus, Lolium, Kæleria, Glyceria, Poa, Triodia, Calamagrostis, Arundo, Aira, Melica, Echinaria, Lappago, Eleusine, Chrysurus, Cynosurus, Beckmannia, Dactylis, Uniola, Briza, Cynodon, Milium, Lagurus, Alopecurus, Phleum, Crypsis, Phalaris, Torrettia, Paspalium, Digitaria, Panicum, Orthopogon, Pennisetum, Saccharum, Rottbollia, Microchloa, Leersia; of *Hexandr. Monogyn.* Bambusa, Ehrharta; of *Hexandr. Digyn.* Oryza; of *Monæc. Triandr.* Zea, Tripsacum, Coix, Olyra; of *Monæc. Hexandr.* Zizania, Pharus; of *Polygam. Monæc.* Andropogon, Chloris, Penicillaria, Sorghum, Holcus, Ischæmum, Ægilops, Manisuris. 74 Gen. 377 Sp.

Class IX. Monocotyledoneæ. *Cryptogameæ*, in which the fructification is concealed, unknown, or irregular. Five Orders.

Order 1. *Naiadeæ*, contains of *Monandr. Monogyn.* Hippuris; of *Diandr. Digyn.* Callitriche; of *Tetrand. Tetragyn.* Ruppia; of *Hexandr. Trigyn.* Aponogeton; of *Heptand. Tetragyn.* Saururus; of *Monæc. Monandr.* Zannichelia, Chara; of *Monæc. Diand.* Lemna; of *Monæc. Polyand.* Ceratophyllum, Myriophyllum. 10 Gen. 23 Sp.

2. *Equisetaceæ*, contains of *Cryptog. Gonopterid.* Equisetum. 1 Gen. 7 Sp.

3. *Marsiliaceæ*, contains of *Cryptogam. Hydropterid.* Isoetes, Pilularia. 2 Gen. 2 Sp.

4. *Lycopodineæ*, contains of *Cryptogam. Stachopterid.* Lycopodium, Psilotum. 2 Gen. 12 Sp.

5. *Filices*, contains of *Cryptogam. Stachiopterid.* Ophioglossum, Botrychium; of *Crypto. Poropterid.* Marattia; of *Cryptog. Schismatopterid.* Lygodium, Anemia, Osmunda; of *Cryptog. Filic.* Acrosticum, Hemionitis, Meniscium, Grammitis, Polypodium, Allantodia, Aspidum, Asplenium, Scolopendrium, Diplazium, Pteris, Vittaria, Onoclea, Blechnum, Woodwardia, Doodia, Adiantum, Cheilanthes, Lonchitis, Davallia, Dicksonia, Cyathea, Trichomanes, Hymenophyllum. 32 Gen. 139 Sp.

As the following genera are not referred to their natural orders in the *Hortus Suburbanus Londinensis* of *Sweet*, from which this table and that of the Linnæan arrangement have been composed, we have brought them together here as unknown, or *Miscellaneæ*; but most of them will be found referred to their proper natural orders in the General Index at the end of this work.

Of these doubtful genera, there are in *Monandr. Monogyn.* Pollichia; in *Diandr. Monogyn.* Galipea, Fontanesia; in *Triandr. Monogyn.* Leptanthus; in *Tetrandr. Monogy.* Zieria, Witheringia, Penæa, Manettia, Curtisia, Chloranthus, Radiola; in *Pentand. Monogyn.* Caldasia, Lasiopetalum, Galax, Calodendrum, Scopolia; in *Pentand. Pentagyn.* Commersonia; in *Hexand. Monogyn.* Diphyllea, Nandina; in *Heptand. Monogyn.* Jonesia; in *Octandr. Monogyn.* Bocconia, Tetratheca, Jambolifera; in *Decand. Monogyn.* Crowea, Codon, Monotropa, Dionæa, Garuga, Samyda, in *Decandr. Pentagyn.* Grielum; in *Dodecand. Monogyn.* Aristotelia; in *Polyand. Monogyn.* Sarracenia; in *Diadelph. Pentandr.* Monnieria; in *Polyadelph. Polyandr.* Xanthochymus; in *Monæc. Polyandr.* Acidoton, Salisburia, Pariana; in *Monæc. Monadelph.* Heretiera; in *Diæc. Triand.* Stilago; in *Diæc. Tetrand.* Schœffera; in *Diæc. Pentandr.* Picramnia, Antidesma; in *Diæcia Decandria*, Hyænanchea, Euclea, Datisca; in *Diæcia Polyand.* Trewia; in *Diæc. Monadelph.* Loureira, Nepenthes; in *Polygam. Diæc.* Brosimum, Hamiltonia, Laurophyllus. 53 Gen. 71 Sp.

Chap. V.

Vegetable Organology, or the external Structure of Plants.

278. Vegetables may be regarded as a natural assemblage of individuals, reducible to classes, according as they are distinguished by a structure or organisation more complicated or more simple; or, according as they are found to be formed with, or without certain parts or organs entering into the general idea of the plant. The former will constitute what may be denominated perfect plants, and will form a class comprehending the principal mass of the vegetable kingdom. The latter will constitute what may be denominated imperfect plants, and will a form a class comprehending all such vegetables as are not included in the foregoing class. Such is the arrangement of Keith, from whose work, as by far the best for general purposes, we have extracted this and the three following chapters.

Sect. I. *Perfect Plants.*

The parts of perfect plants may be distributed into conservative and reproductive, as corresponding to their respective functions in the economy of vegetation.

Subsect. 1. *Conservative Organs.*

279. The conservative organs are such as are absolutely necessary to the growth and preservation of the plant, including the root, trunk, branch, leaf, and frond.

The *root* (for technical details see terminology, 202.) is that part of the plant by which it attaches itself to the soil in which it grows, or to the substance on which it feeds, and is the principal organ of nutrition. This definition is no doubt liable to exceptions. For even of plants denominated perfect, some are found to float on the surface of the water, having their roots immersed on it, but not fixed; such as the several species of lemma or duck-meat; and of plants denominated imperfect, some have no root at all, or, at least, no visible part distinct from the rest to which that appellation can be ascribed; such as many of the confervæ; or they are apparently altogether root, such as the tuber cibarium or truffle. The viscum or misletoe roots into the bark of trees. At the point of union between the root and upper part of the plant, there may generally be perceived a sort of annular bulge or protuberance surrounding or encircling it. It is most discernible in the early stages of the plant's growth, and is then particularly conspicuous in the horse-chestnut. French botanists call it *le collet*, the collar. Roots have been found to exhibit a considerable variety of shape, size, and structure, analogous to the peculiarities affecting the general habit of the plant.

280. The *trunk* (203-4.) is that part of the plant which, springing immediately from the root, ascends in a vertical position above the surface of the soil, and constitutes the principal bulk of the individual. It has been represented by Linnæus as being the caudex ascendens, or root above ground; an illustration perhaps more fanciful than philosophical.

281. The *branches* (204.) are the divisions of the trunk, originating generally in the upper extremity, but often also along the sides. The primary divisions are again subdivided into secondary divisions, and these again into still smaller divisions, till they terminate at last in slender twigs. In point of external form and structure the branches resemble the trunk; but in point of insertion, distribution, and direction, they exhibit some considerable variety, furnishing a ground of distinction, occasionally resorted to by botanists in the discriminating and characterising of species.

282. The *leaf*, (229.) which is a temporary part of the plant, is a thin and flat substance of a green color, issuing generally from numerous points towards the extremities of the branches, but sometimes also immediately from the stem or root, and distinguishable by the sight or touch into an upper and under surface, a base and an apex, with a midrib and lateral nerves. But to this difinition there are no doubt a good many exceptions. For leaves are not always thin and flat, nor are they always green. The leaves of the aloe and common house-leek are thick and fleshy; the leaves of the beet are of a dark and dull purple; and the leaves of Canary reed-grass are variegated with stripes of green and white. Nor are all leaves furnished with a midrib and lateral divisions; for in the grasses the nerves are parallel.

283. The *frond*, (230.) which is to be regarded as a compound of several of the parts already described, consists of an union or incorpooation of the leaf, leaf-stalk, and branch or stem, forming as it were but one organ, of which the constituent parts do not separate spontaneously from one another by means of the fracture of any natural joint, as in the case of plants in general, but adhere together even in their decay. Like the stipe, it is peculiar only to palms, at least as applicable to perfect plants, and is sometimes pinnate, as in zamia integrifolia; sometimes doubly pinnate, and sometimes fan-shaped and plaited, as in chamærops humilis and raphis flabelliformis.

Subsect. 2. *Conservative Appendages.*

284. The conservative appendages are such accessory or supernumerary parts as are found to accompany the conservative organs occasionally, but not invariably. It is not meant, however, that they make their appearance at random. They are permanent in whatever species they are found to exist; some being peculiar to one species, and some to another. But they are never found to be all united in the same species, and are not necessarily included in the general idea of the plant. Where they occur, however, they are often of the greatest utility to the botanist. They are denominated gems, glands, tendrils, stipulæ, armature, pubescence, and anomalies.

285. *Gems* (247.) are organised substances issuing from the surface of the plant, and containing the rudiments of new and additional parts which they protrude; or the rudiments of new individuals which they constitute by detaching themselves ultimately from the parent plant, and fixing themselves in the soil. Gems, according to Gœrtner, are of two sorts, simple and compound; simple if furnished with only a single envelope; and compound if furnished with two or more envelopes. Of each sort there are also two species, the former including the propago and gongylus; the latter, the bulb and bud, which last only are proper to perfect plants.

286. *Glands* (250.) are small and minute substances of various different forms, found chiefly on the surface of the leaf and petiole, but often also on the other parts of the plant, and supposed to be organs of secretion.

287. The *tendril* (246.) is a thread-shaped and generally spiral process issuing from the stem, branch, or petiole, and sometimes even from the expansion of the leaf itself, being an organ by which plants of weak and climbing stems attach themselves to other plants, or other substances for support; for which purpose it seems to be well fitted by nature, the tendril being much stronger than a branch of the same size.

288. The *stipulæ* (232.) are small and foliaceous appendages accompanying the

real leaves, and assuming the appearance of leaves in miniature. They are found by botanists to be of great importance in specific discrimination.

289. *Ramenta* (233.) are thin, oblong, and strap-shaped appendages of a brownish color, issuing from the surface of the plant, and somewhat resembling the stipulæ, but not necessarily accompanying the leaves. The term, which literally signifies bits of chips or shavings, seems to have been employed by Linnæus to denote the small and scattered scales that are frequently found on the stems of vegetables, originating in the bark, and giving it a rough or chopped appearance. Hence a branch or stem that is covered with thin and dry scales or flaps is said to be ramentaceous, as in the case of tamarix Gallica or French tamarisk.

290. The *armature* (251-4.) consists of such accessory and auxiliary parts as seem to have been intended by nature to defend the plant against the attacks of animals.

291. The *pubescence* (254.) is a general term, including under it all sorts of vegetable down or hairiness, with which the surface of the plant may be covered, finer or less formidable than the armature.

292. *Anomalies.* There are several other appendages proper to conservative organs, which are so totally different from all the foregoing, that they cannot be classed with any of them; and so very circumscribed in their occurrence, that they do not yet seem to have been designated by any peculiar appellation. The first anomaly, as affects the conservative appendages, occurs in dionœa muscipula or Venus's fly-trap. A second is that which occurs in sarracenia purpurea or purple side-saddle-flower. A third, which is still more singular, occurs in nepenthes distillatoria. The last anomaly is that of a small globular and membranaceous bag, attached as an appendage to the roots and leaves of some of the aquatics. It is confined only to a few genera, but is to be seen in great abundance on the roots or leaves of the several species of utricularia inhabiting the ponds and ditches of this country; and on the leaves of aldrovanda vesciculosa, an inhabitant of the marshes of Italy. In utricularia vulgaris this appendage is pear-shaped, compressed with an open border at the small end, furnished with several slender fibres originating in the margin, and containing a transparent and watery fluid, and a small bubble of air, by means of which it seems to acquire a buoyancy that suspends it in the water.

Subsect. 3. *Reproductive Organs.*

293. The reproductive organs are such parts of the plant as are essential to its propagation, corresponding in extent to the fructification of Linnæus, which he has elegantly defined to be a temporary part of the vegetable, whose object is the reproduction of the species, terminating the old individual, and beginning the new. It includes the flower with its immediate accompaniments or peculiarities, the flower-stalk, receptacle, and inflorescence, together with the ovary or fruit.

294. The *flower*, (255.) like the leaf, is a temporary part of the plant, issuing generally from the extremity of the branches, but sometimes also from the root, stem, and even leaf, being the apparatus destined by nature for the production of the fruit, and being also distinguishable, for the most part, by the brilliancy of its coloring or the sweetnes of its smell. It has been happily styled by Pliny, the joy of plants, "flos gaudium arborum;" of which the lily, the tulip, and the rose, are magnificent examples.

295. The *flower-stalk* (210.) is a partial trunk or stem, supporting one or more flowers, if the flowers are not sessile, and issuing from the root, stem, branch, or petiole, and sometimes even from the leaf. It is considered by botanists as comprehending two different species, the scape and peduncle.

296. The *receptacle* (263.) is the seat of the flower, and point of union between the different parts of the flower, or between the flower and the plant, whether immediate and sessile, or mediate and supported upon a flower-stalk. Some botanists have considered it as a part of the flower itself, though this view of the subject is not entirely correct; but it is at any rate a part of the fructification, and cannot possibly be wanting in the case of any flower whatever. Like the flower-stalk, it has been discriminated by botanists into two different species, which are not indeed designated by proper names, but characterised by the appellations of the proper receptacle, and the common receptacle.

297. The *inflorescence* (212.), a term introduced by Linnæus, is the peculiar mode of aggregation in which flowers are arranged or distributed upon the plant, whence it is called sometimes also the mode of flowering.

298. The *fruit*. (262.) In the progress of fructification, when the several organs of the flower have discharged their respective functions, the petals, the stamens, the style, and often the calyx, wither and fall. The ovary alone remains attached to the plant, and swells and expands till it reaches maturity. It is now denominated the fruit. But at the period of its complete developement it also detaches itself from the plant and drops into the bosom of the earth, containing and protecting the embryo of the future vegetable. The fruit then is the ripened ovary and the parts which it contains. In popular lan-

guage the term is confined chiefly to such fruits as are esculent, as the apple, the peach, and the cherry, or perhaps to the esculent part only; but with the botanist the matured ovary of every flower with the parts contained constitutes the fruit.

Subsect. 4. *Reproductive Appendages.*

299. The reproductive organs, like the conservative organs, are often found to be furnished with various additional and supernumerary parts, not at all essential to their constitution, because not always present, and hence denominated appendages. Many of them are precisely of the same character with that of the conservative appendages, except that they are of a finer and more delicate texture. Such are the glands, down, pubescence, hairs, thorns or prickles, with one or other of which the parts of the fructification are occasionally furnished. But others are altogether peculiar to the reproductive organs, and are to be regarded as constituting, in the strict acceptation of the term, true reproductive appendages. Some of them are found to be proper to the flower, and others to the fruit.

300. The *appendages proper to the flower* are the involucre, spathe, and bracte, generally designated by the appellation of Floral leaves, as being leaf-like substances situated near the flower, though different in their color, form, or substance, from the real leaves of the plant; together with the nectary, and several other minute organs presumed to be nectaries, though not certainly known to be so.

301. *Appendages of the fruit.* — When the flower with its appendages has fallen, the ovary, which is still immature, is left attached to the plant, to complete the object of the fructification in the ripening of the contained seed. If it is left without any extraneous or supernumerary appendage, which is a case that often occurs, as in the cherry, apricot, and currant, the fruit is said to be naked. The naked fruit, however, is not to be confounded with the naked seed, from which it is altogether distinct. For it is the want of a conspicuous pericarp that constitutes the naked seed; but it is the want of an additional integument enveloping the pericarp, that constitutes the naked fruit. But all parts of the flower are not always deciduous, and it often happens that one or other of them still continues to accompany the pericarp or seed both in its ripening and ripened state, constituting its appendage, and covering it either wholly or in part, or adhering to it in one shape or other.

Sect. II. *Imperfect Plants.*

302. Imperfect plants, are plants defective or apparently defective, in one or other of the more conspicuous parts or organs, whether conservative or reproductive, belonging to vegetables in general, such as the root, stem, leaf, blossom. Linnæus characterised them by the appellation of cryptogamous plants, because their organs of fructification are not yet detected, or are so very minute as to require the aid of the microscope to render them visible: and in the system of Jussieu they are included in the monocotyledoneæ and acotyledoneæ, composing the cryptogameæ of the former, and the whole of the latter division. As in the perfect plants, so in the imperfect plants, the eye readily recognises traces of a similitude or dissimilitude of external habit and deportment characterising the different individuals of which they consist, and suggesting also the idea of distinct tribes or families. And upon this principle different botanists have instituted different divisions, more or less extensive, according to their own peculiar views of the subject. But one of the most generally adopted divisions of imperfect plants is that by which they are distributed into ferns, (including the natural orders of felices, equisitaceæ, and lycopodineæ,) mosses, hepaticæ, algæ, lichenes, and fungi. Dillennius, Michelle, Bulliard, Hedwig, and Acharius, have rendered themselves illustrious by the study of these tribes.

Subsect. 1. *Felices, Equisitaceæ, and Lycopodineæ.*

303. These orders are herbaceous, and consist for the most part of stemless plants, dying down to the ground in the winter, but furnished with a perennial root, from which there annually issues a frond bearing the fructification. The favorite habitations of many of them are heaths and uncultivated grounds, intermixed with furze and brambles; but the habitations of such as are the most luxuriant in their growth, are moist and fertile spots, in shady and retired situations, as on mossy dripping rocks, or by fountains and rills of water. Some of them will thrive even on the dry and barren rock, or in the chinks and fissures of walls; and others only in wet and marshy situations where they are half immersed in water.

304. *Conservative organs.* — The *root* of these families, as in most other natural orders, assumes very different aspects in different species. The *trunk* is a cylindrical and upright stem, composed as it were of several tubes, inserted into one another by the extremities, the insertions forming knots or joints, sometimes simple and sometimes branched, as in the genus equisetum. In general they are not furnished with any part that can correctly be called a *branch*, though some are furnished with parts which

are generally designated by that name, as in equisetum and lycopodium. The *leaf*, like the branch, is not in general to be found, at least as a separate and distinct organ. Lycopodium is an exception, in which it is generally of a strap-shaped figure, scattered promiscuously over the stem and branch, and often so closely crowded together as to overlap one another like the tiles of a house. The most general feature characterising the growth and habits of ferns is that of the *frond*, being an incorporation of the leaf, branch, and stipe, as in the genus scolopendrium.

305. *Reproductive organs.* — As ferns are destitute of conspicuous flowers, so they were at one time thought to be destitute also of seeds. Hence the common opinion so prevalent in ancient times with regard to the nonentity, or the invisibility of fern-seed.

Subsect. 2. *Musci.*

306. The mosses are a tribe of imperfect plants of a small and diminutive size, consisting often merely of a root, surmounted with a tuft of minute leaves, from the centre of which the fructification springs, but furnished for the most part with a stem and branches, on which the leaves are closely imbricated, and the fructification terminal or lateral. They are perennials and herbaceous, approaching to shrubby; or annuals, though rarely so, and wholly herbaceous, the perennials being also evergreens. Their most favorite habitations are bleak and barren soils, such as mountains, heaths, woods, where they are found, not only rooted in the earth, but attached also to the roots and trunks of trees, and even to the flinty rock; or immersed in bogs and ditches, or floating, though fixed by the roots, in streams of running water. As they affect the most barren soils, so they thrive best also in the coldest and wettest seasons. In the drought of summer they wither and languish; but in the more moderate temperature of autumn they begin to recruit, so that even the chilling cold of winter that deprives other plants of their verdure and foliage, and threatens destruction to the race of vegetables, tends but to refresh and revive the family of the mosses. Hence their capacity of retaining moisture for a great length of time without discovering any tendency to putrefaction, and of recovering their verdure when moistened with water, even after having been completely dried, and kept in a dried state for many years. From the extreme minuteness of their parts, they are apt to be overlooked by the superficial observer, or disregarded by the novice in botany, who is attracted perhaps only by what is specious in the plant or flower, but who, when the desire of botanical knowledge shall have inspired him with a relish for microscopical observation, will find the study of the mosses to be no less interesting than that of the more perfect plants, and the form and texture of their parts to be no less beautiful and elegant than that of the most gaudy flowers.

307. *Conservative organs.* — The *root* is generally composed of a number of small and slender fibres closely matted together, as in tetraphis viridula. Some are altogether *stemless*, consisting merely of a root surmounted with a few minute leaves, as in the case of phascum muticum. The *branches* are in their structure similar to that of the stem, and are distributed frequently without any regular order, as in hypnum riparium. The *leaves*, which are indeed very minute, are notwithstanding uncommonly elegant if viewed under the microscope. They assume a considerable variety of the forms specified in the description of the leaves of perfect plants.

308. *Reproductive organs.* — The fructification of the mosses, though extremely elegant in its structure, is yet, at the same time, so extremely minute as to be but seldom noticed, except by botanists. The ancients, who believed in the doctrine of equivocal generation, regarded the mosses as a tribe of plants originating in the putrefaction of other vegetables, or in the accidental concourse of generative particles collected together by the alluvion of rains or rivers, and consequently as producing no flower or fruit. The earlier botanists of modern times seem to have regarded them in much the same light; and even the great and illustrious Tournefort, who published his Botanical Institutions about the beginning of the eighteenth century, when the doctrine of equivocal generation had begun to be more than suspected, and the doctrine of vegetable sexes admitted, at least in part, classes them along with mushrooms and sea-weed, under the title of aspermæ, or plants without seed. But this arrangement was now no longer regarded as being at all satisfactory; and botanists, who began to suspect that a distinction existed even in mosses, were at last induced to undertake the irksome but indispensable task of a minute and scrupulous investigation of the several parts and appearances of individual subjects during their several stages of growth, with a view to the discovery of sexual organs. According to Hedwig, the mosses, with regard to their fructification, are for the most part diœcious, as in the genus hypnum, or polytrichum. Many of them are, however, monœcious, as in the genus phascum; and a few of them are hermaphrodite, as in bryum aureum. The barren flowers of the mosses are the stars or disks, and buds, frequently terminating the branches, or sitting in the bosom of the leaves, and are sometimes proliferous. The *fertile flowers*, like the barren flowers, are generally terminal; but they are often also lateral or radical.

Subsect. 3. *Hepaticæ.*

309. The hepaticæ are a tribe of small and herbaceous plants resembling the mosses, but chiefly constituting fronds, and producing their fruit in a capsule that splits into longitudinal valves. The name is derived from a Greek word signifying the liver, because perhaps some of them were formerly employed as a remedy in diseases of the liver; or because some of them exhibit, in their general aspect, a slight resemblance to the lobes of the liver. In their habitations, they affect for the most part the same sort of situations as the mosses, being found chiefly in wet and shady spots, by the sides of springs and ditches, or on the shelving brinks of rivulets, or on the trunks of trees. Like the mosses, they thrive best also in cold and damp weather, and recover their verdure, though dried, if moistened again with water. The hepaticæ and the mosses are indeed so nearly allied, that they have generally been regarded as constituting but one family, and classed together accordingly; the latter under the title of musci frondosi, and the former under that of musci hepatici. Such was the division even of Hedwig; but later botanists have found it to be more consonant to the principles of sound and scientific arrangement, to separate the hepaticæ from the mosses altogether, and to convert them into a distinct tribe.

310. *Conservative organs.* — Some of the hepaticæ seem to be destitute of a *root* altogether, or are at least not furnished with any conspicuous root, as in jungermannia asplenoides; but where a root is present it consists of a number of small and fibrous productions, issuing from the base or under-surface of the herbage, and fixing it to the soil or substance on which it grows. The *herbage*, in a few species, consists of a *stem*, furnished with distinct leaves like the mosses, as in jungermannia cochleariformis, and some others, in which the leaves are so distributed as to give the shoot a sort of wing-like appearance; but in the greater number the herbage is frondose, creeping along upon the surface of the soil or substance to which it is attached, and striking root as it extends.

311. The *reproductive organs* of the hepaticæ, in as far as they are yet known, are pretty much analogous to those of the mosses; but the parts corresponding to the stamens and pistils of perfect plants do not appear to have been hitherto ascertained so satisfactorily as to leave no ground of doubt. In their flowering, however, they appear also, like the mosses, to be either monœcious or diœcious. According to Hedwig the *barren flowers* of the hepaticæ, which can scarcely be said to have any perceptible calyx or corolla, consist either of small and globular protuberances issuing from the summit of the plant, or from among the leaflets, or from the surface of the frond, constituting a viscus that contains a powdery substance which is the pollen, as in jungermannia; or of small and minute granules, surrounded with substances resembling the succulent threads of the mosses, and imbedded in the body of the frond; or in target-shaped substances issuing from the surface of the frond, and elevated in conspicuous pedicles, as in marchantia. The *fertile flowers* consist for the most part of a double envelope, an outer and an inner; the former corresponding in some degree to the calyx, and the latter, which immediately invests the ovary, and is surmounted with the style, to the corolla of perfect plants.

Subsect. 4. *Algæ & Lichenes.*

312. The term algæ seems originally to have denoted any sort of plant or herb growing in sea-water. But among modern botanists it has a much more extensive signification, including not merely marine and many other immersed plants, but also a great variety of plants that are not even aquatics, agreeing, however, in the common character of having their herbage frondose, or but rarely admitting of the distinction of root, stem, and leaf, and their fructification imbedded, either in the substance of the frond itself, or in some peculiar and generally sessile receptacle. The algæ were formerly divided into the six following genera, Lichen, tremella, fucus, ulva, conferva, byssus; but now the genus Lichen forms an order of itself. (See 277.)

313. *Conservative organs.* — The algæ are but seldom found to exhibit any evident traces of a distinct and decided *root*, though they are often attached to the substance on which they grow by means of a number of small fibres, issuing from the edge or under-surface of the frond, as in many of the lichens; or by means of a small cylindrical and bony sort of substance issuing from its base or centre, as in several of the fuci. The figure and contexture of the *frond* differs very much in the different genera of this tribe, as well as in many of the different species of the same genus.

In the *lichenes* it is often merely a sort of powdery substance adhering to some accidental basis of support. In the *byssi* it consists often of a number of finely feathered threads, finer than those of a cobweb, and closely matted together, which in their aggregate appearance frequently resemble a piece of soft and smooth velvet of a rich and beautiful color; being also of terrestrial growth, and growing on the bark of trees, or on rotten wood, or on stones and rocks, or in damp vaults or cellars, and on wine casks, where it is often so extremely fine and delicate, that the slightest breath or touch will disperse or dissolve it. In the *tremellæ* it is a gelatinous and often pellucid substance of no regular or definite shape, but chiefly of terrestrial growth, being found for the most part on decayed stumps and branches of trees, or on stones and gravel walks, or on meadows and pastures after rain, where it is sometimes found resembling a large lump of transparent jelly, which people unacquainted with botany are apt to regard as the congealed remains of what are vulgarly called shooting stars, after having fallen to the ground. In the *ulvæ* it is a thread-like and tubular substance, or a flat waved and leaf-like membrane, or a sort of spongy and viscid pulp, chiefly aquatic, though partly marine and partly inhabiting pools or lakes of fresh water, and but rarely found on the surface of the earth. In the *conferva* it is a fibrous and thread-like substance, jointed, forked, or branched, with the threads closely matted together, and extricable only by immersion, being wholly aquatic, but partly also marine, and partly inhabiting pools, cisterns, or rivulets of fresh water. In the *fuci* it is sometimes capillary or cylindrical, and sometimes flat, with or without a midrib, sometimes jointed like a necklace, and sometimes leafy and shrub-like, and interspersed with a number of bags or bladders pellucid or opaque; being wholly marine, and generally known by the appellation of sea-weed or sea-wrack, attaching itself to rocks and stones on the sea-shore, so as to be laid bare at low water, but often also at such a depth as to be constantly submersed.

314. *Reproductive organs.* — The fructification of the algæ is less perfectly known than that of any of the preceding tribes of imperfect plants, but it has received, like them, also considerable elucidation from Hedwig, particularly in as much as regards the lichens. In all species of lichen there are certain tubercles or wart-like substances which contain the pollen, and a number of cup-shaped or target-shaped substances. These substances are considered the seeds, which finally escape through the crust. Gærtner, however, contends that the powdery substance, ejected from the targets or saucers consists, not of seeds, but of a peculiar species of gem, which he denominates the propago, and describes as being a simple gem without leaves or regular shape, which, separating at length from the parent plant, is dispersed in the way of seeds, but is not itself a seed. In the remaining genera of the algæ, the fructification is, if possible, still more obscure, exhibiting no traces of stamens or pistils, or even of the warts and saucers of the lichens, but merely a number of small granules, irregularly dispersed throughout the substance of the plant, and extricated only by its decay, which Hedwig presumes to be seeds; but which Gærtner regards also as a peculiar species of gem, and designates by the appellation of the gongylus, describing it as being a simple gem without leaves, of a globular form and solid contexture, imbedded in the bark of the plant and extricated only by its decay; so that it may very well be doubted whether the genera in question do at all produce perfect seeds, or are propagated by any other means than that of gems. In the fuci the interspersed granules are said to have rperforation above them, which the other genera have not.

315. The *utility* of the algæ is obviously very considerable, whether we regard them as furnishing an article of animal food, or as applicable to medicine and the arts. The fucus edulis, and several other fuci, are eaten and much relished by many people, whether raw or dressed, and it is likely that some of them are fed upon by various species of fish. When disengaged from their place of growth and thrown upon the sea-shore, they are often collected by the farmer and converted into a manure. They are often also employed, as the name imports, in the preparation of dyes, as well as in the lucrative manufacture of kelp, a commodity of the most indispensable utility in the important arts of making soap and glass.

The lichen rangiferinus forms the principal nourishment of the rein-deer during the cold months of winter, when all other herbage fails. The lichen islandicus is eaten by the Icelanders instead of bread, or used in the preparation of broths, and like the lichen pulmonarius, has been lately found to be beneficial in consumptive affections. Many of them are also employed in the preparation of some of our finest dyes, or pigments; and it is from the lichen parellus that the chemical analysist obtains his litmus. The lichens and the mosses seem instituted by nature to provide for the universal diffusion of vegetable life over the whole surface of the terrestrial globe. The powdery and tuberculous lichens attach themselves even to the bare and solid rock. Having reached the maturity of their species, they die and are converted into a fine earth, which forms a soil for the leathery lichens. These again decay and moulder into dust in their turn; and the depth of soil, which is thus augmented, is now capable of nourishing and supporting other tribes of vegetables. The seeds of the mosses lodge in it, and spring up into plants, augmenting also by their decay the quantity of soil, and preparing it for the support of plants of a more luxuriant growth, so that in the revolution of ages even the surface of the barren rock is covered with a soil capable of supporting the loftiest trees.

Subsect. 5. *Fungi.*

316. The fungi are a tribe of plants whose herbage is a frond of a fleshy or pulpy texture, quick in its growth, and fugacious in its duration, and bearing seeds or gems

in an appropriate and exposed membrane, or containing them interspersed throughout its mass. But this rule is not without its exceptions; for many of the fungi are converted, during the process of vegetation, or rather when their vegetation is over, into a tough, leathery, and even woody substance, which gives them a permanency beyond that of their congeners, and a trait of character that is not included in the above definition. They are also a tribe of plants that may be regarded as the lowest in the vegetable scale, exhibiting a considerable resemblance to the tribe of zoophites, and thus forming the connecting link between the vegetable and animal kingdoms. The habitations they affect are very various, many of them vegetating only on the surface of the earth, and some of them even buried under it; others on stumps and trunks of rotten trees; others on decayed fruit; others on damp and wet walls; and others on animal ordure.

317. *Conservative organs.* — Many of the fungi are altogether destitute of any conspicuous *root*, being attached to some appropriate basis of support merely by means of a large and flattened surface. The *frond* (230.) is often merely a thin, flat, and leathery sort of substance, adhering to a basis of support by means of the whole of its under-surface, as in the boleti. In others it is globular and sitting, as in lycoperdon; and in others it is bell-shaped and sitting, as in nidularia.

318. *Reproductive organs.* — In fungi furnished with gills (242.) and a curtain, if the inner surface of the curtain is carefully examined with a good magnifier, before the time of its natural detachment from the stipe or pileus, there will be found adhering to it a number of fine and delicate threads supporting small globules; and in such as have no curtain the same sort of substances may be found adhering to the edge of the pileus. These Hedwig regards as stamens. If the gills are next examined in the same manner and about the same time, there will be found sitting on their edge or surface a multitude of small tender and cylindrical substances, some of which are surmounted with a small globule, and others not. These he regards as being probably the styles and summits. Similar substances may be detected on the other genera of fungi also. But from the extreme minuteness of their parts, and from their strong similitude to the down with which the finer organs of vegetables are generally covered, it is easy to perceive how very difficult it must be to decide upon their true character.

319. *Uses.* — The powder of the lycoperdons is said to be an excellent styptic; and is remarkable also for its property of strongly repelling moisture. If a basin is filled with water, and a little of the powder strewed upon the surface so as to cover it thinly, the hand may be plunged into it and thrust down to the bottom without being wetted with a single drop of water. Several of the boleti, when dried, afford a very useful tinder; and several of the agarics and tubers are used as articles of food, or as ingredients in the preparation of seasoning. The truffle is much esteemed for the rich and delicate flavor which it imparts to soups and sauces; and the mushroom for its esculent property, and utility in the preparation of ketchup.

Chap. VI.

Vegetable Anatomy, or the internal Structure of Plants.

The organs of plants which are discoverable by external examination, are themselves reducible to component organs, which are again resolvable into constituent and primary organs. These we shall call the decomposite, the composite, and the elementary.

Sect. I. *Decomposite Organs.*

The decomposite organs constitute the vegetable individual, and are distinguishable by external examination; to the dissection of which we will now proceed, taking them in the retrograde order of the seed, pericarp, flower, leaf, gem, and caudex, or branch, stem, and root, with their decomposite appendages.

320. The *seed.* The mass of the seed consists of two principal parts, distinguishable without much difficulty; namely, the integuments and nucleus, or embryo, and its envelopes. The *integuments* proper to the seed are two in number, an exterior integument and an interior integument; which are sometimes, however, enveloped by the additional integument constituting an appendage of the seed, under the title of the pellicle or seminal epidermis. The *exterior integument* or *testa* is the original cuticle of the nucleus, not detachable in the early stages of its growth, but detachable at the period of the maturity of the fruit, when it is generally of a membranaceous or leathery texture; though sometimes soft and fleshy, and sometimes crustaceous and bony. It may be very easily distinguished in the transverse or longitudinal section of the garden bean or any other large seed, and may be also easily detached by the aid of a little manipulation. The *interior integument* or *sub-testa* lines the exterior integument or testa, and immediately envelopes the nucleus, deriving its origin from the interior portion of the umbilical cord, which, after perforating the testa, disperses into a multiplicity of ramifi-

cations connected by a fine membrane, and forms the interior integument. Like the testa, to which indeed it adheres, it may be easily distinguished in the garden bean, or in a ripe walnut; in which last it is a fine transparent and net-like membrane.

321. The *nucleus* is that part of the seed which is contained within the proper integuments, consisting of the albumen with the vitellus, when present, and embryo. The *albumen* is an organ resembling in its consistence the white of an egg, and forming, in most cases, the exterior portion of the nucleus, but always separable from the interior or remaining portion. The *vitellus* is an organ of a fleshy but firm contexture, situated, when present, between the albumen and embryo; to the former of which it is attached only by adhesion, but to the latter by incorporation of substance, so as to be inseparable from it, except by force. The *embryo*, which is the last and most essential part of the seed and final object of the fructification, as being the germ of the future plant, is a small and often very minute organ, enclosed within the albumen and occupying the centre of the seed. The *cotyledon* or seed-lobe, is that portion of the embryo, that encloses and protects the plantlet, and springs up during the process of germination into what is usually denominated the seminal leaf, if the lobe is solitary; or seminal leaves, if there are more lobes than one. In the former case the seed is said to be monocotyledonous; in the latter case, it is said to be dicotyledonous. Dicotyledonous seeds, which constitute by far the majority of seeds, are well exemplified in the garden bean. As there are some seeds whose cotyledon consists of one lobe only, falling short of the general number, so there are also a few whose cotyledon is divisible into several lobes, exceeding the general number. They have been denominated polycotyledonous seeds, and are exemplified in the case of lepidium sativum or common garden cress, in which the lobes are six in number; as in that also of the different species of the genus pinus, in which they vary from three to twelve. But although by far the greater number of seeds are furnished with two cotyledons, or with a cotyledon divisible or not divisible into several lobes, there is also a considerable proportion in which the cotyledon is altogether wanting, or at least believed to be wanting by botanists in general. These, according to Gærtner, are exemplified in the fuci, ferns, and fungi, the embryo being merely a germinating cicatricle imbedded in the surface of a vitellus which forms the mass of the seed. But Hedwig, to whose opinions on this subject much deference is also due, maintains that the seeds of the plants in question are furnished with cotyledons as well as those of other plants, and that no seed whatever is without them. This is a case, however, in which the general opinion of botanists is against him, as may be seen from the many systems founded upon the presence, or absence, or number of the cotyledons, and exemplified, as we have seen, in that of the great and justly celebrated Jussieu, whose primary divisions are those of acotyledonous, monocotyledonous, and dicotyledonous plants, the polycotyledonous being thought to be too few in number to constitute a separate division. It should be recollected, however, that the above divisions were instituted at a time when the subject had not yet undergone any thing like a rigorous scrutiny, that already many changes have been found necessary, and that future investigations will in all probability point out the necessity of more. In watching the germination of fern-seed, Mirbel observed some substances which he regards as cotyledons, and so far supports the position of Hedwig. The *plantlet*, or future plant in miniature, is the interior and essential portion of the embryo, and seat of vegetable life. In some seeds it is so minute as to be scarcely perceptible; while in others it is so large as to be divisible into distinct parts, as in the garden bean.

322. The *pericarp*, which in different species of fruit assumes so many varieties of contexture, acquires its several aspects, not so much from a diversity of substance as of modification. The valves of the *capsule*, but particularly the partitions by which it is divided into cells, are composed of a thin and skinny membrane, or of an epidermis covering a pulp more or less indurated, and interspersed with longitudinal fibres. The capsule of the mosses is composed of a double and net-like membrane, enclosed within a fine epidermis. The *pome* is composed of a fine but double epidermis, or, as Knight says, of two skins, enclosing a soft and fleshy pulp, with bundles of longitudinal fibres passing through it, contiguous to, and in the direction of, its longitudinal axis. The valves of the *legume* are composed of an epidermis enclosing a firm but fleshy pulp, lined for the most part with a skinny membrane, and of bundles of longitudinal fibres, forming the seam. The *nut-shell*, whether hard or bony, or flexible and leathery, is composed of a pulp more or less highly indurated, interspersed with longitudinal fibres, and covered with an epidermis. The *drupe* is composed of an epidermis enclosing a fleshy pulp, which is sometimes so interwoven with a multiplicity of longitudinal fibres as to seem to consist wholly of threads, as in the cocoa-nut. The *berry* is composed of a very fine epidermis enclosing a soft and juicy pulp. The scales of the *strobile* are composed of a tough and leathery epidermis, enclosing a spongy but often highly indurated pulp interspersed with longitudinal fibres that pervade also the axis.

Professor Richard, of the French Institute, has lately given a new analysis of fruits, in which, as in his Reformation of the Linnæan classes (*Nouv. El. de Bot.* 1819,) he has introduced several new terms; but as our object is to compile opinions already established, we have not adopted any of them.

323. The *flower-stalk*, or peduncle supporting the flower, which is a prolongation of the stem or branch, or rather a partial stem attached to it, if carefully dissected with the assistance of a good glass, will be found to consist of the following several parts: — 1st, An epidermis, or external envelope. 2dly, A parenchyma, or soft and pulpy mass. 3dly, Bundles of longitudinal threads or fibres, originating in the stem or branch, and passing throughout the whole extent of the parenchyma. The several organs of the flower are merely prolongations of the component parts of the flower-stalk, though each organ does not always contain the whole of such component parts, or at least not under the same modifications. The epidermis, however, and parenchyma are common to them all; but the longitudinal threads or fibres are seldom if ever to be found except in the calyx or corolla.

324. The *leaf-stalk* or petiole supporting the leaf, which is a prolongation of the branch or stem, or rather a partial stem attached to it, exhibits upon dissection the same sort of structure as the peduncle — namely, an epidermis, a pulp or parenchyma, and bundles of longitudinal threads or fibres.

325. *Gems.* — In the previous description of the external structure of the plant, it has been shown that there exists among the different tribes of vegetables four distinct species of gems — two peculiar to perfect plants, the bud and bulb — and two peculiar to imperfect plants, the propago and gongylus; the latter being denominated simple gems, because furnished with a single envelope only; and the former being denominated compound gems, because furnished with more than a single envelope.

326. *Buds* are composed externally of a number of spoon-shaped scales overlapping one another, and converging towards a point in the apex, and often cemented together by means of a glutinous or mucilaginous substance exuding from their surface. If these scales are stripped off and dissected under the microscope, they will be found to consist, like the leaves or divisions of the calyx, of an epidermis enclosing a pulp interspersed with a net-work of fibres, but unaccompanied with longitudinal threads. If the scales of a leaf-bud are taken and stripped off, and the remaining part carefully opened up, it will be found to consist of the rudiments of a young branch terminated by a bunch of incipient leaves imbedded in a white and cottony down, being minute but complete in all their parts and proportions, and as already described in Terminology (247.) folded or rolled up in the bud in a peculiar and determinate manner.

327. *Bulbs*, which are either radical or caulinary, exhibit in their external structure, or in a part of their internal structure that is easily detected, several distinct varieties, some being solid, some coated, and some scaly; but all protruding in the process of vegetation the stem, leaf, and flower, peculiar to their species.

328. The *propago*, which is a simple gem, peculiar to some genera of imperfect plants, and exemplified by Gærtner in the lichens, consists of a small and pulpy mass forming a granule of no regular shape, sometimes naked, and sometimes covered with an envelope, which is a fine epidermis.

329. The *gongylus*, which is also a simple gem peculiar to some genera of imperfect plants, and exemplified by Gærtner in the fuci, consists of a slightly indurated pulp moulded into a small and globular granule of a firm and solid contexture, and invested with an epidermis.

330. The term *caudex*, in its present application, is to be understood as including the whole mass or body both of the trunk and root, as distinct from the temporary parts of the plant, or parts already investigated; and as comprehending both the caudex ascendens, and caudex descendens of Linnæus, or the trunk and its divisions, with the root and its divisions. In opening up and dissecting the caudex, whether ascending or descending, the dissector will soon discover that its internal structure, like its external aspect or habit, is materially different in different tribes of plants.

331. The first general mode of the internal structure of the caudex, is that in which an epidermis encloses merely an *homogeneous mass* of pulp or slender fibre, that forms the principal body of the caudex, and becomes somewhat indurated with age, though not woody, without discovering any further variety of component parts. This Mirbel observes, is the simplest mode of internal structure existing among vegetables; it is exemplified in the lower orders of frondose and imperfect plants, particularly the algæ and fungi.

332. The second general mode of internal structure is that in which an epidermis encloses a caudex, that consists of two or more substances, or assemblages of substances, totally *heterogeneous* in their character. A very common variety of this mode is that in which an epidermis or bark encloses a *soft and pulpy* mass, interspersed with a number of longitudinal nerves or fibres, or bundles of fibres, extending from the base to the apex, and disposed in a peculiarity of manner characteristic of a tribe or genus. This mode prevails chiefly in herbaceous and annual or biennial plants. The pulp being *solid*, as in aspidium filix-mass, and *tubular*, as in the garden parsnep or common hemlock.

333. A second variety of this mode is that in which a strong and often thick bark encloses a circular layer of longitudinal fibres, or several such circular and concentric layers, interwoven with thin transverse and divergent layers of pulp, so as to form a *firm and compact* cylinder, in the centre of which is lodged a pulp or pith. This mode is best exemplified in trees and shrubs, though it is also applicable to many plants whose texture is chiefly or almost wholly herbaceous, forming as it were the connecting link between such plants as are purely herbaceous on the one hand, and such as are purely woody on the other. In the latter case the wood is perfect; in the former case it is imperfect. The wood being imperfect in the root of the beet, the common bramble, and burdock; and perfect in the oak or alder.

334. The *appendages* of the plant, whether conservative or reproductive, exhibit nothing in their internal structure that it is at all essentially different from that of the organs that have been already described.

Sect. II. *Composite Organs.*

From the previous analysis of the plant, the decomposite organs have been found to be reducible, in the first place, to one or other of the several following substances: namely, epidermis, pulp, pith, cortical layers, ligneous layers, vegetable fibre; which now remain to be farther analyzed, under the title of composite organs, as being still compound, with a view to reach the ultimate and elementary organs of the vegetable subject.

335. Structure of the *vegetable epidermis.* The epidermis of the vegetable, which, from its resemblance to that of the animal, has been designated by the same name, is the external envelope or integument of the plant, extending over the whole surface, and covering the root, stem, branches, leaves, flower, and fruit, with their appendages; the summit of the pistil only excepted. But although it is extended over the whole surface of the plant, it is not of equal consistence throughout. In the root and trunk it is a tough and leathery membrane, or it is a crust of considerable thickness, forming a notable portion of the bark, and assuming some peculiar shade of colour; while in the leaves, flowers, and tender shoots it is a fine colourless, and transparent film, when detached; and when adherent, it is always tinged with some peculiar shade, which it borrows from the parts immediately beneath it. Du Hamel, Saussure, Hedwig, Comparetti, Bauer, and others have examined the epidermis, and according to their descriptions, it is represented as consisting of at least two if not more layers, which, in the stem of many plants, are very easily distinguished, particularly in that of the paper birch. The bark of which may, perhaps, be regarded as a succession of individual cuticles.

336. The *pulp* is a soft and juicy substance, constituting the principal mass of succulent plants, and a notable proportion of many parts even of woody plants. It constitutes the principal mass of many of the fungi and fuci, and of herbaceous plants in general. Of those phytologists who have described the pulp, Mirbel is considered the most accurate. He compares it to clusters of small and hexagonal cells or bladders, containing for the most part a coloured juice, and formed apparently of the foldings and doublings of a fine and delicate membrane, in which no traces of organization are to be distinguished. In the trunk of what are called dicotyledonous plants, he regards the pulp, or cellular tissue, as consisting of two distinct portions, which he designates by the respective appellations of the herbaceous tissue, and the parenchyma. The former is the exterior portion of the cellular tissue, of which the cells always contain a resinous and coloured juice, that communicates its peculiar tinge to the epidermis. The latter is the interior portion of the tissue, composed also of cells, but differing from those of the herbaceous tissue in containing only a watery juice without color, because it has not been exposed to the action of the light, though in the calyx and fruit this watery juice is said to be also often colored. But in the description of the vegetable pulp, the only distinction necessary to be made is that by which it is divided into two parts — namely, an apparatus of hexagonal cells or vesicles, and a contained juice, whether colorless or colored, the union of which substances forms a true pulp.

337. The *pith*, as has been already shown, is a soft and spongy, but often succulent substance, occupying the centre of the root, stem, and branches, and extending in the direction of their longitudinal axis, in which it is enclosed as in a tube. The structure of the pith is precisely similar to that of the pulp, being composed of an assemblage of hexagonal cells containing a watery and colorless juice, or of cellular tissue and a parenchyma.

338. The *cortical layers*, or interior and concentric layers constituting the mass of the bark, are situated immediately under the cellular integument where such integument exists, and where not, immediately under the epidermis; or they are themselves external. They are distinguishable chiefly in the bark of woody plants, but particularly in that of the lime-tree. They are composed of two elementary parts — bundles of longitudinal fibres constituting a net-work — and a mass of pulp, more or less indurated,

filling up the meshes. The innermost of the layers is denominated the liber, from its having been used by the ancients to write on before the invention of paper. It is the finest and most delicate of them all, and often most beautifully reticulated. But the liber of daphne lagetto is remarkable beyond that of all other plants for the beauty and delicacy of its net-work, which is not inferior to that of the finest lace, and at the same time so very soft and flexible that in countries in which the tree is a native the lace of the liber is often made to supply the place of a neckcloth. If the cortical layers are injured or destroyed by accident, the part destroyed is again regenerated, and the wound healed up without a scar. But if the wound penetrates beyond the liber, the part destroyed is no longer regenerated. Or if a tree is bent so as to break part of the cortical fibres, and then propped up in its former position, the fractured fibres will again unite. Or if a portion of the stem is entirely decorticated and covered with a piece of bark, even from another tree, the two different barks will unite. Hence the practicability of ascertaining how far the liber extends. And hence also the origin of grafting, which is always effected by a union of the liber of the graft and stock.

339. The *ligneous layers*, or layers constituting the wood, occupy the intermediate portion of the stem between the bark and pith; and are distinguishable into two different sorts — concentric layers, and divergent layers.

340. The *concentric layers*, which constitute by far the greater part of the mass of the wood, are sufficiently conspicuous for the purpose of exemplification on the surface of a horizontal section of most trunks or branches, as on that of the oak and elm. But though they are generally described as being concentric, they are not always strictly so. For they are often found to extend more on the one side of the axis of the stem or branch, than on the other. Some authors say the excess is on the north side, but others say it is on the south side. The former account for it by telling us it is because the north side is sheltered from the sun; and the latter by telling us it is because the south side is sheltered from the cold; and thus from the operation of contrary causes alleging the same effect, which has been also thought to be sufficiently striking and uniform to serve as a sort of compass, by which the bewildered traveller might safely steer his course, even in the recesses of the most extensive forest. But Duhamel has exposed the futility of this notion, by showing that the excess is sometimes on the one side of the axis, and sometimes on the other, according to the accidental situation of the great roots and branches; a thick root or branch producing a proportionably thick layer of wood on the side of the stem from which it issues. The layers are indeed sometimes more in number on the one side than on the other, as well as thicker. But this is the exception, and not the rule. They are thickest however on the side on which they are fewest, though not of the same thickness throughout. Duhamel after counting twenty layers on the one side of the transverse section of the trunk of an oak, found only fourteen on the other. But the fourteen exceeded the twenty in thickness by one-fourth part. But the layers thus discoverable on the horizontal section of the trunk are not all of an equal consistency throughout, there being an evident diminution in their degree of solidity from the centre where they are hardest, to the circumference where they are softest. The outermost layer, which is the softest of all, is denominated the alburnum, perhaps from its being of a brighter white than any of the other layers, either of wood or bark, from which character, as well as from its softer texture, it is also easily distinguished, though in the case of some plants, as in that of the poplar and lime-tree, this peculiarity of character is not very apparent. From the peculiarity of external character however, which it possesses in general, it was at one time thought to be a substance essentially different from that of the layers which it invests. The ancients, whose phytological opinions were often very whimsical, supposed it to be something analogous to the fat of animals, and intended perhaps to serve as a sort of nutriment to the plant in winter. But it is now known to be merely wood in a less condensed state, being yet lighter and softer than the interior layers, but acquiring strength and solidity with age. It does not however acquire its utmost degree of solidity till after a number of years, as is plain from the regular gradation observable in the solidity of the different layers. But if a tree is barked a year before it is cut down, then the alburnum is converted into wood, in the course of that year.

341. The *divergent layers* which intersect the concentric layers in a transverse direction, constitute also a considerable proportion of the wood, as may be seen in a horizontal section of the fir or birch, or of almost any woody plant, on the surface of which they present an appearance like that of the radii of a circle.

342. If any one of the concentric layers, as they present themselves at first sight on a horizontal section of the stem, is taken and inspected minutely, its *structure* will be found to consist of several smaller and component layers, which are themselves composed of layers smaller still, till at last they are incapable of farther division. The concentric layers are composed of longitudinal fibres, generally forming a net-work; and the divergent layers, of parallel threads or fibres of cellular tissue, extending in a transverse direction, and filling up the interstices of the net-work; the two sets of fibres being

interwoven and interlaced together, so as to form a firm and compact body in the matured layers; and thus corresponding exactly to the description given of them by Grew and Malphighi, in which the longitudinal fibres are compared to the warp, and the transverse fibres to the woof of a web.

343. In plants that are purely herbaceous, and in the herbaceous parts of woody plants, it has been seen that the stem or other herbaceous part, is furnished with a number of notable and often insulated fibres passing longitudinally throughout its whole extent, as in the stipe of aspidium filix-mass, or leaf-stalk of the alder. These fibres, when viewed superficially, appear to be merely individuals, but when inspected minutely, and under the microscope, they prove to be groups or bundles of fibres smaller and minuter still, firmly cemented together, and forming in the aggregate a strong and elastic thread; but capable of being split into a number of component fibres, till at last you can divide them no longer. If the fibres of the bark are separated by the destruction of a part, the part is again regenerated, and the fibres are again united, without leaving behind them any traces of a wound. But if the fibres of the wood are separated by the destruction of a part, the part is never regenerated, and the fibres are never united.

Sect. III. *Elementary or Vascular Organs.*

344. From the previous analysis of the composite organs it appears they are all ultimately reducible to fibres, cellular tissue with or without parenchyma, and reticulated membrane, which we must consequently regard as being, under one modification or other, the ultimate and elementary organs of which the whole mass of the plant is composed. If it is asked of what the elementary organs are themselves composed, the reply is, they are composed, as appears from the same analysis, of a fine, colourless, and transparent membrane, in which the eye, aided by the assistance even of the best glasses, can discover no traces whatever of organization; which membrane we must also regard as constituting the ultimate and fundamental fabric of the elementary organs themselves, and by consequence of the whole of the vegetable body. It has been asked by some phytologists whether or not plants are furnished with vessels analogous to the blood vessels of the animal system. But if it is admitted that plants contain fluids in motion, which cannot possibly be denied, it will follow, as an unavoidable consequence, that they are furnished with vessels conducting or containing such fluids. If the stem of a plant of marigold is divided by means of a transverse section, the divided extremities of the longitudinal fibres, arranged in a circular row immediately within the bark, will be distinctly perceived, and their tubular structure demonstrated by means of the orifices which they present, particularly when the stem has begun to wither. The same sort of structure may be observed in the stem of cucurbitaceous plants also, particularly in that of the gourd, in which there are besides discoverable several sets of longitudinal tubes situated near the centre, and of considerable diameter. Regarding it therefore as certain that plants are furnished with longitudinal tubes, as well as with cells or utricles for the purpose of conveying or containing their alimentary juices, we proceed to the specific illustration of both together with their peculiarities and appendages.

345. The *utricles* are the fine and membranous vessels constituting the cellular tissue of the pith and pulp already described, whether of the plant, flower, or fruit. Individually they resemble oblong bladders inflated in the middle, as in the case of some plants; or circular or hexagonal cells, as in the case of others. Collectively they have been compared to an assemblage of threads of contiguous bladders or vesicles, or to the bubbles that are found on the surface of liquor in a state of fermentation.

346. The *tubes* are the vessels formed by the cavities of the longitudinal fibres, whether as occurring in the stem of herbaceous plants, or in the foot-stalk of the leaf and flower, or in the composition of the cortical and ligneous layers, or by longitudinal openings pervading the pulp itself, as in the case of the vine. They have generally been characterised under the denominations of proper vessels, lymphatics, and tracheæ. But as this is rather a premature reference to their different uses, which is besides not altogether correct, we shall adopt, with a little alteration, the denominations introduced by Mirbel, as arising from their form or structure. The first and primary division founded upon this principle is that by which they are distributed into large tubes and small tubes.

347. The *large tubes* are tubes distinguishable by the superior width of the diameter which they present on the horizontal section of the several parts of the plant. *Simple tubes* are the largest of all the large tubes, and are formed of a thin and entire membrane, without any perceptible disruption of continuity, and are found chiefly in the bark, though not confined to it, as they are to be met with also both in the alburnum and matured wood, as well as in the fibres of herbaceous plants. *Porous tubes* resemble the simple tubes in their general aspect; but differ from them in being pierced with small holes or pores, which are often distributed in regular and parallel rows. They are found in most abundance in woody plants, and particularly in wood that is firm and compact, like that of the oak; but they do not, like the simple tubes, seem destined to contain

any oily or resinous juice. *Spiral tubes* are fine, transparent, and thread-like substances, occasionally interspersed with the other tubes of the plant, but distinguished from them by being twisted from right to left, or from left to right, in the form of a corkscrew. They occur in most abundance in herbaceous plants, particularly in aquatics. *False spiral tubes* are tubes apparently spiral on a slight inspection, but which, upon minute examination, are found to derive their appearance merely from their being cut transversely by parallel fissures. *Mixed tubes* are tubes combining in one individual two or more of the foregoing varieties. Mirbel exemplifies them in the case of the butomus umbellatus, in which the porous tubes, spiral tubes, and false spiral tubes, are often to be met with united in one.

348. The *small tubes* are tubes composed of a succession of elongated cells united, like those of the cellular tissue. Individually they may be compared to the stem of the grasses, which is formed of several internodia, separated by transverse diaphragms; and collectively to an united assemblage of parallel and collateral reeds.

349. It has been seen in the foregoing analysis of the elementary or other organs, that the continuity of the membrane composing them is often interrupted by the occurrence of a number of *apertures* or openings effected in its fabric; and affecting its general aspect; and which may be reduced to the two following species: namely, pores and gaps.

350. *Pores* are small and minute openings of various shapes and dimensions, that seem to be destined to the absorption, transmission, or exhalation of fluids. They are distinguishable into the two following sorts: perceptible pores and imperceptible pores. The *perceptible pores* are either external or internal, and are the apertures described by Hedwig as discoverable in the net-work constituting the epidermis. The *imperceptible pores* are pores that are not distinguishable by the eye, assisted even with the best glasses; but which are known to exist by the evidence of experiment.

351. *Gaps*, according to M. Mirbel, are empty, but often regular and symmetrical spaces formed in the interior of the plant by means of a partial disruption of the membrane constituting the tubes or utricles. In the leaves of herbaceous plants the gaps are often interrupted by transverse diaphragms formed of a portion of the cellular tissue which still remains entire, as may be seen in the transparent structure of the leaves of typha and many other plants. Transverse gaps are said to be observable also in the bark of some plants, though very rarely.

352. As the decomposite and composite organs are found to be furnished with several *appendages*, so also are the elementary organs.

In the description of the external structure of the plant, we found that certain substances which appear on the surface of the leaves, foot-stalks, and branches, have been regarded as *glands*, and there are other substances situated in the interior of the plant, and attached to, or incorporated with, the elementary organs, which have been also regarded under this character, particularly by M. Mirbel.

353. Plants are furnished, not only with appendages which are fitly included under the appellation of external *pubescence*; but the elementary and vascular organs of some of them are furnished also with analogous appendages, denominated their internal pubescence, as in the leaf or flower-stalk of nymphea lutea.

Chap. VII.

Vegetable Chemistry or primary Principles of Plants.

354. As plants are not merely organised beings, but beings endowed with a species of life, absorbing nourishment from the soil in which they grow, and assimilating it to their own substance by means of the functions and operations of their different organs, it is plain that no great progress can be made in the explication of the phenomena of vegetable life, and no distinct conception formed, of the rationale of vegetation, without some specific knowledge of the primary principles of vegetables, and of their mutual action upon one another. The latter requisite presupposes a competent acquaintance with the elements of chemistry; and the former points out the necessity of a strict and scrupulous analysis of the several compound ingredients constituting the fabric of the plant, or contained within it.

355. If the object of the experimenter is merely that of extracting such compound ingredients as may be known to exist in the plant, the necessary apparatus is simple, and the process easy. But if it is that of ascertaining the primary and radical principles of which the compound ingredients are themselves composed, the apparatus is then complicated, and the process extremely difficult, requiring much time and labor, and much previous practice in analytical research. But whatever may be the object of analysis, or particular view of the experimenter, the processes which he employs are either mechanical or chemical.

356. The *mechanical processes* are such as are effected by the agency of mechanical powers, and are often indeed the operation of natural causes; hence the origin of gums and other spontaneous exudations. But the substances thus obtained do not always flow sufficiently fast to satisfy the wants or necessities of man. And men have consequently contrived to accelerate the operations of nature by means of artificial aid in the application of the wimble or ax, widening the passages which the extravasated fluid has forced, or opening up new ones. But it more frequently happens that the process employed is wholly artificial, and altogether effected without the operation of natural causes. When the juices are enclosed in vesicles lodged in parts that are isolated, or may easily be isolated, the vesicles may be opened by means of rasps or graters, and the juices expressed by the hand, or by some other fit instrument. Thus the volatile oil may be obtained that is lodged in the rind of the lemon. When the substance to be extracted lies more deeply concealed in the plant, or in parts which cannot be easily detached from the rest, it may then become necessary to pound or bruise the whole, or a great part of the plant, and to subject it, thus modified, to the action of the press. Thus seeds are sometimes treated to express their essential oils. And if by the action of bruising or pressing heterogeneous ingredients have been mixed together, they may generally be separated with considerable accuracy by means of decantation, when the substances held in suspension have been precipitated. Thus the acid of lemons, oranges, gooseberries, and other fruits, may be obtained in considerable purity, when the mucilage that was mixed with them has subsided.

357. The *chemical processes* are such as are effected by the agency of chemical powers, and may be reduced to the following: distillation, combustion, the action of water, the action of acids and alkalies, the action of oils and alcohols, and lastly fermentation. They are much more intricate in their nature than the mechanical processes, as well as more difficult in their application.

Of the *products of vegetable analysis*, as obtained by the foregoing processes, some consist of several heterogeneous substances, and are consequently *compound*, as being capable of further decomposition; and some consist of one individual substance only, and are consequently *simple*, as being incapable of further decomposition.

Sect. I. *Compound Products.*

The compound products of analysis are very numerous in themselves, and much diversified in their qualities. They are gum, sugar, starch, gluten, albumen, fibrina, extract, tannin, coloring matter, bitter principle, narcotic principle, acids, oils, wax, resins, gum resins, balsams, camphor, caoutchouc, cork, woody fibre, sap, proper juice, charcoal, ashes, alkalies, earths, metallic oxides.

358. *Gum* is an exudation that issues spontaneously from the surface of a variety of plants, in the state of a clear, viscid, and tasteless fluid, that gradually hardens upon being exposed to the action of the atmosphere, and condenses into a solid mass. It issues copiously from many fruit-trees, but especially from such as produce stone-fruit, as the plum and cherry-tree. From plants, or parts of plants, containing it, but not discharging it by spontaneous exudation, it may be obtained by the process of maceration in water. It has been found by chemists to consist of several varieties, known by the names of gum arabic, gum tragacanth, cherry-tree gum, and mucilage. Gum arabic, which is the most plentiful of all the gums, is the produce of the mimosa nilotica, a native of the interior of Africa and of Arabia; whence its name. When pure, it is colorless and transparent, though sometimes it is tinged with yellow, varying in its specific gravity from 1300 to 1490. *Davy's Agric. Chem.*, Lect. iii. It is insoluble in alcohol; but is readily soluble in water; and if the solution is exposed to the action of the atmosphere, the water is gradually evaporated, and the gum again left in a solid mass. According to the analysis of Gay Lussac and Thenard, it consists of the following elements, in the following proportions, 100 parts being the integer: carbon 42·23; oxygene 50·84; hydrogene 6·93; saline and earthy matter a small quantity; total 100·. Gum tragacanth is the produce of the astragalus tragacantha, a thorny shrub that grows in the islands of the Levant. It is less transparent than gum arabic, and not so easily dissolved in water. Cherry-tree gum is obtained from the prunus avium, and other species of the same genus, and in general from all trees with stone-fruit, from which it exudes spontaneously and in great abundance. It differs from gum arabic and tragacanth in its concreting in larger masses, and being more easily melted. Mucilage is found chiefly in the roots and leaves of plants, particularly such as are bulbous and succulent; the bulbs of the hyacinth and leaves of the marshmallow. It is found also in flax-seed, and in many of the lichens, and is to be obtained only by maceration in water, from which it is separated by means of sulphuric acid.

Gum, in all its varieties, is capable of being used as an article of food, and is highly nutritive, though not very palatable. It is also of considerable utility in the arts, particularly in calico-printing, in which the printer employs it to give consistency to his colors, and to prevent them from spreading. The botanist often uses it to fix his specimans upon paper, for which purpose it is very well adapted. It forms likewise an ingredient in ink; and in medicine it forms the basis of many mixtures, in which its influence is sedative and emollient.

359. *Sugar* is the produce of the saccharum officinarum. The canes or stems of the plant, when ripe, are bruised between the rollers of a mill, and the expressed juice is collected and put into large boilers, in which it is mixed with a small quantity of quicklime, or strong ley of ashes, to neutralise its acid, and is then made to boil. The scum which gathers on the top during the process of boiling is carefully cleared away; and when the juice has been boiled down to the consistence of a sirup, it is drawn off and allowed to cool in vessels which are placed above a cistern, and perforated with small holes, through which the impure and liquid part, known by the name of molasses, escapes; while the remaining part is converted into a mass of small and hard granules of a brownish or whitish color, known by the designation of raw sugar, which, when imported into Europe, is further purified by an additional process, and converted by filtration or crystallisation into what is called loaf sugar, or refined sugar, or candied sugar. Sugar thus obtained has a sweet and luscious taste, but is without smell. According to Dr. Thomson its specific caloric is 1·086, its specific gravity 1·4045; and its constituent elements are oxygene 64·7; carbon 27·5; hydrogene 7·8; total 100·. The juice of the acer saccharinum, or American maple, yields sugar in such considerable abundance as to make it an object with the North American farmer to manufacture it for his own use. A hole is bored in the trunk of the vegetating tree early in the spring, for the purpose of extracting the sap; of which a tree of ordinary size, that is, of from two to three feet in diameter, will yield from one hundred and fifty to two hundred pints and upwards, in a good season. The sap, when thus obtained and neutralised by lime, deposits, by evaporation, crystals of sugar in the proportion of about a pound of sugar to forty pints of sap. It is not materially different in its properties from that of the sugar-cane. The juice of the grape, when ripe, yields also a sugar by evaporation and the action of pot-ashes, which is known by the appellation of the sugar of grapes, and has been lately employed in France as a substitute for colonial sugar, though it is not so sweet or agreeable to the taste. The root of beta vulgaris or common beet yields also, by boiling and evaporation, a sugar which is distinguished by a peculiar and slightly bitter taste, owing perhaps to the presence of a bitter extractive matter which has been found to be one of the constituents of the beet. Sugar has been extracted from the following vegetables also, or from their productions: from the sap of the birch, sycamore, bamboo, maize, parsnep, cow-parsnep, American aloe, dulse, walnut-tree, and cocoa-nut-tree; from the fruit of the common arbutus, and other sweet-tasted fruits; from the roots of the turnip, carrot, and parsley; from the flower of the euxine rhododendron; and from the nectary of most other flowers.

The utility of sugar, as an aliment, is well known; and it is as much relished by many animals as by man. By bees it is sipped from the flowers of plants, under the modification of nectar, and converted into honey; and also seems to be relished by many insects, even in its concrete state; as it is also by many birds. By man it is now regarded as being altogether indispensable, and though used chiefly to give a relish or seasoning to food, is itself highly nutritive. It is also of much utility in medicine, and celebrated for its anodyne and antiseptic qualities, as well as thought to be peculiarly efficacious in preventing diseases by worms.

360. *Starch.* — If a quantity of wheaten flour is made into a paste with water, and kneaded and washed under the action of a jet till the water runs off colorless, part of it will be found to have been taken up and to be still held in suspension by the water, which will, by-and-by, deposit a sediment that may be separated by decantation. This sediment is starch, which may be obtained also immediately from the grain itself, by means of a process well known to the manufacturer, who renders it finally fit for the market by washing and edulcorating it with water, and afterwards drying it by a moderate heat. Starch, when thrown upon red-hot iron, burns with a kind of explosion, and leaves scarcely any residuum behind. It has been found by the analysis of Gay Lussac and Thenard, to be composed of carbon 43·55; oxygene 49·68; hydrogene 6·77; total 100·. This result is not very widely different from that of the analysis of sugar, into which, it seems, starch may be converted by diminishing the proportion of its carbon, and increasing that of its oxygene and hydrogene. This change is exemplified in the case of the malting of barley, which contains a great proportion of starch, and which absorbs during the process a quantity of oxygene, and evolves a quantity of carbonic acid; and accordingly part of it is converted into sugar. Perhaps it is exemplified also in the case of the freezing of potatoes, which acquire in consequence a sweet and sugary taste, and are known to contain a great deal of starch, which may be obtained as follows: let the potatoes be taken and grated down to a pulp, and the pulp placed upon a fine sieve, and water made to pass through it: the water will be found to have carried off with it an infinite number of particles, which it will afterwards deposit in the form of a fine powder, separable by decantation; which powder is starch, possessing the

essential properties of wheaten-starch. It may be obtained from the pith of several species of palms growing in the Moluccas and several other East Indian islands, by the following process: the stem, being first cut into pieces of five or six feet in length, is split longitudinally so as to expose the pith, which is now taken out and pounded, and mixed with cold water, which after being well stirred up, deposits at length a sediment that is separated by decantation, and is the starch which the pith contained, or the sago of the shops.

Salop is also a species of starch that is prepared, in the countries of the East, from the root of the orchis morio, mascula, bifolia, and pyramidalis. So also is cassava, which is prepared from the root of jatropha manihot, a native of America, the expressed juice of which is a deadly poison, used by the Indians to poison their arrows; but the sediment which it deposits is a starch that is manufactured into bread, retaining nothing of the deleterious property of the juice; and so also is sowans, which is prepared from the husk of oats as obtained in the process of grinding.

According to Parmentier, starch may be extracted from arctium lappa, atropa belladonna, polygonum bistorta, bryonia alba, colchicum autumnale, spiræa filipendula, ranunculus bulbosus, scrophularia nodosa, sambucus ebulus and nigra, orchis morio and mascula, imperatoria ostruthium, hyoscyamus niger, rumex obtusifolius, acutus, and aquaticus, arum maculatum, iris pseudacorus and fœtidissima, orobus tuberosus, bunium bulbocastanum. It is found also in the following seeds: wheat, barley, oats, rice, maize, millet-seed, chestnut, horse-chestnut, peas, beans, acorns.

Starch, which is an extremely nutritive substance, forms one of the principal ingredients in almost all articles of vegetable food used, whether by man or the inferior animals. The latter feed upon it in the state in which nature presents it; but man prepares and purifies it so as to render it pleasing to his taste, and uses it under the various modifications of bread, pastry, or confectionary. Its utility is also considerable in medicine and in the arts; in the preparation of anodyne and strengthening medicaments, and in the composition of cements; in the clearing and stiffening of linen; and in the manufacture of hair powder.

361. *Gluten* is that part of the paste formed from the flour of wheat that remains unaffected by the water after all the starch contained in it has been washed off. It is a tough and elastic substance, of a dull white color, without taste, but of a very peculiar smell. It is soluble in the acids and alkalies, but insoluble in water and in alcohol. Gluten has been detected, under one modification or other, in a very considerable number of vegetables or vegetable substances, as well as in the flour of wheat. Rouelle, the younger, showed that it exists in the green fecula of plants; and Proust found it in the following grains and fruits; peas, beans, barley, rye, acorns, chestnuts, horse-chestnuts, apples, quinces, alder-berries, grapes. He found it also in the leaves of rue, cabbage, cresses, hemlock, borage, and saffron, and in the petals of the rose.

It is unquestionably one of the most important of all vegetable substances, as being the principle that renders the flour of wheat so fit for forming bread, by its occasioning the panary fermentation, and making the bread light and porous. It is used also as a cement, and capable of being used as a varnish, and a ground for paint.

362. *Albumen*, which is a thick, glary, and tasteless fluid, resembling the white of an unboiled egg, is a substance that has been but lately proved to exist in the vegetable kingdom. Its existence was first announced by Fourcroy, and finally demonstrated by the experiments of Vauquelin on the dried juice of the papaw-tree. It is nearly related to animal gluten, and the elements of its composition are, carbon 52·883; oxygene 23·872; hydrogene 7·540; nitrogene 15·705; total 100·. Albumen has not been found in such abundance in any other plant, as in the plant above specified. But it has been found to exist in mushrooms and some other of the fungi. And the juice of the fruit of hibiscus esculentus, a West Indian plant, is said to contain such a proportion of it as to render it fit to be employed as a substitute for the white of eggs, in clarifying the juice of the sugar-cane. Almonds also, and other kernels from which emulsions are made, have been found to contain a substance possessing the properties of curd, which resembles albumen very closely.

363. From the blood and muscles of animals chemists extract a peculiar substance, which they denominate *fibrina*. This substance constitutes the fibrous part of the muscles, and resembles gluten in its appearance and elasticity. A substance possessing the same properties has been detected by Vauquelin in the juice of the papaw-tree, which is called vegetable fibrina.

364. *Extract.* — When vegetable substances are macerated in water, a considerable portion of them is dissolved; and if the water is again evaporated, the substance held in solution may be obtained in a separate state. This substance is denominated extract. But it is evident that extract thus obtained will not be precisely the same principle in every different plant; but will vary in its character according to the species producing it, or the soil in which the plant has grown, or some other accidental cause. Its distinguish-

ing properties are the following: it is soluble in water as it is obtained from the vegetable, but becomes afterwards insoluble in consequence of the absorption of oxygene from the atmosphere. It is soluble in alcohol; and it unites with alkalies, and forms compounds which are soluble in water. When distilled it yields an acid fluid impregnated with ammonia, and seems to be composed principally of hydrogene, oxygene, carbon, and a little nitrogene. Extract, or the extractive principle, is found in a greater or less proportion in almost all plants whatever, and is very generally an ingredient of the sap and bark, particularly in barks of an astringent taste. But still it is not exactly the same in all individual plants, even when separated as much as possible from extraneous substances. It may therefore be regarded as constituting several different species, of which the following are the most remarkable:

Extract of catechu. — This extract is obtained from an infusion of the wood or powder of catechu in cold water. Its color is a pale brown; and its taste slightly astringent. It is precipitated from its solution by nitrate of lead, and yields by distillation carbonic and carburetted hydrogene gas, leaving a porous charcoal.

Extract of senna. — This extract is obtained from an infusion of the dried leaves of cassia senna in alchol. The color of the infusion is brownish, the taste slightly bitter, and the smell aromatic. It is precipitated from its solution by the muriatic and oxymuriatic acids; and when thrown on burning coals consumes, with a thick smoke and aromatic odor, leaving behind a spongy charcoal.

Extract of quinquina. — This extract was obtained by Fourcroy, by evaporating a decoction of the bark of the quinquina of St. Domingo in water, and again dissolving it in alcohol, which finally deposited by evaporation the peculiar extractive. It is insoluble in cold water; but very soluble in boiling water; its color is brown, and its taste bitter. It is precipitated from its solution by lime-water, in the form of a red powder; and when dry it is black and brittle, breaking with a polished fracture.

Extract of saffron. — This extract is obtained in great abundance from the summits of the pistils of crocus sativus, which are almost wholly soluble in water.

Extracts were formerly much employed in medicine; though their efficacy seems to have been over-rated. But a circumstance of much more importance to society is that of their utility in the art of dyeing. By far the greater part of colors used in dyeing are obtained from vegetable extracts, which have a strong affinity for the fibres of cotton or linen, with which they enter into a combination that is rendered still stronger by the intervention of mordants.

365. *Coloring matter.* — The beauty and variety of the coloring of vegetables, chemists have ascribed to the modifications of a peculiar substance which they denominate the coloring principle, and which they have accordingly endeavoured to isolate and extract; first, by means of maceration or boiling in water, and then by precipitating it from its solution. The chemical properties of coloring matter seem to be as yet but imperfectly known, though they have been considerably elucidated by the investigations of Bertholet, Chaptal, and others. Its affinities to oxygene, alkalies, earths, metallic oxides; and cloths fabricated, whether of animal or vegetable substances, such as wool or flax, seem to be among its most striking characteristics. But its affinity to animal substances is stronger than its affinity to vegetable substances; and hence wool and silk assume a deeper dye, and retain it longer than cotton or linen. Coloring matter exhibits a great variety of different tints, as it occurs in different species of plants; and as it combines with oxygene, which it absorbs from the atmosphere, it assumes a deeper shade. But it loses at the same time a portion of its hydrogene, and becomes insoluble in water; and thus it indicates its relation to extract. Fourcroy reduced colors to the four following sorts: extractive colors, oxygenated colors, carbonated colors, and hydrogenated colors; the first being soluble in water, and requiring the aid of saline or metallic mordants to fix them upon cloth; the second being insoluble in water, as altered by the absorption of oxygene, and requiring no mordant to fix them upon cloth; the third containing in their composition a great proportion of carbon, but soluble in alkalies; and the fourth containing a great proportion of resin, but soluble in oils and alcohol. But the simplest mode of arrangement is that by which the different species of coloring matter are classed according to their effect in the art of dyeing. The principal and fundamental colors in this art are the blue, the red, the yellow, and the brown.

The finest of all vegetable blues is that which is known by the name of indigo. It is the produce of the indigofera tinctoria, Lin., a shrub which is cultivated for the sake of the dye it affords, in Mexico and the East Indies. The plant reaches maturity in about six months, when its leaves are gathered and immersed in vessels filled with water till fermentation takes place. The water then becomes opaque and green, exhaling an odor like that of volatile alkali, and evolving bubbles of carbonic acid gas. When the fermentation has been continued long enough, the liquid is decanted and put into other vessels, where it is agitated till blue flakes begin to appear. Water is now poured in, and the flakes are precipitated in the form of a blue powdery sediment, which is obtained by decantation; and which, after being made up into small lumps and dried in the shade, is the indigo of the shops. It is insoluble in water, though slightly soluble in alcohol. But its true solvent is sulphuric acid, with which it forms a fine blue dye, known by the name of liquid blue. It affords by distillation carbonic acid gas, water, ammonia, some oily and acid matter, and much charcoal; whence its constituent principles are most probably carbon, hydrogene, oxygene, and nitrogene. Indigo may be procured also from several other plants besides indigofera tinctoria, and particularly from isatis tinctoria or woad, a plant indigenous to Britain, and thought to be the plant with the juice of which the ancient Britons stained their naked bodies, to make them look terrible to their enemies. If this plant is digested in alcohol, and the solution evaporated, white crystalline grains, somewhat resembling starch, will be left behind; which grains are indigo, becoming gradually blue by the action of the atmosphere. The blue color of indigo therefore is owing to its combination with oxygen.

The principal red colors are such as are found to exist in the root, stem, or flower, of the five following plants: rubia tinctorum, lichen roccella and parellus, carthamus tinctorius, cæsalpinia crista, and hæmatoxylon campechianum.

Yellow, which is a color of very frequent occurrence among vegetables, and the most permanent among flowers, is extracted for the purpose of dyeing, from a variety of plants. 1st, It is extracted from the reseda luteola, Lin., by the decoction of its dried stems. The coloring matter is precipitated by means of alum, and is much used in dyeing wool, silk, and cotton. It is also obtained from the morus tinctoria, bixa orellana, serratula tinctoria, genista tinctoria, rhus cotinus, rhamnus infectorius, and quercitron, the bark of which last affords a rich and permanent yellow that is at present much in use.

The coloring matter of vegetables that gives a brown dye to cloths is very abundant, particularly in astringent plants. It is obtained from the root of the walnut-tree, and rind of the walnut; as also from the sumac and alder, but chiefly from nut-galls, which are excrescences formed upon the leaves of a species of quercus indigenous to the south of Europe, in consequence of the puncture of insects. The best in quality are brought from the Levant. They are sharp and bitter to the taste, and extremely astringent; and soluble in water by decoction when ground or grated to a powder. The decoction strikes, with the solution of iron, a deep black, that forms the basis of ink, and of most dark colors used in dyeing cloths.

866. *Tannin.* — If a quantity of pounded nut-galls, or bruised seeds of the grape, is taken and dissolved in cold water, and the solution evaporated to dryness, there will be left behind a brittle and yellowish substance of a highly astringent taste, which substance is tannin, or the tanning principle. It is soluble both in water and alcohol, but insoluble in ether. With the salts of iron it strikes a black. And when a solution of gelatine is mixed with an aqueous solution of tannin, the tannin and gelatine fall down in combination, and form an insoluble precipitate. When tannin is subjected to the process of distillation it yields charcoal, carbonic acid, and inflammable gases, with a minute quantity of volatile alkali, and seems accordingly to consist of the same elements with extract, from which, however, it is distinguished by the peculiar property of its action upon gelatine. Tannin may be obtained from a great variety of other vegetables also, as well as those already enumerated, but chiefly from their bark; and of barks, chiefly from those that are astringent to the taste. The following table exhibits a general view of the relative value of different species of barks, as ascertained by Sir Humphry Davy. It gives the average obtained from 480lb. of the entire bark of a middle-sized tree of the several different species, taken in the spring, when the quantity of tannin is the largest.

	lb.		lb.
Oak	29	Sycamore	11
Spanish chestnut	21	Lombardy poplar	15
Leicester willow (large)	33	Birch	8
Elm	13	Hazel	14
Common willow (large)	11	Black thorn	16
Ash	16	Coppice oak	32
Beech	10	Inner rind of oak bark	72
Horse-chestnut	9	Oak cut in autumn	21

Tannin, which is regarded by chemists as being the general principle of astringency, has been found to be of the very first utility in its application to medicine. The medical virtues of Peruvian bark, so celebrated as a febrifuge and antiseptic, are supposed to depend upon the quantity and quality of its tannin. But it is also of special utility in its application to the arts, in consequence of its peculiar property of forming an insoluble compound with gelatine, by means of which the hides of animals are converted into leather; and on which the importan art of tanning wholly depends. The bark of the oak-tree, which contains tannin in great abundance, is that which is most generally used by the tanner. The hides to be tanned are prepared for the process by steeping them in lime-water, and scraping off the hair and cuticle. They are then soaked first in weaker infusions, and afterwards in stronger infusions of the bark, till at last they are completely impregnated. This process requires a period of from ten to eighteen months, if the hides are thick; and four or five pounds of bark are necessary on an average to form one pound of leather.

367. *Bitter principle.* — The taste of many vegetables, such as those employed in medicine, is extremely bitter. The quassia of the shops, the roots of common gentian, the bark and wood of common broom, the calyx and floral leaves of the hop, and the leaves and flowers of chamomile, may be quoted as examples. This bitter taste has been thought to be owing to the presence of a peculiar substance, different from every other vegetable substance, and has been distinguished by the name of the bitter principle. When water has been digested for some time over quassia, its color becomes yellow, and its taste intensely bitter; and if it is evaporated to dryness, it leaves behind a substance of a brownish yellow, with a slight degree of transparency, that continues for a time ductile, but becomes afterwards brittle. This substance Dr. Thomson regards as the bitter principle in a state of purity. It is soluble in water and in alcohol; but the solution is not much affected by re-agents. Nitrate of silver and acetate of lead are the only two that occasion a precipitate. The bitter principle is of great importance, not only in the practice of medicine, but also in the art of brewing, particularly as it is obtained from the hop, its influence being that of checking fermentation, preserving the fermented liquor, and communicating to it a peculiar and agreeable flavor. It appears to consist principally of carbon, hydrogene, and oxygene, with a little nitrogene.

368. *Narcotic principle.* — There is a species of medical preparations known by the name of narcotics, which have the property of inducing sleep; and if administered in large doses, of occasioning death. They are obtained from the milky and proper juices of some vegetables, and from the infusion of the leaves or stem of others, all which have been supposed to contain in their composition some common ingredient, which chemists have agreed to designate by the name of the narcotic principle. It exists in great abundance in opium, which is the concrete juice of papaver album, or the white poppy, from which it is obtained pure, in the form of white crystals. It is soluble in boiling water and in alcohol, as well as in all acid menstrua; and it appears that the action of opium on the animal subject depends on this principle. When distilled it emits white vapors, which are condensed into a yellow oil. Some water and carbonate of ammonia pass into a receiver; and at last carbonic acid gas, ammonia, and carburetted hydrogen, are disengaged, and a bulky charcoal left behind. Many other vegetable substances besides opium, possess narcotic qualities, though they have not yet been minutely analyzed. The following are the most remarkable: the inspissated juice of lettuce, which resembles opium much in its appearance, is obtained by the same means, and possesses the same medical virtues; the leaves of atropa belladonna, or deadly nightshade, and indeed the whole plant; the leaves of digitalis purpurea, or foxglove; and lastly, the following plants, hyoscyamus niger, conium maculatum, datura stramonium, and sedum palustre, with many others belonging to the Linnæan natural order of Luridæ.

369. *Acids.* — Acids are a class of substances that may be distinguished by their exciting on the palate the sensation of sourness. They exist, not only in the animal and mineral, but also in the vegetable kingdom; and such of them as are peculiar to vegetables have been denominated vegetable acids. Of acids peculiar to vegetables chemists enumerate the following: the oxalic, acetic, citric, malic, gallic, tartaric, benzoic, and prussic, which exist ready formed in the juices or organs of the plant, and are accordingly denominated native acids; together with the mucous, pyromucous, pyrotartarous, pyrolignous, camphoric, and suberic, which do not exist ready formed in the plant, and are hence denominated artificial acids. They are consequently not within the scope of the object of the present work.

370. *Oxalic acid.* — If the expressed juice of the oxalis acetosella is left to evaporate slowly, it deposits small crystals of a yellowish color and saltish taste, which are known by the name of the acidulum of sorrel, that is, a salt with excess of acid, from which the acid may be obtained pure by processes well known to the chemist. It is not used in medicine or the arts, except in its state of acidulum, in which it is employed to make a sort of lemonade, and to discharge stains of ink. It has been found also in oxalis corniculata, geranium acidum, in the several species of rumex, and in the pubescence of cicer arietinum.

371. *Acetic acid.* — The acetic acid or vinegar, which is generally manufactured from wine in a certain stage of fermentation, has been found also ready-formed in the sap of several trees, as analysed by Vauquelin; and also in the acid juice of the cicer arietinum,

of which it forms a constituent part. It was obtained also by Scheele from the sap of the sambucus nigra; and is consequently to be regarded as a native vegetable acid. It is distinguished from other vegetable acids by its forming soluble salts with the alkalies and earths.

372. *Citric acid.* — Citric acid is the acid that exists in the juice of lemons. Its taste is very sour in a state of purity, but exceedingly pleasant when diluted with water. By a red heat it yields carbonic acid gas and carbonated hydrogene gas, and is reduced to a charcoal; nitric acid converts it into oxalic and acetic acid, and with lime it forms a salt insoluble in water. It has been found unmixed with other acids in the following vegetable substances: in the juice of oranges and lemons, and in the berries of vaccinium oxycoccus, vitis idæa, prunus padus, solanum dulcamara, and rosa canina. It has been found also in many other fruits, mixed with other acids.

373. *Malic acid.* — Malic acid is found chiefly in the juice of unripe apples, whence it derives its name. But it is found also in the juice of barberries, alderberries, gooseberries, plums, and common house-leek.

374. *Gallic acid.* — Gallic acid, as it is obtained in the greatest abundance, so it derives its name from the nut-gall, from which it may be extracted by exposing a quantity of the powder of nut-galls to a moderate heat in a glass retort; and the acid will sublime and form crystals of an octahedral figure. Its taste is austere and astringent. It strongly reddens vegetable blues. It is soluble both in water and alcohol; and is distinguished by its property of communicating to solutions of iron a deep purple color. When exposed to a gentle heat it sublimes without alteration, but a strong heat decomposes it. Nitric acid converts it into the malic and oxalic acids. It is of great utility in the art of dyeing, and forms the basis of all black colors, and of colors with a dark ground. It forms also the basis of ink; and chemists use it as a test to detect the presence of iron.

375. *Tartaric acid.* — If wine is kept for a length of time in a cask or other close vessel, a sediment is precipitated which adheres to the sides or bottom, and forms a crust known by the name of tartar, which is a combination of potass and a peculiar acid in excess. The compound is tartarite of potass, and the acid, in its state of purity, is the tartaric acid. It is characterised by the property of its forming with potass a salt that is soluble with difficulty. It has been found in the following vegetable substances also: in the pulp of tamarinds, in the juice of the grape, and mulberries, sorrel, and sumac; and the roots of triticum repens, and leontodon taraxacum. It is not much used except among chemists. But the tartarite from which it is usually obtained is well known for its medical virtues under the name of cream of tartar.

376. *Benzoic acid.* — From the styrax benzoin there exudes a resinous substance, known in the shops by the name of benzoin, and in which the benzoic acid is contained. It is distinguished from the other acids by its aromatic odor and extreme volatility. It has been obtained also from the balsams of tolu and storax; and is used in pharmacy, in the preparation of boluses and electuaries.

377. *Prussic acid.* — The prussic acid is generally classed among the animal acids, because it is obtained in the greatest abundance from animal substances. But it has been proved to exist in vegetable substances also, and is procured by distilling laurel leaves, or the kernels of the peach and cherry, or bitter almonds. When pure it exists in the form of a colorless fluid, with an odor resembling that of peach-tree blossoms. It does not redden vegetable blues. But it is characterised by its property of forming a bluish-green precipitate when it is poured, with a little alkali added to it, into solutions containing iron.

378. From the experiments that have been made upon vegetable acids, it appears that all of them contain carbon, oxygene, and hydrogene, in one proportion or other; and that the prussic acid contains also a portion of nitrogene. The gallic acid contains more of carbon than any other vegetable acid, and the oxalic more of oxygene.

Vegetable oils are of two kinds, the fixed and the volatile. The former are not suddenly affected by the application of heat; the latter are very inflammable.

379. *Fixed oils.* — Fixed oils are but seldom found, except in the seeds of plants, and chiefly in such as are dicotyledonous. They are found also, though rarely, in the pulp of fleshy fruits, as in that of the olive, which yields the most abundant and valuable species of all fixed oils. But dicotyledonous seeds which contain oil, contain also at the same time a quantity of mucilage and fecula, and form, when bruised in water, a mild and milky fluid, known by the name of emulsion. And on this account they are sometimes denominated emulsive seeds. Some seeds yield their oil merely by means of pressure, though it is often necessary to reduce them first of all to a sort of pulp, by means of pounding them in a mortar. Others require to be exposed to the action of heat, which is applied to them by means of pressure between warm plates of tin, or of the vapor of boiling water, or of roasting before they are subjected to the press. Fixed oil, when pure, is generally a thick and viscous fluid, of a mild or insipid taste, and without smell.

But it is never entirely without some color, which is for the most part green or yellow. Its specific gravity is to water as 9·403 to 1·000. It is insoluble in water. It is decomposed by the acids, but with the alkalies it forms soap. When exposed to the atmosphere it becomes inspissated and opaque, and assumes a white color and a resemblance to fat. This is in consequence of the absorption of oxygene; but owing to the appearance of a quantity of water in oil that is exposed to the action of the air, it has been thought that the oxygene absorbed by it is not yet perhaps assimilated to its substance. When exposed to cold it congeals and crystallises, or assumes a solid and granular form; but not till the thermometer has indicated a degree considerably below the freezing point. When exposed to the action of heat it is not volatilised till it begins to boil, which is at 600° of Fahrenheit. By distillation it is converted into water, carbonic acid, and carburetted hydrogene gas, and charcoal; the product of its combustion is nearly the same; and hence it is a compound of carbon, oxygene, and hydrogene.

Fixed oils are generally divided into two sorts, fat oils and drying oils. The former are readily inspissated by the action of the air, and converted into a sort of fat. The latter are capable of being dried by the action of the air, and converted into a firm and transparent substance.

The principal species of fat oils are the following: 1st, olive oil, which is expressed from the pulpy part of the fruit of olea europea. The fruit is first broken in a mill, and reduced to a sort of paste. It is then subjected to the action of a press, and the oil which is now easily separated swims on the top of the water in the vessel beneath. It is manufactured chiefly in France and in Italy, and is much used throughout Europe instead of butter, and to give a seasoning to food. 2dly, oil of almonds, which is extracted from the fruit of the amygdalus communis or common almond. The almonds are first well rubbed or shook in a coarse bag or sack, to separate a bitter powder which covers their epidermis. They are then pounded to a paste in mortars of marble, which is afterwards subjected to the action of a press; and the oil is now obtained as in the case of the olive. 3dly, rape-seed oil, which is extracted from the brassica napus and campestris. It is less fixed and less liable to become rancid than the two former, and is manufactured chiefly in Flanders. 4thly, oil of behen, which is extracted from the fruit of the guilandina mohringa, common in Egypt and Africa. It is apt to become rancid; but it is without odor, and is, on this account, much used in perfumery.

The principal species of drying oils are linseed oil, nut oil, poppy oil, and hempseed oil. 1st, linseed oil is obtained from the seeds of flax, which are generally roasted before they are subjected to any other process, for the purpose of drying up their mucilage and separating more oil. 2dly, nut oil is extracted from the fruit of corylus avellana, or juglans regia. The kernel is first slightly roasted, and the oil then expressed. It is used in paintings of a coarser sort; and also in the seasoning of food by many of the inhabitants of the middle departments of France; but it is apt to become rancid. 3dly, poppy oil is extracted from the seeds of papaver somniferum, which is cultivated in France for this purpose. It is clear and transparent, and dries readily; and when pure it is without taste or odor. It is used for the same purposes as the olive oil, for which it is often sold, and possesses nothing of the narcotic properties of the poppy. 4thly, Hempseed oil is extracted from the seed of the hemp. It has a harsh and disagreeable taste, and is used only by painters.

380. *Volatile oils.* — Volatile oils, which are known also by the name of essential oils, are of very common occurrence in the vegetable kingdom, and are found in almost all the different organs of the plant. They are found in many roots, to which they communicate a fragrant and aromatic odor, with a taste somewhat acrid. The roots of inula helenium, genista canariensis, and a variety of other plants, contain essential oils. They are found also in the bark of laurus cinnamomum, of laurus sassafras, and pinus; in the leaves of labiate plants, such as mint, rosemary, marjoram; and of the odorous umbelliferæ, such as chervil, fennel, angelica; and of plants with compound flowers, such as wormwood. They are found also in the flower itself, as in the flowers of chamomile and the rose; and in the fruit, as in that of pepper and ginger, and in the external integuments of many seeds, but never in the cotyledon. They are extracted by means of expression or distillation, and are extremely numerous; and perhaps every plant possessing a peculiar odor possesses also a peculiar and volatile oil. The aroma of plants therefore, or the substance from which they derive their odor, and which is cognisable only by the sense of smell, is perhaps merely the more volatile and evaporable part of their volatile oil, disengaging itself from its combinations. Volatile oils are characterised by their strong and aromatic odor, and rather acrid taste. They are soluble in alcohol, but are not readily converted into soaps by alkalies. They are very inflammable, and are volatilised by a gentle heat. Like fixed oils, their specific gravity is generally less than that of water, on the surface of which they will float; though in some cases it is found to be greater than that of water, in which they conse-

quently sink. They are much in request on account of their agreeable taste and odor, and are prepared and sold by apothecaries or perfumers, under the name of distilled waters or essences; as well as employed also in the manufacture of varnishes and pigments.

381. *Wax.* — On the upper surface of the leaves of many trees there may often be observed a sort of varnish, which, when separated by certain chemical processes, is found to possess all the properties of bees'-wax, and is consequently a vegetable wax. It exudes, however, from several other parts of the plant besides the leaf, and assumes a more waxy and concrete form, as from the catkins of the poplar, the alder, and the fir; from the fruit of the myrica cerifera and croton sebiferum; but particularly from the antheræ of the flowers, from which it is probable that the bees extract it unaltered. It was the opinion of Reaumur, however, that the pollen undergoes a digestive process in the stomach of the bee before it is converted into wax, though a late writer on the subject endeavours to prove that the wax is elaborated from the honey extracted by the bee, and not from the pollen. It is found also in the interior of many seeds, from which it is extracted, by means of pounding them and boiling them in water. The wax is melted and swims on the top. Wax, when pure, is of a whitish color, but without taste and without smell. The smell of bees'-wax is indeed somewhat aromatic, and its color yellow. But this is evidently owing to some foreign substance with which it is mixed, because it loses its smell and color by means of bleaching, and becomes perfectly white. This is done merely by drawing it out into thin stripes, and exposing it for some time to the atmosphere. Bleached wax is not affected by the air. Its specific gravity is 0·9600. It is insoluble in water, and in alcohol. It combines with the fixed oils, and forms with them a composition known by the name of cerate. It combines also with the fixed alkalies, and forms with them a compound possessing the properties of common soap. The acids have but little action on it, and for this reason it is useful as a lute to confine them, or to prevent them from injuring cork. When heat is applied to wax it becomes soft, and melts at the temperature of 142° if unbleached, and of 155° if bleached, into a colorless and transparent fluid, which, as the temperature diminishes, concretes again and resumes its former appearance. At a higher temperature it boils and evaporates, and the vapor may be set on fire by the application of red heat. Hence its utility in making candles. And hence an explication of the singular phenomenon observable in the dictamnus fraxinella. This plant is fragrant, and the odor which it diffuses around forms a partial and temporary atmosphere, which is inflammable; for if a lighted candle or other ignited body is brought near to the plant, especially in the time of drought, its atmosphere immediately takes fire. This phenomenon was first observed by the daughter of the celebrated Linnæus, and is explained by supposing the partial and temporary atmosphere to contain a proportion of wax exuded from the plant, and afterwards reduced to vapor by the action of the sun. The result of its combustion in oxygene gas was, according to Lavoisier, carbonic acid and water, in such proportion as to lead him to conclude that 100 parts of wax are composed of 82·28 of carbon and 17·72 of hydrogene. But owing to the little action of acids upon it, there seems reason to believe that it contains also oxygene as an ingredient.

Wax possesses all the essential properties of a fixed oil. But fixed oils have the property of becoming concrete, and of assuming a waxy appearance when long exposed to the air, in consequence, as it seems, of the absorption of oxygene. Wax therefore may be considered as a fixed oil rendered concrete, perhaps by the absorption of oxygene during the progress of vegetation. But if this theory is just, the wax may be expected to occur in a considerable variety of states, according to its degree of oxygenation; and this is accordingly the case. Sometimes it has the consistency of butter, and is denominated butter of wax, as butter of coco, butter of galam. Sometimes its consistency is greater, and then it is denominated tallow, as tallow of croton; and when it has assumed its last degree of consistency, it then takes the appellation of wax. The following are its principal species: butter of cacao, butter of coco, butter of nutmeg, tallow of croton, and wax of myrtle.

The butter of cacao is extracted from the seeds of the theobroma cacaco or chocolate plant, either by boiling them in water, or by subjecting them to the action of the press after having exposed them to the vapor of boiling water. Butter of coco is found in the fruit of the cocos nucifera or coco-nut-tree. It is expressed from the pulp of the nut, and is even said to separate from it when in a fluid state, as cream separates from milk. Butter of nutmeg is obtained from the seeds of the myristica officinalis or nutmeg-tree. From the fruit of the croton sebiferum, a waxy substance is extracted, of the consistency of tallow. The wax of myrtle is obtained from the berry of the myrica cerifera.

382. *Resins.* — Resins are volatile oils, rendered concrete by means of the absorption of oxygene, or rather perhaps by the abstraction of part of their hydrogene. They have a slight degree of transparency, and their color is generally yellowish. Their taste is

somewhat acrid, but they are without smell when pure. Their specific gravity varies from 1·0180 to 1·2289. They are non-conductors of electricity, and when excited by friction their electricity is negative.

383. *Rosin.* — From different species of the pine, larch and fir-tree, there exudes a juice which concretes in the form of tears. Its extrication is generally aided by means of incisions, and it receives different appellations, according to the species from which it is obtained. If it is obtained from the pinus sylvestris, it is denominated common turpentine; from pinus larix, Venice turpentine; from amyris balsamea, balsam of Canada. It consists of two ingredients, oil of turpentine and rosin. The oil is extricated by distillation, and the rosin remains behind. If the distillation is continued to dryness, the residuum is common rosin or colophonium; but if water is mixed with it while yet fluid, and incorporated by violent agitation, the residuum is yellow rosin. The yellow rosin is the most ductile, and the most generally used in the arts. From the resinous juices of the fir, the substances known by the name of pitch and tar are also manufactured. The trunk is cut or cleft into pieces of a convenient size, which are piled together in heaps, and covered with turf. They are then set on fire, and the resinous juice which is thus extricated, being prevented from escaping in a volatile state by means of the turf, is precipitated and collected in a vessel beneath. It is partly converted into an empyreumatic oil, and is now tar, which, by being further inspissated, is converted into pitch.

384. *Mastich* is extracted from the pistacea lentiscus. Sandarach is obtained from the juniperis communis, by spontaneous exudation. Elemi is extracted from the amyris elemifera. Tacambac is the produce of the fagara octandra and populus balsamifera. Labdanum is obtained from the cistus creticus. Opobalsamum or balm of gilead, which has been so much famed for its medical virtues, is the produce of the amyris gileadensis, a shrub which grows in Judæa and in Arabia; but it is so much valued by the Turks that its importation is prohibited. This is the balm of gilead so much celebrated in Scripture. Pliny says it was first brought to Rome by the generals of Vespasian. It is obtained in a liquid state from incisions made in the bark, and is somewhat bitter to the taste. Copaiva or balsam of copaiva is obtained from the copaifera officinalis. Dragon's blood is obtained from the dracœna draco, pterocarpus draco, and calamus rotang. Guaiac is the produce of the guaiacum officinale. Botany Bay resin, the produce of the acarois resinifera, a native of New Holland, and found in great abundance about Botany Bay. Green resin constitutes the coloring matter of the leaves of trees, and of almost all vegetables. It is insoluble in water, but soluble in alcohol. When treated with oxymuriatic acid, it assumes the color of a withered leaf, and exhibits the resinous properties more distinctly. Copal is the produce of the rhus copallinum, a tree which is found in North America. Animé is obtained from the hymenæa coubaril, or locust-tree, a native of North America. Lac is the produce of the croton lacciferum, a native of the East Indies.

385. *Bloom.* — Upon the epidermis of the leaves and fruit of certain species of plants, there is to be found a fine soft and glaucous powder. It is particularly observable upon cabbage leaves, and upon plums, to which it communicates a peculiar shade. It is known to gardeners by the name of bloom. It is easily rubbed off by the fingers; and when viewed under the microscope, seems to be composed of small opaque and unpolished granules, somewhat similar to the powder of starch; but with a high magnifying power it appears transparent. When rubbed off, it is again reproduced, though slowly. It resists the action of dews and rains, and is consequently insoluble in water. But it is soluble in spirits of wine; from which circumstance it has been suspected, with some probability, to be a resin.

Such are the most remarkable of the resins that have hitherto been subjected to chemical analysis, or employed in medicine and the arts. Their medical virtues, however, are not quite so great as has been generally supposed; but their utility in the arts is very considerable. They are employed in the arts of painting, varnishing, embalming, and perfumery; and they furnish us with two of the most important of all materials to a naval power, pitch and tar.

386. *Gum-resins.* — This term is employed to denote a class of vegetable substances which have been regarded by chemists as consisting of gum and resin. They are generally contained in the proper vessels of the plant, whether in the root, stem, branches, leaves, flower, or fruit. But there is this remarkable difference between resins and gum-resins, that the latter have never been known, like the former, to exude spontaneously from the plant. They are obtained by means of bruising the parts containing them, and expressing the juice, which is always in the state of an emulsion, generally white, but sometimes of a different color; or they are obtained by means of incisions from which the juice flows. This juice, which is the proper juice of the plant, is then exposed to the action of the sun, by which in warm climates it is condensed and inspissated, and converted into the gum-resin of commerce. Gum-resins, in their solid state,

are brittle, and less transparent than resins. They have generally a strong smell, which is sometimes aliaceous, and a bitter and nauseous taste. They are partially soluble both in water and in alcohol. When heated they do not melt like the resins, nor are they so combustible. But they swell and soften by heat, and at last burn away with a flame. By distillation they yield volatile oil, ammonia combined with an acid, and have a bulky charcoal. The principal species of gum-resins which have been hitherto applied to any useful purpose are: — Galbanum, obtained from the stem of the bubon galbanum; ammoniac, brought from Africa in the form of small tears; the plant which yields it is thought to be a species of ferula; scammony, the produce of the convolvulus scammonia; opoponax, obtained from the pastinaca opoponax; euphorbium, the produce of the euphorbia officinalis; its taste is caustic; it is considered as a poison, but is occasionally employed in medicine; olibanum is obtained from the juniperus lycia, which grows in Arabia, particularly by the borders of the Red Sea. It is the frankincense of the ancients. It exudes from incisions made in the tree, and concretes into masses about the size of a chestnut; sagapenum is supposed to be obtained from the ferula persica; gamboge, or gumgutt, the produce of the mangostana cambogia; myrrh, the plant yielding which grows in Abyssinia and Arabia. Bruce says it belongs to the genus mimosa; but however this may be, myrrh is the juice of the plant concreted in the form of tears. Its color is yellow, its odor strong but agreeable, and its taste bitter; it is employed in medicine, and is esteemed an excellent stomachic. Assafœtida, a substance, which is well known for its strong and fetid smell, is obtained from the ferula assafœtida. At four years old the plant is dug up by the root. The root is then cleaned, and the extremity cut off; a milky juice exudes which is collected; and when it ceases to flow another portion is cut off, and more juice extricated. The process is continued till the root is exhausted. The juice which has been collected soon concretes and constitutes assafœtida. It is brought to Europe in small agglutinated grains of different colours, white, red, yellow. It is hard, but brittle. Its taste is bitter, and its smell insufferably fetid; the Indians use it as a seasoning for their food, and call it the food of the gods. In Europe, it is vulgarly known by the appellation of devil's dung. It is used in medicine as an antispasmodic.

387. *Balsams.* — The substances known by the name of balsams are resins united to the benzoic acid. They are obtained by means of incisions made in the bark, from which a viscous juice exudes, which is afterwards inspissated by the action of the fire or air; or they are obtained by means of boiling the part that contains them. They are thick and viscid juices, but become readily concrete. Their color is brown or red; their smell aromatic when rubbed; their taste acrid; their specific gravity 1·090. They are unalterable in the air after becoming concrete. They are insoluble in water, but boiling water abstracts part of their acid; they are soluble in the alkalies and nitric acid. When heated, they melt and swell, evolving a white and odorous smoke. The principal of the balsams are the following: benzoin, storax, styrax, balsam of tolu, balsam of Peru. Benzoin is the produce of the styrax benzoin; storax is obtained from the styrax officinale; styrax is a semi-fluid juice, the produce of a tree said to be cultivated in Arabia; balsam of tolu is obtained from the toluifera balsamum; balsam of Peru is obtained from the myroxylon peruiferum.

388. *Camphor.* — The substance known by the name of camphor is obtained from the root and stem of the laurus camphora, by distillation. When pure it is a white brittle substance, forming octagonal crystals or square plates. Its taste is hot and acrid, its odor strong but aromatic, its specific gravity 0·9887. When broke into small fragments and put into water, on the surface of which it swims, a singular phenomenon ensues. The water surrounding the fragments is immediately put into commotion, advancing and retiring in little waves and attacking the fragments with violence. The minuter fragments are driven backwards and forwards upon the surface as if impelled by contrary winds. If a drop of oil is let fall on the surface of the water it produces an immediate calm. This phenomenon has been attributed to electricity. Fourcroy thinks it is merely the effect of the affinities of the camphor, water, and air, entering into combination. Though camphor is obtained chiefly from the laurus camphora, yet it is known to exist in a great many other plants, particularly labiate plants, and has been extracted from the roots of zedoary, sassafras, thyme, rosemary, and lavender.

389. *Caoutchouc.* — The substance denominated caoutchouc was first introduced into Europe about the beginning of the eighteenth century. But from a use to which it is very generally applied of rubbing out the marks made upon paper by a black-lead pencil, it is better known to most people in this country by the name of Indian rubber. It is obtained chiefly from hævea caoutchouc and jatropha elastica, trees indigenous to South America; but it has been obtained also from several trees which grow in the East Indies, such as ficus indica, artocarpus integrifolia, and urceola elastica. If an

incision is made into the bark of any of these plants a milky juice exudes, which, when exposed to the air, concretes and forms caoutchouc. As the object of the natives in collecting it had been originally to form it into vessels for their own use, it is generally made to concrete in the form of bags or bottles. This is done by applying the juice when fluid in thin layers to a mould of dried clay, and then leaving it to concrete in the sun or by the fire. A second layer is added to the first, and others in succession, till the vessel acquires the thickness that is wanted. The mould is then broken and the vessel fit for use, and in this state it is generally brought into Europe. It has been brought, however, even in its milky state by being confined from the action of the air. If the milky juice is exposed to the air, an elastic pellicle is formed on the surface. If it is confined in a vessel containing oxygene gas, the pellicle is formed sooner. If oxymuriatic acid is poured into the milky juice, the caoutchouc precipitates immediately. This renders it probable that the formation of the caoutchouc is owing to the absorption of oxygene. Caoutchouc, when pure, is of a white color, without taste and without smell. The black color of the caoutchouc of commerce is owing to the method of drying the different layers upon the moulds on which they are spread. They are dried by being exposed to smoke. The black color of the caoutchouc therefore is owing to the smoke or soot alternating with its different layers. It is soft and pliable like leather, and extremely elastic, so that it may be stretched to a very great length, and still recover its former size. Its specific gravity is 0·9335. Gough of Manchester, has made some curious and important experiments on the connexion between the temperature of caoutchouc and its elasticity, from which it results that ductility as well as fluidity is owing to latent heat. Caoutchouc is not altered by exposure to the air. It is perfectly insoluble in water; but if boiled in water for some time its edges become so soft that they will cement, if pressed and kept for a while closely together. It is insoluble in alcohol, but soluble in ether. It is soluble also in volatile oils and in alkalies. And from the action operated upon it by acids, it is thought to be composed of carbon, hydrogene, oxygene, and azote. It seems to exist in a great variety of plants combined with other ingredients. It may be separated from resins by alcohol. It may be separated from the berries of the misletoe by means of water, and from other vegetable substances by other processes. It is said to be contained both in opium and in mastic. But from these substances it cannot be extracted in sufficient quantities to make it worth the labor. It is applied to a great many useful purposes both in medicine and the arts, to which, from its great pliability and elasticity, it is uncommonly well adapted. In the countries where it is produced the natives make boots and shoes of it, and often use it by way of candle.

390. *Cork.* — The substance known by the name of cork is the outer and exfoliated bark of the quercus suber or cork-tree, a species of oak that grows in great abundance in France, Spain, and Italy. But to prevent its natural exfoliation, which is always irregular, and to disengage it in convenient portions, a longitudinal incision is made in the bark from the root to the top of the stem; and a transverse and circular incision at each extremity. The outer layer, which is cork, is then stripped off, and to flatten and reduce it to sheets, it is put into water and loaded with weights. The tree continues to thrive, though it is thus stripped of its cork once in two or three years. Cork is a light, soft, and elastic substance, distinguished by the following properties: — Its colour is a sort of light tan. It is very inflammable and burns with a bright white flame, leaving a black and bulky charcoal behind. When distilled it yields a small quantity of ammonia. Nitric acid corrodes and dissolves it, changing its colour to yellow, and finally decomposes it, converting it partly into an acid, and partly into a soft substance resembling wax or resin. The acid which is thus formed is denominated the suberic acid, and has been proved by the experiments of Lagrange to be an acid of a peculiar nature. It seems probable that cork exists in the bark of some other trees also as well as the quercus suber. The bark of the ulmus suberosa assumes something of the external appearance of cork, which it resembles in its thickness, softness, and elasticity, and in its loose and porous texture, as well as also in its chemical properties. Fourcroy seems, indeed, to regard the epidermis of all trees whatever, to be a sort of cork, but does not say on what grounds his opinion is founded.

391. *Woody fibre.* — The principal body of the root, stem, and branches of trees, is designated by the appellation of wood. But the term is too general for the purpose of analytical distinction, as the part designated by it often includes the greater part of the substances that have been already enumerated. It remains therefore to be ascertained whether there exists in the plant any individual substance different from those already described, and constituting more immediately the fabric of the wood. If a piece of wood is well dried and digested, first in water and then in alcohol, or such other solvent as shall produce no violent effects upon the insoluble parts; and if the digestion is continued till the liquid is no longer colored, and dissolves no more of the substance of the plant, there remains behind a sort of vegetable skeleton, which constitutes the

basis of the wood, and which has been denominated woody fibre. It is composed of bundles of longitudinal threads, which are divisible into others still smaller. It is somewhat transparent. It is without taste and smell, and is not altered by exposure to the atmosphere. It is insoluble in water and alcohol; but the fixed alkalies decompose it with the assistance of heat. When heated in the open air it blackens without melting or frothing, and exhales a thick smoke and pungent odor, leaving a charcoal that retains the form of the original mass. When distilled in a retort it yields an empyreumatic oil, carburetted hydrogene gas, carbonic acid, and a portion of ammonia, according to Fourcroy, indicating the presence of nitrogene as constituting one of its elementary principles, and yet this ingredient does not appear in the result of the later analysis of Gay Lussac, and Thenard, which is, carbon, 52·53; oxygene, 41·78; hydrogene, 5·69. — Total 100·

392. *Charcoal.* — When wood is burnt with a smothered flame, the volatile parts are driven off by the heat, and there remains behind a substance exhibiting the exact form, and even the several layers of the original mass. This process is denominated charring, and the substance obtained, charcoal. As it is the woody fibre alone which resists the action of heat, while the other parts of the plant are dissipated, it is plain that charcoal must be the residuum of woody fibre, and that the quantity of the one must depend upon the quantity of the other, if they are not rather to be considered as the same. Charcoal may be obtained from almost all parts of the plant, whether solid or fluid. It often escapes, however, during combustion, under the form of carbonic acid, of which it constitutes one of the elements. From a variety of experiments made on different plants and on their different parts, it appears that the green parts contain a greater proportion of charcoal than the rest. But this proportion is found to diminish in autumn, when the green parts begin to be deprived of their glutinous and extractive juice. The wood contains more charcoal than the alburnum, the bark more than both. But this last result is not constant in all plants, because the bark is not a homogenous substance, the outer parts being affected by the air and the inner parts not. The wood of the quercus robur, separated from the alburnum, yielded from 100 parts of its dried substance 19·75 of charcoal; the alburnum 17·5; the bark 26; leaves gathered in May 30; in September 26. But the quantity of charcoal differs also in different plants as well as in different parts of the same. In the plants examined by Proust, the proportion was found to be as follows, the quantity of wood charred being represented by unity: — Black ash 0·25; guaiacum 0·24; pine 0·20; green oak 0·20; heart of oak 0·19; wild ash 0·17; white ash 0·17. Charcoal is insoluble in water, of which however it absorbs a portion when newly made, as also of atmospheric air. It is incapable of putrefaction. It is not altered by the most violent heat that can be applied, if all air and moisture are excluded; but when heated to about 800 it burns in atmospheric air or oxygene gas, and if pure, without leaving any residuum. It is regarded by chemists as being a triple compound, of which the ingredients are carbon, hydrogene, and oxygene. Charcoal is of great utility both to the chemist and artist as a fuel for heating furnaces, as well as for a variety of other purposes. It is an excellent filter for purifying water. It is a very good tooth-powder; and is also an indispensable ingredient in the important manufacture of gunpowder.

393. *The sap.* — If the branch of a vine is cut asunder early in the spring, before the leaves have begun to expand, a clear and colourless fluid will issue from the wound, which gardeners denominate the tears of the vine. It is merely, however, the ascending sap, and may be procured from almost any other plant by the same or similar means, and at the same season; but particularly from the maple, birch, and walnut-tree, by means of boring a hole in the trunk. It issues chiefly from the porous and mixed tubes of the alburnum; though sometimes it does not flow freely till the bore is carried to the centre. A small branch of a vine has been known to yield from twelve to sixteen ounces, in the space of twenty-four hours. A maple-tree of moderate size yields about 200 pints in a season, as has been already stated; and a birch-tree has been known to yield in the course of the bleeding season, a quantity equal to its own weight. In the sap of fagus sylvatica, Vauquelin found the following ingredients: — Water, acetate of lime, with excess of acid, acetate of potass, gallic acid, tannin, mucous and extractive matter, and acetate of alumina. In 1039 parts of the sap of ulmus campestris, he found 1027 parts of water and volatile matter, 9·240 of acetate of potass, 1·060 of vegetable matter, 0·796 of carbonate of lime, besides some slight indications of the presence of sulphuric and muriatic acids; and at a later period of the season he found the vegetable matter increased, and the carbonate of lime and acetate of potass diminished. From the above experiments, therefore, as well as from those of other chemists, it is plain that the sap consists of a great variety of ingredients, differing in different species of plants; though there is too little known concerning it to warrant the deduction of any general conclusions, as the number of plants whose sap has been hitherto analysed is yet but very limited. It is the grand and principal

source of vegetable aliment, and may be regarded as being somewhat analogous to the blood of animals. It is not made use of by man, at least in its natural state. But there are trees, such as the birch, whose sap may be manufactured into a very pleasant wine; and it is well known that the sap of the American maple-tree yields a considerable quantity of sugar.

304. *The proper juice.* — When the sap has received its last degree of elaboration from the different organs through which it has to pass, it is converted into a peculiar fluid, called the proper juice. This fluid may be distinguished from the sap by means of its color, which is generally green, as in periwinkle; or red, as in logwood; or white, as in spurge; or yellow, as in celandine; from the two last of which it may readily be obtained by breaking the stem asunder, as it will then exude from the fracture. Its principal seat is in the bark, where it occupies the simple tubes; but sometimes it is situated between the bark and wood, as in the juniper-tree; or in the leaf, as in the greater part of herbs; or it is diffused throughout the whole plant, as in the fir and hemlock; in which case, either the proper juice mixes with the sap, or the vessels containing it have ramifications so fine as to be altogether imperceptible. It is not, however, the same in all plants, nor even in the different parts of the same plant. In the cherry-tree it is mucilaginous; in the pine it is resinous; in spurge and celandine it is caustic, though resembling in appearance an emulsion. In many plants the proper juice of the bark is different from that of the flower; and the proper juice of the fruit different from both. Its appearance under the microscope, according to Senebier, is that of an assemblage of small globules connected by small and prism-shaped substances placed between them. If this juice could be obtained in a state of purity, its analysis would throw a considerable degree of light upon the subject of vegetation. But it seems impracticable to extract it without a mixture of sap. Senebier analysed the milky juice of euphorbia cyparissias, of which he had procured a small quantity considerably pure, though its pungency was so great as to occasion an inflammation of the eyes to the person employed to procure it. It mixed readily with water, to which it communicated its color. When left exposed to the air a slight precipitation ensued; and when allowed to evaporate a thin and opaque crust remained behind. Alcohol coagulated it into small globules. Ether dissolved it entirely, as did also oil of turpentine. Sulphuric acid changed its color to black; nitric acid to green. The most accurate experiments on the subject are those of Chaptal. When oxymuriatic acid was poured into the peculiar juice of euphorbia, a very copious white precipitate fell down, which, when washed and dried, had the appearance of starch, and was not altered by keeping. Alcohol, aided by heat, dissolved two-thirds of it, which the addition of water again precipitated. They had all the properties of resin. The remaining third part possessed the properties of woody fibre. The same experiment was tried on the juice of a variety of other plants, and the result uniformly was that oxymuriatic acid precipitated from them woody fibre. The virtues of plants have generally been thought to reside in their proper juices, and the opinion seems indeed to be well founded. It is at least proved by experiment in the poppy, spurge, and fig. The juice of the first is narcotic, of the two last corrosive. The diuretic and balsamic virtues of the fir reside in its turpentine, and the purgative property of jalap in its resin. If sugar is obtained from the sap of the sugar-cane and maple, it is only because it has been mixed with a quantity of proper juice. The bark certainly contains it in greatest abundance, as may be exemplified in cinnamon and quinquina. But the peach-tree furnishes an exception to this rule: its flowers are purgative, and the whole plant aromatic; but its gum is without any distinguished virtues. Malpighi regarded the proper juice as the principle of nourishment, and compared it to the blood of animals; but this analogy does not hold very closely. The sap is, perhaps, more analogous to the blood, from which the proper juice is rather a secretion. In one respect, however, the analogy holds good, that is, with regard to extravasated blood and peculiar juices. If the blood escapes from the vessels it forms neither flesh nor bones, but tumors; and if the proper juices escape from the vessels containing them, they form neither wood nor bark, but a lump or deposite of inspissated fluid. To the sap or to the proper juice, or rather to a mixture of both, we must refer such substances as are obtained from plants under the name of expressed juices, because it is evident that they can come from no other source. In this state they are generally obtained in the first instance whether with a view to their use in medicine or their application to the arts. It is the business of the chemist or artist to separate and purify them afterwards according to the peculiar object he may happen to have in view, and the use to which he purposes to apply them. They contain, like the sap, acetate of potass or of lime, and assume a deeper shade of color when exposed to the fire or air. The oxymuriatic acid precipitates from them a colored and flaky substance as from the sap, and they yield by evaporation a quantity of extract. But they differ from the sap in exhibiting no traces of tannin or gallic acid, and but rarely of the saccharine principle.

395. *Ashes.* — When vegetables are burnt in the open air the greatest part of their substance is evaporated during the process of combustion; but ultimately there remains behind, a portion which is altogether incombustible, and incapable of being volatilized by the action of fire. This residuum is known by the name of ashes. Herbaceous plants, after being dried, yield more ashes than woody plants; the leaves more than the branches; and the branches more than the trunk. The alburnum yields also more ashes than the wood; and putrefied vegetables yield more ashes than the same vegetables in a fresh state, if the putrefaction has not taken place in a current of water. The result of Saussure's experiments on this subject was the following: — A thousand parts of dried leaves of the oak, gathered in May, contained 53 parts of ashes; of the rhododendron ferrugineum, 30. A thousand parts of the leaves of the æsculus hypocastanum, gathered in May, yielded 72 parts of ashes; of the trunk and branches, 35. A thousand parts of the leaves of the same plant, gathered in September, 86 parts of ashes; the fruit, gathered in October, 34. A thousand parts of the dried bark of the oak, contained 60 parts of ashes; of the alburnum, four; of the wood, two. A thousand parts of the leaves of the oak, gathered in May, yielded, in the green state, 13 parts of ashes; dried, 53. The same leaves, gathered in September, yielded in their green state 24 parts of ashes; dried, 55. A thousand parts of the pisum sativum, in flower, yielded 95 parts of ashes; when in fruit, only 81. A thousand parts of the vicca faba yielded before flowering 16 parts of ashes, in their green state, and 895 parts of water of vegetation; when in flower they contained 20 parts of ashes, and 876 of water of vegetation. Such are the proportions in which plants, when decomposed by combustion, yield ashes, as far as these proportions have been ascertained by the experiments of Saussure. But a more important subject of inquiry is the analysis of the ashes themselves, with a view to the discovery of the ingredients of which they are composed. These may be reduced to three, alkalies, earths, and metals, which must therefore be considered as ingredients in the composition of the vegetable. But vegetable ashes contain also a variety of other principles, occurring, however, in such small proportions as generally to escape observation. Perhaps they contain all substances not capable of being volatilized by the action of fire.

396. *Alkalies.* — The alkalies are a peculiar class of substances, distinguished by a caustic taste and the property of changing vegetable blues to green. They are generally regarded as being three in number, potass, soda, and ammonia, of which the two former only are found in the ashes of vegetables. Ammonia is, indeed, often obtained from vegetable substances by means of distillation, but then it is always formed during the process. If the ashes of vegetables, burnt in the open air, are repeatedly washed in water, and the water filtered and evaporated to dryness, potass is left behind. The potass of commerce is manufactured in this manner, though it is not quite pure. But it may be purified by dissolving it in spirits of wine, and evaporating the solution to dryness in a silver vessel. When pure it is white and semi-transparent, and is extremely caustic and deliquescent. It dissolves all soft animal substances, and changes vegetable blues into green. It dissolves alumina, and also a small quantity of silex, with which it fuses into glass by the aid of fire. It had been long suspected by chemists to be a compound substance; and according to the notable discovery of Sir H. Davy, its component parts are at last ascertained to be a highly inflammable metal, which he denominates potassium, and oxygene — one proportion of each. Soda is found chiefly in marine plants, from the ashes of which it is obtained by means of lixiviation. It exists in great abundance in salsoa, soda, zostera maritima, and in various species of fuci. It is generally obtained in the state of a carbonate, but is purified in the same manner as potass, to which it is similar in its properties; but from which it is easily distinguished by its forming a hard soap with oil, while potass forms a soft soap. It consists, according to Sir H. Davy, of one proportion of a metal which he denominates sodium, and two proportions of oxygene. Such are the only vegetable alkalies, and the modes of obtaining them. They are found generally in the state of carbonates, sulphates, or muriates, salts that form beyond all comparisson the most abundant ingredient in the ashes of green herbaceous plants whose parts are in a state of vegetation. The ashes of the golden rod, growing in an uncultivated soil, and of the bean, turnsol, and wheat, were found by Saussure to contain, at least three-fourths of their weight of alkaline salts. This was nearly the case also with the leaves of trees just bursting from the bud. But the proportion of alkaline salts is found to diminish rather than to augment as the parts of the plant are developed. The ashes of the leaves of the oak, gathered in May, yielded 47 parts in the 100 of alkaline salts; and in September, only 17.

The utility of the alkalies, as obtained from vegetables, is of the utmost importance in the arts, particularly in the formation of glass and of soaps. If a mixture of soda or potass, and silex or sand, in certain proportions, is exposed to a violent heat, the ingredients are melted down into a fluid mass, which is glass in a state of fusion. In this state it may be moulded into almost any form at the pleasure of the artist. And accordingly we find that it is manufactured into a great variety of utensils and instruments under the heads of flint-glass, crown-glass, bottle-glass. Bottle-glass is the coarsest; it is formed of soda and common sand, and is used in the manufacture of the coarser sort of bottles. Crown-glass is composed of soda and fine sand: it is moulded into large plates for the purpose of forming window-glasses and looking-glasses. Flint-glass is the finest and most transparent of all: that which is of the best quality is composed of 120 parts of white siliceous sand, 40 parts of pearl-ash, 35 of red oxide of lead, 13 of nitrate of potass, and 25 of black oxide of manganese. It is known also by the name of crystal, and may be cut and polished so as to serve for a variety of ornamental purposes, as well as for the more important and more useful purpose of forming optical instruments, of which the discoveries of the telescope and the microscope are the curious or sublime results. If a quantity of oil is mixed with half its weight of a strong solution of soda or potass, a combination takes place which is rendered more complete by means of boiling. The new compound is soap. The union of oil with potass forms soft soap, and with soda hard soap; substances of the greatest efficacy as detergents, and of the greatest utility in the washing and bleaching of linen. The alkalies are used also in medicine, and are found to be peculiarly efficacious in the reduction of urinary calculi.

397. *Earths.* — The only earths which have hitherto been found in plants are the following: lime, silica, magnesia, alumina. Of these earths, *lime* is by far the most abundant. It is generally combined with a portion of phosphoric, carbonic, or sulphuric acid, forming phosphates, or carbonates, or sulphates of lime. The phosphate of lime is, next to the alkaline salt, the most abundant ingredient in the ashes of green herbaceous plants, whose parts are all in a state of vegetation. The leaf of a tree, bursting from the bud, contains in its ashes a greater proportion of earthy phosphate than at any other period: 100 parts of the ashes of the leaves of the oak, gathered in May, furnished 24 parts of earthy phosphate; in September, only 18·25. In annual plants the proportion of earthy phosphate diminishes from the period of their germination to that of their flowering. Plants of the bean, before flowering, gave 14·5 parts of earthy phosphate; in flower, only 13·5. Carbonate of lime is, next to phosphate of lime, the most abundant of the earthy salts that are found in vegetables. But if the leaves of plants are washed in water the proportion of carbonate is augmented. This is owing to the subtraction of their alkaline salts and phosphates in a greater proportion than their lime. In green herbaceous plants, whose parts are in a state of increase, there is but little carbonate of lime; but the ashes of the bark of trees contain an enormous quantity of carbonate of lime, and much more than the alburnum, as do also the ashes of the wood. The ashes of most seeds contain no carbonate of lime; but they abound in phosphate of potass. Hence the ashes of plants, at the period of the maturity of the fruit, yield less carbonate of lime than at any previous period.

398. *Silica* is not found to exist in a great proportion in the ashes of vegetables, unless they have been previously deprived of their salts and phosphates by washing; but when the plants are washed in water, the proportion of their silica augments. The ashes of the leaves of the hazel, gathered in May, yielded 2·5 parts of silica in 100. The same leaves, washed, yielded four parts in 100. Young plants, and leaves bursting from the bud, contain but little of silica in their ashes; but the proportion of silica augments as the parts are developed. But perhaps this is owing to the diminution of the alkaline salts. The ashes of some stalks of wheat gathered a month before the time of flowering, and having some of the radical leaves withered, contained $\frac{12}{100}$ of silica and $\frac{65}{100}$ of alkaline salts. At the period of their flowering, and when more of their leaves were withered, the ashes contained 32 parts of silica and 54 of alkaline salts. Seeds divested of their external covering, contain less silica than the stem furnished with its leaves; and it is somewhat remarkable that there are trees of which the bark, alburnum, and wood, contain scarcely any silica, and the leaves a great deal, particularly in autumn. This is a phenomenon that seems inexplicable. The greater part of the grasses contain a very considerable proportion of silica, as do also the plants of the genus equisetum. Sir H. Davy has discovered that it forms a part of the epidermis of these plants, and in some of them the principal part. From 100 parts of the epidermis of the following plants the proportions of silica were, in bonnet cane, 90; bamboo, 71·4; common reed, 48·1; stalks of corn, 66·5. Owing to the silica contained in the epidermis, the plants in which it is found, are sometimes used to give a polish to the surface of substances where smoothness is required. The Dutch rush, a plant of this kind, is used to polish even brass.

399. *Magnesia* does not exist so abundantly in the vegetable kingdom as the two preceding earths. It has been found, however, in several of the marine plants, particularly the

fuci; but salsola soda contains more of magnesia than any other plant yet examined. According to Vauquelin, 100 parts of it contain 17·929 of magnesia. *Alumina* has been detected in several plants, but never except in very small quantities.

400. *Metallic Oxides.* — Among the substances found in the ashes of vegetables, we must class also metals. They occur, however, only in small quantities, and are not to be detected except by the most delicate experiments. The metals hitherto discovered in plants are iron, manganese, and perhaps gold. Of these iron is by far the most common. It occurs in the state of an oxide, and the ashes of hard and woody plants, such as the oak, are said to contain nearly $\frac{1}{12}$ part of their own weight of this oxide. The ashes of salsola contain also a considerable quantity. The oxide of manganese was first detected in the ashes of vegetables by Scheele, and afterwards found by Proust in the ashes of the pine, calendula, vine, green oak, and fig-tree. Becher, Kunckel, and Sage, together with some other chemists, contend also for the existence of gold in the ashes of certain plants; but the very minute portion which they found, seems more likely to have proceeded from the lead employed in the process than from the ashes of the plant. It has been observed by Saussure, that the proportion of the oxides of iron and of manganese augments in the ashes of plants as their vegetation advances. The leaves of trees furnish more of these principles in autumn than in spring. It is so also with annual plants. Seeds contain metals in less abundance than the stem; and if plants are washed with water, the proportion of their metallic oxides is augmented.

The substances that have been above described constitute, as is evident, the principal ingredients that enter into the vegetable composition. They are indeed numerous, though some of them, such as the metallic oxides, occur in such small proportions as to render it doubtful whether they are in reality vegetable productions or no. The same thing may be said of some of the other ingredients that have been found in the ashes of plants, which it is probable they have absorbed ready formed by the root, and deposited unaltered, so that they can scarcely be at all regarded as being the genuine products of vegetation. But besides the substances above enumerated there are also several others that have been supposed to constitute distinct and peculiar genera of vegetable productions, and which might have been introduced under such a character; such as the mucus, jelly, sarcocol, asparagin, inulin, and ulmin, of Dr. Thomson, as described in his well known System of Chemistry; but as there seems to be some difference of opinion among chemists with regard to them, and a belief entertained that they are but varieties of one or other of the foregoing ingredients, it is sufficient for the purposes of this work to have merely mentioned their names. Several other substances of a distinct and peculiar character have been suspected to exist in vegetable productions: such as the febrifuge principle of Seguin, as discovering itself in Peruvian bark; the principle of causticity or acridity of Senebier, as discovering itself in the roots of ranunculus bulbosus, scilla maritima, bryonia alba, and arum maculatum, in the leaves of digitalis purpurea, in the bark of Daphne Mezereon, and in the juice of the Spurges: to which may be added the fluid secreted from the sting of the common nettle, the poisons inherent in some plants, and the medical virtues inherent in others; together with such peculiar principles as may be presumed to exist in such regions of the vegetable kingdom as remain yet unexplored. The important discoveries which have already resulted from the chemical analysis of vegetable substances encourage the hope that further discoveries will be the result of further experiment; and from the zeal and ability of such chemists as are now directing their attention to the subject every thing is to be expected.

Sect. II. *Simple Products.*

401. From the above analysis of the vegetable subject, it is evident, that the compound ingredients of vegetables are all ultimately reducible to a very few constituent and uncompounded elements; and that the most essential of such compounds consist of carbon, oxygen, and hydrogen, merely; though others contain also a small proportion of nitrogen, said to be found only in cruciform plants. The remaining elementary principles which plants have been found to contain, although they may be necessary in the vegetable economy, yet they are by no means principles of the first importance, as occurring only in small proportions, and being dependent in a great measure on soil and situation; whereas the elements of carbon, oxygene, and hydrogene, form as it were the very essence of the vegetable subject, and constitute by their modifications the peculiar character of the properties of the plant. This is conspicuously exemplified in the result of the investigations of Gay Lussac, and Thenard, who have deduced from a series of the most minute and delicate experiments the three following propositions, which they have dignified by the name of Laws of Vegetable Nature: *Traité de Chem. Element.* tom. iii. chap. iii. 1st, Vegetable substances are always acid when the oxygen they contain is to the hydrogen in a greater proportion than in water.

2dly, Vegetable substances are always resinous, or oily, or spirituous, when the oxygen they contain is to the hydrogen in a smaller proportion than in water. 3dly, Vegetable substances are neither acid nor resinous, but saccharine or mucilaginous, or analogous to woody fibre or starch, when the oxygen and hydrogen they contain are in the same proportion as in water. Such is a brief sketch of the vegetable analysis: but if the reader, not being already an adept, wishes to descend into the detail of particulars and to prepare himself for original experiment, let him search out and peruse original papers, and let him consult the vegetable department of the several elementary publications referred to, especially that of Dr. Thomson's System of Chemistry; the most distinguished and elaborate of all our elementary works on the subject, and the guide chiefly applied to in the drawing up of the sketch that is here exhibited.

Chap. VIII.

Functions of Vegetables.

402. From the analysis of the vegetable structure whether external or internal, and of the primary and constituent principles of which the vegetable is composed, or to which it may be reduced, the transition to the subject of the functions of the vegetable organs is both natural and easy. This subject necessarily involves the several following topics: Germination; nutriment; digestion; growth and developement of parts; anomalies of vegetable developement; sexuality of vegetables; impregnation of the vegetable germe; changes consequent upon impregnation; propagation and dispersion of the species; causes limiting the dispersion of the species; evidence and character of vegetable vitality.

Sect. I. *Germination of the Seed.*

403. Germination is that act or operation of the vegetative principle by which the embryo is extricated from its envelopes, and converted into a plant. This is universally the first part of the process of vegetation. For it may be regarded as an indubitable fact, that all plants spring originally from seed. The conditions necessary to germination relate either to the internal state of the seed itself, or to the circumstances in which it is placed, with regard to surrounding substances.

The first condition necessary to germination is, that the seed must have reached *maturity.* Unripe seeds seldom germinate, because their parts are not yet prepared to form the chemical combinations on which germination depends. There are some seeds, however, whose germination is said to commence in the very seed-vessel, even before the fruit is ripe, and while it is yet attached to the parent plant. Such are those of the *Tangekolli* of Adanson, and *Agave vivipara* of East Florida, as well as of the *Cyamus Nelumbo* of Sir J. E. Smith, or sacred Bean of India; to which may be added the seeds of the common garden Radish, Pea, Lemon, &c. But these are examples of rare occurrence; though it is sometimes necessary to sow or plant the seed almost as soon as it is fully ripe, as in the case of the Coffee-bean; which will not germinate unless it is sown within five or six weeks after it has been gathered. But most seeds, if guarded from external injury, will retain their germinating faculty for a period of many years. This has been proved by the experiment of sowing seeds that have been long so kept; as well as by the deep ploughing up of fields that have been long left without cultivation. A field that was thus ploughed up near Dunkeld, in Scotland, after a period of forty years' rest, yielded a considerable blade of black oats without sowing. It could have been only by the plough's bringing up to the surface, seeds that had been formerly too deeply lodged for germination.

The second condition is, that the seed sown must be *defended from the action of the rays of light.* This has no doubt been long known to be a necessary condition of germination, if we regard the practice of the harrowing or raking in of the grains or seeds sown by the farmer or gardener as being founded upon it.

A third condition necessary to germination is the *access of heat.* No seed has ever been known to germinate at or below the freezing point. Hence seeds do not germinate in winter, even though lodged in their proper soil. But the vital principle is not necessarily destroyed in consequence of this exposure; for the seed will germinate still, on the return of spring, when the ground has been again thawed, and the temperature raised to the proper degree. But this degree varies considerably in different species of seeds, as is obvious from observing the times of their germination, whether in the same or in different climates. For if seeds which naturally sow themselves, germinate, in different climates at the same period; or in the same climate at different periods; the temperature necessary to their germination must of consequence be different. Now these cases are constantly occurring and presenting themselves to our notice; and have also been made the subject of particular observation. Adanson found that seeds which will germinate in the space of twelve hours in an ordinary degree of heat, may be made to germinate in the space of three hours by exposing them to a greater degree of heat; and that seeds transported from the climate of Paris to that of Senegal, have their periods of germination accelerated from one to three days (*Familles des Plantes*, vol. i. p. 84.) Upon the same principle, seeds transported from a warmer to a colder climate, have their period of germination protracted till the temperature of the latter is raised to that of the former. This is well exemplified in the case of greenhouse and hothouse plants, from which it is also obvious that the temperature must not be raised beyond a certain degree, otherwise the vital principle is totally destroyed.

A fourth condition necessary to germination is the *access of moisture*. Seeds will not germinate if they are kept perfectly dry. Water, therefore, or some liquid equivalent to it, is essential to germination. Hence rain is always acceptable to the farmer or gardener, immediately after he has sown his seeds; and if no rain falls, recourse must be had, if possible, to artificial watering. But the quantity of water applied is not a matter of indifference. There may be too little, or there may be too much. If there is too little, the seed dies for want of moisture; if there is too much, it then rots. The case is not the same, however, with all seeds. Some can bear but little moisture, though others will germinate even when partially immersed; as was proved by an experiment of Du Hamel's, at least in the case of Peas, which he placed merely upon a piece of wet sponge, so as to immerse them by nearly the one half, and which germinated as if placed in the soil. But this was found to be the most they could bear; for when totally immersed in the water they rotted. There are some seeds, however, that will germinate even when wholly submersed. The seeds of aquatics must of necessity germinate under water; and Peas have been also known to do so under certain conditions.

A fifth condition, necessary to germination, is the *access of atmospheric air*. Seeds will not germinate if placed in a *vacuum*. Ray introduced some grains of Lettuce-seed into the receiver of an air-pump, which he then exhausted. The seeds did not germinate. But they germinated upon the re-admission of the air, which is thus proved by consequence to be necessary to their germination. Achard proved that no seed will germinate in nitrogene gas, or carbonic acid gas, or hydrogene gas, except when mixed with a certain proportion of oxygene gas; and hence concluded that oxygene gas is necessary to the germination of all seeds, and the only constituent part of the atmospheric air which is absolutely necessary. Humboldt found that the process of germination is accelerated by means of previously steeping the seed in water impregnated with oxymuriatic acid. Cress-seed treated in this manner germinated in the space of three hours, though its ordinary period of germination is not less than thirty-two hours.

The period necessary to complete the process of germination is not the same in all seeds, even when all the necessary conditions have been furnished. Some species require a shorter, and others a longer period. The Grasses are among the number of those plants whose seeds are of the most rapid germination; then perhaps cruciform plants; then leguminous plants; then labiate plants; then umbelliferous plants; and in the last order rosaceous plants, whose seeds germinate the slowest. The following table indicates the periods of the germination of a considerable variety of seeds as observed by Adanson.

	Days.		Days.
Wheat, Millet-seed	1	Orache	8
Spinage, Beans, Mustard	3	Purslain	9
Lettuce, Anise-seed	4	Cabbage	10
Melon, Cucumber, Cress-seed	5	Hyssop	30
		Parsley	40 or 50
Radish, Beet-root,	6	Almond, Chesnut, Peach	1 year
Barley	7	Rose, Hawthorn, Filbert	2 years.

404. *Physical Phenomena*. When a seed is committed to the soil under the conditions that have been just specified, the first infallible symptom of germination is to be deduced from the prolongation of the radicle, bursting through its proper integuments, and directing its extremity downwards into the soil. The next step in the process of germination is the evolution of the cotyledon or cotyledons, unless the seed is altogether acotyledonous, or the cotyledons hypogean, as in the oak. The next step, in the case of seeds furnished with cotyledons, is that of the extrication of the plumelet, or first real leaf, from within or from between the cotyledon or cotyledons, and its expansion in the open air. The last and concluding step is the developement of the rudiments of a stem, if the species is furnished with a stem, and the plant is complete. Whatever way the seed may be deposited, the invincible tendency of the radicle is to descend and fix itself

in the earth; and of the plumelet to ascend into the air. Many conjectures have been offered to account for this. Knight accounts for it on the old but revived principle of gravitation. Keith conjectures that it takes place from a power inherent in the vegetable subject, analogous to what we call instinct in the animal subject, infallibly directing it to the situation best suited to the acquisition of nutriment and consequent developement of its parts.

405. The *chemical phenomena* of germination consist chiefly in the changes that are effected in the nutriment destined for the support and developement of the embryo till it is converted into a plant. This nutriment either passes through the cotyledons, or is contained in them; because the embryo dies when they are prematurely cut off. But the farinaceous substance of the cotyledons, at least in exalbuminous seeds, is a proof that they themselves contain the nutriment. They are to be regarded therefore as repositories of the food destined for the support of the embryo in its germinating state. And if the seed is furnished with a distinct and separate albumen, then is the albumen to be regarded as the repository of food, and the cotyledon or cotyledons as its channel of conveyance. But the food thus contained in the albumen or cotyledons is not yet fitted for the immediate nourishment of the embryo. Some previous preparation is necessary; some change must be effected in its properties. And this change is effected by the intervention of chemical agency. The moisture imbibed by a seed placed in the earth is immediately absorbed by the cotyledons or albumen, which it readily penetrates, and on which it immediately begins to operate a chemical change, dissolving part of their farina, or mixing with their oily particles, and forming a sort of emulsive juice. The consequence of this change is a slight degree of fermentation, induced, perhaps, by the mixture of the starch and gluten of the cotyledons in the water which they have absorbed, and indicated by the extraction of a quantity of carbonic acid gas as well as by the smell and taste of the seed. This is the commencement of the process of germination, which takes place even though no oxygene gas is present. But if no oxygene gas is present, then the process stops; which shows that the agency of oxygene gas is indispensable to germination. Accordingly, when oxygene gas is present it is gradually inhaled by the seed; and the farina of the cotyledons is found to have changed its savour. Sometimes it becomes acid, but generally sweet, resembling the taste of sugar; and is consequently converted into sugar or some substance analogous to it. This is a further proof that a degree of fermentation has been induced; because the result is precisely the same in the process of the fermentation of Barley when converted into malt, as known by the name of the saccharine fermentation; in which oxygene gas is absorbed, heat and carbonic acid evolved, and a tendency to germination indicated by the shooting of the radicle. The effect of oxygen therefore in the process is that of converting the farina of the albumen or cotyledons into a mild and saccharine food, fit for the nourishment of the infant plant by diminishing the proportion of its carbon, and in augmenting, by consequence, that of its oxygen and hydrogen. The radicle gives the first indications of life, expanding and bursting its integuments, and at length fixing itself in the soil: the plumelet next unfolds its parts, developing the rudiments of leaf, branch, and trunk: and, finally, the seminal leaves decay and drop off; and the embryo has been converted into a plant, capable of abstracting immediately from the soil or atmosphere the nourishment necessary to its future growth.

Sect. II. *Food of the vegetating Plant.*

406. If the embryo, when converted into a plant and fixed in the soil, is now capable of abstracting from the earth or atmosphere the nutriment necessary to its growth and developement, the next object of the phytologist's inquiry will be that of ascertaining the substances which it actually abstracts, or the food of the vegetating plant. What then are the component principles of the soil and atmosphere? The investigations and discoveries of modern chemists have done much to elucidate this dark and intricate subject. Soil, in general, may be regarded as consisting of earths, water, vegetable mould, decayed animal substances, salts, ores, alkalies, gases, perhaps in a proportion corresponding to the order in which they are now enumerated; which is at any rate the fact with regard to the three first, though their relative proportions are by no means uniform. The atmosphere has been also found to consist of at least four species of elastic matter — nitrogen, oxygen, carbonic acid gas, and vapour; together with a multitude of minute particles detached from the solid bodies occupying the surface of the earth, and wafted upon the winds. The two former ingredients exist in the proportion of about four to one; carbonic acid gas in the proportion of about one part in 100; and vapour in a proportion still less. Such then are the component principles of the soil and atmosphere, and sources of vegetable nourishment. But the whole of the ingredients of the soil and atmosphere are not taken up indiscriminately by the plant and converted into vegetable food, because plants do not thrive indiscriminately in all varieties of soil.

Part only of the ingredients are selected, and in certain proportions; as is evident from the analysis of the vegetable substance given in the foregoing book, in which it was found that carbon, hydrogen, oxygen, and nitrogen, are the principal ingredients of plants; while the other ingredients contained in them occur but in very small proportions. It does not however follow, that these ingredients enter the plant in an uncombined and insulated state, because they do not always so exist in the soil and atmosphere; it follows only that they are inhaled or absorbed by the vegetating plant under one modification or another. The plant then does not select such principles as are the most abundant in the soil and atmosphere; nor in the proportions in which they exist; nor in an uncombined and insulated state. But what are the substances actually selected; in what state are they taken up; and in what proportions? In order to give arrrangement and elucidation to the subject, it shall be considered under the six following heads: Water, Gases, Vegetable Extracts, Salts, Earths, Manures.

407. *Water.* As water is necessary to the commencement of vegetation, so also is it necessary to its progress. Plants will not continue to vegetate unless their roots are supplied with water; and if they are kept long without it, the leaves will droop and become flaccid, and assume a withered appearance. Now this is evidently owing to the loss of water; for if the roots are again well supplied with water, the weight of the plant is increased, and its freshness restored. But many plants will grow, and thrive, and effect the developement of all their parts, if the root is merely immersed in water, though not fixed in the soil. Lilies, hyacinths, and a variety of plants with bulbous roots, may be so reared, and are often to be met with so vegetating; and many plants will also vegetate though wholly immersed. Most of the marine plants are of this description. It can scarcely be doubted therefore, that water serves for the purpose of a vegetable aliment. But if plants cannot be made to vegetate without water; and if they will vegetate, some when partly immersed without the assistance of soil; and some even when totally immersed, so as that no other food seems to have access to them; does it not follow that water is the sole food of plants, the soil being merely the basis on which they rest, and the receptacle of their food? This opinion has had many advocates; and the arguments and experiments adduced in support of it were, at one time, thought to have completely established its truth. It was indeed the prevailing opinion of the seventeenth century, and was embraced by several philosophers even of the eighteenth century; but its ablest and most zealous advocates were Van Helmont, Boyle, Du Hamel, and Bonnet, who contended that water, by virtue of the vital energy of the plant, was sufficient to form all the different substances contained in vegetables. Du Hamel reared in the above manner plants of the horse-chestnut and almond to some considerable size, and an oak till it was eight years old. And, though he informs us that they died at last only from neglect of watering; yet it seems extremely doubtful whether they would have continued to vegetate much longer, even if they had been watered ever so regularly: for he admits, in the first place, that they made less and less progress every year; and, in the second place, that their roots were found to be in a very bad state. The result of a great variety of experiments is, that water is not the sole food of plants, and is not convertible into the whole of the ingredients of the vegetable substance, even with the aid of the vital energy; though plants vegetating merely in water, do yet augment the quantity of their carbon.

408. *Gases.* When it was found that water is insufficient to constitute the sole food of plants, recourse was next had to the assistance of the atmospheric air; and it was believed that the vital energy of the plant is at least capable of furnishing all the different ingredients of the vegetable substance, by means of decomposing and combining, in different ways, atmospheric air and water. But as this extravagant conjecture is founded on no proof, it is consequently of no value. It must be confessed, however, that atmospheric air is indispensably necessary to the health and vigour of the plant, as may be seen by looking at the different aspects of plants exposed to a free circulation of air, and plants deprived of it: the former are vigorous and luxuriant; the latter weak and stunted. It may be seen also by means of experiment even upon a small scale. If a plant is placed under a glass to which no new supply of air has access, it soon begins to languish, and at length withers and dies; but particularly if it is placed under the exhausted receiver of an air-pump; as might indeed be expected from the failure of the germination of the seed in similar circumstances. The result of experiments on this subject is, that atmospheric air and water are not the only principles constituting the food of plants. But as in germination, so also in the progress of vegetation, it is part only of the component principles of the atmospheric air that are adapted to the purposes of vegetable nutrition, and selected by the plant as a food. Let us take them in the order of their reversed proportions.

409. In the process of the germination of the seed, the effect of the application of *carbonic acid gas* was found to be altogether prejudicial. But in the process of sub-

sequent vegetation its application has been found, on the contrary, to be extremely beneficial. Plants will not indeed vegetate in an atmosphere of pure carbonic acid, as was first ascertained by Dr. Priestley, who found that sprigs of mint growing in water, and placed over wort in a state of fermentation, generally became quite dead in the space of a day, and did not even recover when put into an atmosphere of common air. Of a number of experiments the results are, 1st. That carbonic acid gas is of great utility to the growth of plants vegetating in the sun, as applied to the leaves and branches; and whatever increases the proportion of this gas in their atmosphere, at least within a given degree, forwards vegetation. 2d. That, as applied to the leaves and branches of plants, it is prejudicial to their vegetation in the shade, if administered in a proportion beyond that in which it exists in atmospheric air. 3d. That carbonic acid gas, as applied to the roots of plants, is also beneficial to their growth, at least in the more advanced stages of vegetation.

410. As *oxygen* is essential to the commencement and progress of germination; so also it is essential to the progress of vegetation. It is obvious, then, that the experiments prove that it is beneficial to the growth of the vegetable as applied to the root; necessary to the developement of the leaves; and to the developement of the flower and fruit. The flower-bud will not expand if confined in an atmosphere deprived of oxygen, nor will the fruit ripen. Flower-buds confined in an atmosphere of pure nitrogen faded without expanding. A bunch of unripe grapes introduced into a globe of glass which was luted by its orifice to the bough, and exposed to the sun, ripened without effecting any material alteration in its atmosphere. But when a bunch was placed in the same circumstance, with the addition of a quantity of lime, the atmosphere was contaminated, and the grapes did not ripen. Oxygen therefore is essential to the developement of the vegetating plant, and is inhaled during the night.

411. Though *nitrogene gas* constitutes by far the greater part of the mass of atmospheric air, it does not seem capable of affording nutriment to plants; for as seeds will not germinate, so neither will plants vegetate in it, but for a very limited time, such as the *Vinca minor, Lythrum Salicaria, Inula dysenterica, Epilobium hirsutum,* and *Polygonum Persicaria,* that seem to succeed equally well in an atmosphere of nitrogene gas as in an atmosphere of common air. Nitrogen is found in almost all vegetables, particularly in the wood, in extract, and in their green parts, derived, no doubt, from the extractive principle of vegetable mould.

412. *Hydrogene gas.* A plant of the *Epilobium hirsutum* which was confined by Priestley in a receiver filled with inflammable air or hydrogen, consumed one-third of its atmosphere and was still green. Hence Priestley inferred that it serves as a vegetable food, and constitutes even the true and proper pabulum of the plant. But the experiments of later phytologists do not at all countenance this opinion. Our conclusion from various experiments is, that hydrogen is unfavorable to vegetation, and does not serve as the food of plants. But hydrogen is contained in plants as is evident from their analysis; and if they refuse it when presented to them in a gaseous state, in what state do they then acquire it? To this question it is sufficient for the present to reply, that if plants do not acquire their hydrogen in the state of gas, they may at least acquire it in the state of water, which is indisputably a vegetable food, and of which hydrogen constitutes one of the component parts.

When plants were confined by Saussure in atmospheres of *carbonic acid,* they required nearly the same condition to support vegetation, and exhibited nearly the same phenomena as in nitrogen. Such as were deprived of their green parts died in the course of a few days. It cannot, therefore, be regarded as favorable to vegetation.

413. *Vegetable Extract.* When it was found that atmospheric air and water are not, even conjointly, capable of furnishing the whole of the aliment necessary to the developement of the plant, it was then alleged that, with the exception of water, all substances constituting a vegetable food must at least be administered to the plant in a gaseous state. But this also is a conjecture unsupported by proof; for even with regard to such plants as grow upon the barren rock, or in pure sand, it cannot be said that they receive no nourishment whatever besides water, except in a gaseous state. Many of the particles of decayed animal and vegetable substances which float in the atmosphere and attach themselves to the leaves, must be supposed to enter the plant in solution with the moisture which the leaves imbibe; and so also similar substances contained in the soil must be supposed to enter it by the root: but these substances may certainly contain vegetable nourishment; and they will perhaps be found to be taken up by the plant in proportion to their degree of solubility in water, and to the quantity in which they exist in the soil. Now one of the most important of these substances is vegetable extract. When plants have attained to the maturity of their species, the principles of decay begin gradually to operate upon them, till they at length die and are converted into dust or vegetable mould, which, as might be expected, constitutes a considerable proportion of

the soil. The chance then is, that it is again converted into vegetable nourishment, and again enters the plant. But it cannot wholly enter the plant, because it is not wholly soluble in water. Part of it, however, is soluble, and consequently capable of being absorbed by the root, and that is the substance which has been denominated extract. Saussure filled a large vessel with pure mould of turf, and moistened it with distilled or rain water, till it was saturated. At the end of five days, when it was subjected to the action of the press, 10,000 parts in weight of the expressed and filtered fluid yielded by evaporation to dryness 26 parts of extract. In a similar experiment upon the mould of a kitchen-garden which had been manured with dung, 10,000 parts of fluid yielded 10 of extract. And in a similar experiment upon mould taken from a well cultivated corn-field, 10,000 parts of fluid yielded four parts of extract. Such was the result in these particular cases. But the quantity of extract that may be separated from pure mould formed by nature upon the surface of the globe is not in general very considerable. After twelve decoctions, all that could be separated from mould of this sort was about one-eleventh of its weight; and yet this seems to be more than sufficient for the purposes of vegetation: for a mould containing this quantity was found by experiment to be less fertile, at least for peas and beans, than a mould that contained only one half or two-thirds the quantity. But if the quantity of extract must not be too much, neither must it be too little. Plants that were put to vegetate in mould deprived of its extract, as far as repeated decoctions could deprive it, were found to be much less vigorous and luxuriant than plants vegetating in mould not deprived of its extract: and yet the only perceptible difference between them is, that the former can imbibe and retain a much greater quantity of water than the latter. From this last experiment, as well as from the great proportion in which it exists in the living plant, it evidently follows that extract constitutes a vegetable food. But extract contains nitrogen; for it yields by distillation a fluid impregnated with ammonia. The difficulty, therefore, of accounting for the introduction of nitrogen into the vegetating plant, as well as for its existence in the mature vegetable substance, is done away; for, although the plant refuses it when presented in a gaseous state, it is plain that it must admit it along with the extract. It seems also probable that a small quantity of carbonic acid gas enters the plant along with the extractive principle, as it is known to contain this gas also.

414. Most plants are found by analysis to contain a certain proportion of *salts*, such as nitrate, muriate, and sulphate of potass or soda, as has been already shown. These salts are known to exist in the soil, and the root is supposed to absorb them in solution with the water by which the plant is nourished. It is at least certain that plants may be made to take up by the roots a considerable proportion of salts in a state of artificial solution. But if salts are thus taken up by the root of the vegetating plant, does it appear that they are taken up as a food? Some plants, it must be confessed, are injured by the application of salts, as is evident from the experiments of Saussure; but others are as evidently benefited by it. Trefoil and lucern have their growth much accelerated by the application of sulphate of lime, though many other plants are not at all influenced by its action. The *Parietaria* nettle and borage will not thrive, except in such soils as contain nitrate of lime or nitrate of potass; and plants inhabiting the sea-coast, as was observed by Du Hamel, will not thrive in a soil that does not contain muriate of soda. It has been thought, however, that the salts are not actually taken up by the root, though converted to purposes of utility by acting as astringents or corrosives in stopping up the orifices of the vessels of the plant, and preventing the admission of too much water: but it is to be recollected that the salts in question are found by analysis in the very substance of the plant, and must consequently have entered in solution. It has been also thought that salts are favorable to vegetation only in proportion as they hasten the putrefaction of vegetable substances contained in the soil, or attract the humidity of the atmosphere. But sulphate of lime is not deliquescent; and if its action consist merely in accelerating putrefaction, why is its beneficial effect confined but to a small number of plants? Grisenthwaite (*New Theory of Agriculture*, 1819, p. 111.) answers this question by stating, that as in the principal grain crops which interest the agriculturist, there exists a particular saline substance, peculiar to each, so, if we turn our attention to the clovers, and turnips, we shall still find the same discrimination. Saintfoin, clover, and lucerne, have long been known to contain a notable quantity of gypsum (sulphate of lime); but such knowledge, very strange to relate, never led to the adoption of gypsum as a manure for those crops, any more than that of phosphate of lime for wheat, or nitrate of soda, or potassa for barley. It is true that gypsum has been long, and in various places, recommended as a manure, but its uses not being understood, it was recommended without any reference to crop, or indeed to the accomplishment of any fixed object.

It is very well known that some particular ingredient may be essential to the composition of a body, and yet constitute but a very small proportion of its mass. Atmospheric air contains only about one part in the 100th of carbonic acid; and yet no one will venture to affirm that carbonic acid gas is merely an adventitious and accidental element existing by chance in the air of the atmosphere, and not an essential ingredient in its composition. Phosphate of lime constitutes but a very small proportion of animal bodies, perhaps not one part in 500; and yet no one doubts that it is essential to the composition of the bones. But the same salt is found in the ashes of all vegetables; and who will say that it is not essential to their perfection?

415. *Earths.* As most plants have been found by analysis to contain a portion of alkaline or earthy salts, so most plants have been found to contain also a portion of earths: and as the two substances are so nearly related, and so foreign in their character to vegetable substances in general, the same inquiry has consequently been made with regard to their origin. Whence are the earths derived that have been found to exist in plants? Chiefly from the soil. But in what peculiar state of combination do they enter the vessels of the plant? The state most likely to facilitate their absorption is that of their solution in water, in which all the earths hitherto found in plants are known to be in a slight degree soluble. If it be said that the proportion in which they are soluble is so very small that it scarcely deserves to be taken into the account, it is to be recollected that the quantity of water absorbed by the plant is great, while that of the earth necessary to its health is but little, so that it may easily be acquired in the progress of vegetation. Such is the manner in which their absorption seems practicable: and Woodward's experiments afford a presumption that they are actually absorbed by the root. The proportion of earths contained in the ashes of vegetables depends upon the nature of the soil in which they grow. The ashes of the leaves of the *Rhododendron ferrugineum*, growing on Mount Jura, a calcareous mountain, yielded 43·25 parts of earthy carbonate, and only 0·75 of silica. But the ashes of leaves of the same plant, growing on Mount Breven, a granitic mountain, yielded two parts of silica, and only 16·75 of earthy carbonate. It is probable, however, that plants are not indebted merely to the soil for the earthy particles which they may contain. They may acquire them partly from the atmosphere. Margray has shown that rain-water contains silica in the proportion of a grain to a pound; which, if it should not reach the root, may possibly be absorbed along with the water that adheres to the leaves. But although the earths are thus to be regarded as constituting a small proportion of vegetable food, they are not of themselves sufficient to support the plant, even with the assistance of water. Giobert mixed together lime, alumine, silica, and magnesia, in such proportions as are generally to be met with in fertile soils, and moistened them with water. Several different grains were then sown in this artificial soil, which germinated indeed, but did not thrive; and perished when the nourishment of the cotyledons was exhausted. It is plain, therefore, that the earths, though beneficial to the growth of some vegetables, and perhaps necessary to the health of others, are by no means capable of affording any considerable degree of nourishment to the plant.

416. *Manures.* Having exhibited a brief view of the different species of vegetable food, whether it be regarded as derived from the soil or the atmosphere; we proceed to show how the food necessary to the support of the vegetating plant may be supplied when defective, or restored when exhausted. With regard to the food of plants derived from the atmosphere, the supply is pretty regular, at least, in as far as the gases are concerned; for they are not found to vary materially in their proportions on any part of the surface of the globe: but the quantity of moisture contained in the atmosphere is continually varying, so that in the same season you have not always the same quantity, though in the course of the year the deficiency is perhaps made up. From the atmosphere, therefore, there is a regular supply of vegetable food kept up by nature for the support of vegetable life, independent of the aid of man: and if human aid were even wanted, it does not appear that it could be of much avail. But this is by no means the case with regard to soils; for if soils are less regular in their composition, they are at least more within the reach of human management. We have already seen the materials of which soils are composed: but what are the proportions of the materials in soils best suited for culture? According to the analysis of Bergman, the soil best suited for culture contains four parts of clay, three of sand, two of calcareous earth, and one of magnesia: and, according to the analysis of Fourcroy and Hassenfratz, 9216 parts of fertile soil contained 305 parts of carbon, together with 279 parts of oil; of which, according to the calculations of Lavoisier, 220 parts may be regarded as carbon: so that the whole of the carbon contained in the soil in question may be estimated at about 525 parts, exclusive of the roots of vegetables, or to about one-sixteenth of its weight. Young observed that equal weights of different soils, when dried and reduced to powder, yielded by distillation quantities of air somewhat corresponding to the ratio of their values. The air was a mixture of fixed and inflammable

airs, proceeding probably from decomposition of the water; but, partly, it may be presumed, from its capacity of abstracting a portion of air from the atmosphere, which the soil at least is capable of doing. — The following is the analysis of a fertile soil, as occurring in the neighbourhood of Bristol. In 400 grains there were of water, 52; silicious sand, 240; vegetable fibre, 5; vegetable extract, 3; alumine, 48; magnesia, 2; oxide of iron, 14; calcareous earth, 30; loss, 6.

But Kirwan has shown in his *Geological Essays*, that the fertility of a soil depends in a great measure upon its capacity for retaining water: and if so, soils containing the same ingredients must be also equally fertile, all other circumstances being the same; though it is plain that their actual fertility will depend ultimately upon the quantity of rain that falls, because the quantity suited to a wet soil cannot be the same that is suited to a dry soil. And hence it often happens that the ingredients of the soil do not correspond to the character of the climate. Silica exists in the soil under the modification of sand, and alumine under the modification of clay. But the one or the other is often to be met with in excess or defect. Soils in which the sand preponderates retain the least moisture; and soils in which the clay preponderates retain the most: the former are dry soils, the latter are wet soils. But it may happen that neither of them is sufficiently favourable to culture; in which case, their peculiar defect or excess must be supplied or retrenched before they can be brought to a state of fertility. But soils in a state of culture, though consisting originally of the due proportion of ingredients, may yet become exhausted of the principle of fertility by means of too frequent cropping, whether by repetition or rotation of the same, or of different crops. And in this case, it should be the object of the phytologist, as well as of the practical cultivator, to ascertain by what means fertility is to be restored to an exhausted soil; or communicated to a new one. In the breaking up of new soils, if the ground has been wet or marshy, as is frequently the case, it is often sufficient to prepare it merely by means of draining off the superfluous and stagnant water, and of paring and burning the turf upon the surface. If the soil has been exhausted by too frequent a repetition of the same crop, it often happens that a change of crop will answer the purpose of the cultivator; for although a soil may be exhausted for one sort of grain, it does not necessarily follow that it is also exhausted for another. And accordingly, the practice of the farmer is to sow his crops in rotation, having in the same field a crop, perhaps, of wheat, barley, beans, and tares in succession; each species selecting in its turn some peculiar nutriment, or requiring, perhaps, a smaller supply than the crop that has preceded it. But even upon the plan of rotation, the soil becomes at length exhausted, and the cultivator obliged to have recourse to other means of restoring its fertility. In this case, an interval of repose is considerably efficacious, as may be seen from the increased fertility of fields that have not been ploughed up for many years, such as those used for pasture; or even from that of the walks and paths in gardens when they are again broken up. Hence also the practice of fallowing, and of trenching or deep ploughing, which in some cases has nearly the same effect.

If any one asks how the fertility of a soil is restored by the means now stated, it will be sufficient to reply that, in the case of draining, the amelioration is effected by means of its carrying off all such superfluous moisture as may be lodged in the soil, which is well known to be prejudicial to plants not naturally aquatics, as well as by rendering the soil more firm and compact. In the case of burning, the amelioration is effected by means of the decomposition of the vegetable substances contained in the turf, and subjected to the action of the fire, which disperses part also of the superfluous moisture, but leaves a residue of ashes favorable to future vegetation. In the case of the rotation of crops, the fertility is not so much restored as more completely developed and brought into action; because the soil, though exhausted for one species of grain, is yet found to be sufficiently fertile for another, the food necessary to each being different, or required in less abundance. In the case of the repose of the soil, the restored fertility may be owing to the decay of vegetable substances that are not now carried off in the annual crop, but left to augment the proportion of vegetable mould; or to the accumulation of fertilising particles conveyed to the soil by rains; or to the continued abstraction of oxygen from the atmosphere. In the case of fallows, it is owing undoubtedly to the action of the atmospheric air upon the soil, whether in rendering it more friable, or in hastening the putrefaction of noxious plants; or it is owing to the abstraction and accumulation of oxygen. In the case of trenching, or deep ploughing, it is owing to the increased facility with which the roots can now penetrate to the proper depth, and thus their sphere of nourishment is increased. But it often happens that the soil can no longer be ameliorated by any of the foregoing means, or not at least with sufficient rapidity for the purposes of the cultivator; and in this case there must be a direct and actual application made to it of such substances as are fitted to restore its fertility. Hence the indispensable necessity of manures, which consist chiefly of animal and vegetable remains that are buried and finally decomposed in the soil, from which they are afterwards absorbed by the root of the plant, in a state of solution.

But as carbon is the principal ingredient furnished by manures as contributing to the nourishment of the plant, and is not itself soluble in water, nor even disengaged by fermentation in a state of purity; under what state of chemical combination is its solution effected? Is it effected in the state of charcoal? It has been thought, indeed, that carbon in the state of charcoal is soluble in water; because water from a dunghill, when evaporated, constantly leaves a residuum of charcoal, as was first ascertained by the experiments of Hassenfratz. But there seem to be reasons for doubting the legitimacy of the conclusion that has been drawn from it; for Senebier found that plants whose roots were immersed in water took up less of the fluid in proportion as it was mixed with water from a dunghill. Perhaps then the charcoal of water from a dunghill is held merely in suspension, and enters the plant under some other modification. But if carbon is not soluble in water in the state of charcoal, in what other state is it soluble? It is soluble in the state of carbonic acid gas. But is this the state in which it actually enters the root? On this subject phytologists have been somewhat divided in opinion. Senebier endeavours to prove that carbonic acid gas, dissolved in water, supplies the roots of plants with almost all their carbon, and founds his arguments upon the following facts: — in the first place, it is known that carbonic acid gas is soluble in water; in the second place, it is known to be contained in the soil, and generated by the fermentation of the materials composing manures; and, in the next place, it is known to be beneficial to vegetation when applied artificially to the roots, at least in a certain degree. This is evident from the following experiment of Ruckert, as well as from several experiments of Saussure's, previously related. Ruckert planted two beans in pots of equal dimensions, filled with garden mould; the one was moistened with distilled water, and the other with water impregnated with carbonic acid gas. But the latter appeared above ground nine days sooner than the former, and produced twenty-five beans; while the former produced only fifteen. Now the result of this experiment, as well as the preceding facts, is evidently favorable to the presumption of Senebier, and shows that if carbonic acid is not the state in which carbon enters the plant, it is at least a state preparatory to it; and there are other circumstances tending to corroborate the opinion, resulting from the analysis of the ascending sap of plants. The tears of the vine, when analysed by Senebier, yielded a portion of carbonic acid and earth; and as the ascending sap could not be supposed to have yet undergone much alteration, the carbonic acid, like the earth, was probably taken up from the soil. But this opinion, which seems to be so firmly established upon the basis of experiment, Hassenfratz strenuously controverts. According to experiments which he had instituted with an express view to the investigation of this subject, plants which were raised in water impregnated with carbonic acid differed in no respect from such as grew in pure water, and contained no carbon that did not previously exist in the seed. Now if this were the fact, it would be decisive of the point in question. But it is plain from the experiments of Saussure, as related in the preceding section, that Hassenfratz must have been mistaken both with regard to the utility of carbonic acid gas as furnishing a vegetable aliment, and with regard to the augmentation of carbon in the plant. The opinion of Senebier, therefore, may still be correct. — It must be acknowledged, however, that the subject is not yet altogether satisfactorily cleared up; and that carbon may certainly enter the plant in some state different from that, either of charcoal in solution, or of carbonic acid gas. Is not the carbonic acid of the soil decomposed before entering the plant? This is a conjecture of Dr. Thomson's, founded upon the following facts: — the green oxide of iron is capable of decomposing carbonic acid; and many soils contain that oxide. Most soils, indeed, contain iron, either in the state of the brown or green oxide, and it has been found that oils convert the brown oxide into green. But dung and rich soils contain a quantity of oily substance. One effect of manures, therefore, may be that of reducing the brown oxide of iron to the green, thus rendering it capable of decomposing carbonic acid gas, so as to prepare it for some new combination, in which it may serve as an aliment for plants. All this, however, is but a conjecture; and it is more probable that the carbonic acid of the soil enters the root in combination with some other substance, and is afterwards decomposed within the plant itself.

Sect. III. *Process of Nutrition.*

417. It is necessary to know not only in what the food of plants consists, but also by what means that food, whether lodged in the soil or wafted through the atmosphere, is taken up by the plant, conveyed to its different parts, and elaborated so as to prepare it for final assimilation.

Intro-susception. As plants have no organ analogous to the mouth of animals, they are enabled to take up the nourishment necessary to their support only by absorption or inhalation, as the chyle into the animal lacteals, or the air into the lungs. The former term will be applied to the intro-susception of non-elastic fluids; the latter, to that of gaseous fluids. The absorption of non-elastic fluids by the epidermis of plants does not admit of a doubt. It is proved, indisputably, that the leaves not only contain air, but do actually inhale it. It was the opinion of Priestley that they inhale it chiefly by the upper surface. And it has been shown by Saussure, that their inhaling power depends entirely upon the organization. It has been a question, however, among phytologists, whether it is not also effected by the epidermis of the other parts of the plant. We can scarcely suppose it to be effected by the dry and indurated epidermis of the bark of aged trunks, of which the original organization is obliterated; nor by that of the larger and more aged branches. But it has been thought there are even some of the soft and succulent parts of the plant by which it cannot be effected, because no pores are visible in their epidermis. M. Decandolle found no pores in the epidermis of fleshy fruits, such as pears, peaches, and gooseberries; nor in that of roots, or scales of bulbs; nor in any part not exposed to the influence of air and light. It is known, however, that fruits will not ripen, and that roots will not thrive, if wholly deprived of air; and hence it is probable that they inhale it by their epidermis, though the pores by which it enters should not be visible, In the root, indeed, it may possibly enter in combination with the moisture of the soil; but in the other parts of the plant it enters no doubt in the state of gas. Herbs, therefore, and the soft parts of woody plants, absorb moisture and inhale gases from the soil or atmosphere by means of the pores of their epidermis, and thus the plant effects the intro-susception of its food.

418. *Ascent of the Sap.* The means by which the plant effects the intro-susception of its food, is chiefly that of absorption by the root. But the fluids existing in the soil when absorbed by the root, are designated by the appellation of sap or lymph; which, before it can be rendered subservient to the purposes of vegetable nutrition, must either be intermediately conveyed to some viscus proper to give it elaboration, or immediately distributed throughout the whole body of the plant. Our present object, therefore, is that of tracing out the progress of its distribution or ascent. The sap is in motion in one direction or other, at least at occasional periods, as the bleeding of plants in spring and autumn sufficiently illustrates. The plant always bleeds most freely about the time of the opening of the bud; for in proportion as the leaves expand the sap flows less copiously, and when they are fully expanded it entirely ceases. But this suspension is only temporary, for the plant may be made to bleed again in the end of the autumn, at least under certain conditions. If an incision is now made into the body of the tree, after the occurrence of a short but sharp frost, when the heat of the sun or mildness of the air begins to produce a thaw, the sap will again flow. It will flow even where the tree has been but partially thawed, which sometimes happens on the south side of a tree, when the heat of the sun is strong and the wind northerly. At the seasons now specified, therefore, the sap is evidently in motion; but the plant will not bleed at any other season of the year. It has been the opinion of some phytologists, that the motion of the sap is wholly suspended during the winter. But though the great cold of winter, as well as the great heat of summer, is by no means so favorable to vegetation as the milder though more changeable temperature of spring and autumn, yet it does not wholly suspend the movement of the sap. Palms may be made to bleed at any season of the year. And although this is not the case with plants in general, yet there is proof sufficient that the colds of winter do not, even in this climate, entirely prevent the sap from flowing. Buds exhibit a gradual developement of parts throughout the whole of the winter, as may be seen by dissecting them at different periods. So also do roots. Evergreens retain their leaves; and many of them, such as the *Arbutus*, *Laurustinus*, and the beautiful tribe of the mosses, protrude also their blossoms, even in spite of the rigor of the season. But all this could not possibly be accomplished, if the motion of the sap were wholly suspended. — The sap then is in perpetual motion with a more accelerated or more diminished velocity throughout the whole of the year; but still there is no decided indication, exhibited in the mere circumstance of the plant's bleeding, of the direction in which the sap is moving at the time; for the result might be the same whether it was passing from the root to the branches, or from the branches to the root. But as the great influx of the sap is effected by means of the pores of the epidermis of the root, it follows that its motion must, at least in the first place, be that of ascent; and such is its direction at the season of the plant's bleeding, as may be proved by the following experiment: — if the bore or incision that has been made in the trunk is minutely inspected while the plant yet bleeds, the sap will be found to issue almost wholly from the inferior side. If several bores are made in the same trunk one

above another, the sap will begin to flow first from the lower bore, and then from those above it. If a branch of a vine be lopped, the sap will issue copiously from the section terminating the part that remains yet attached to the plant; but not from the section terminating the part that has been lopped off. This proves indubitably that the direction of the sap's motion, during the season of the plant's bleeding, is that of ascent. But if the sap flows so copiously during the season of bleeding, it follows that it must ascend with a very considerable force; which force has accordingly been made the subject of calculation. To the stem of a vine cut off about two feet and a half from the ground, Hales fixed a mercurial gauge which he luted with mastic; the gauge was in the form of a syphon, so contrived that the mercury might be made to rise in proportion to the pressure of the ascending sap. The mercury rose accordingly, and reached, as its maximum, to a height of thirty-eight inches. But this was equivalent to a column of water of the height of forty-three feet three and one-third inches; demonstrating a force in the motion of the sap that, without the evidence of experiment, would have seemed altogether incredible. The sap then in ascending from the lower to the upper extremity of the plant is propelled with a very considerable force, at least in the bleeding season. But is the ascending sap propelled indiscriminately throughout the whole of the tubular apparatus, or is it confined, in its course, to any particular channel? Before the anatomy of plants had been studied with much accuracy, there was a considerable diversity of opinion on the subject. Some thought it ascended by the bark; others thought it ascended by the bark, wood, and pith indiscriminately; and others thought it ascended between the bark and wood. The first opinion was maintained and supported by Malpighi, and Grew considers that the sap ascends by the bark, wood, and pith indiscriminately. Du Hamel stript several trees of their bark entirely, which continued, notwithstanding, to live for many years, protruding new leaves and new branches as before. Knight stript the trunk of a number of young crab-trees of a ring of bark half an inch in breadth, but the leaves were protruded, and the branches elongated, as if the operation had not been performed. It is evident, therefore, that the sap does not ascend by the bark. But it is equally evident that it does not ascend by the pith, at least after the first year; for then, even upon Grew's own supposition, it becomes either juiceless or wholly extinct: and even during the first year it is not absolutely necessary, if at all subservient to the ascent of the sap, as is proved by an experiment of Knight's. Having contrived to abstract from some annual shoots a portion of their pith, so as to interrupt its continuity, but not otherwise materially to injure the fabric of the shoot, Knight found that the growth of the shoots which had been made the subject of experiment was not at all affected by it. — The sap then ascends neither by the bark nor pith, but by the wood only. But the whole mass of the wood throughout is not equally well adapted for the purpose of conveying it. The interior and central part, or part that has acquired its last degree of solidity, does not in general afford it a passage. This is proved by what is called the girdling of trees, which consists in making a circular gap or incision quite round the stem, and to the depth of two or three inches, so as to cut through both the bark and alburnum. An oak-tree on which Knight had performed this operation, with a view to ascertaining the channel of the sap's ascent, exhibited not the slightest mark of vegetation in the spring following. The sap then does not ascend through the channel of the matured wood. But if the sap ascends neither through the channel of the bark, nor pith, nor matured wood, through what other channel does it actually ascend? The only remaining channel through which it can possibly ascend is that of the alburnum. In passing through the channel of the alburnum, does the sap ascend promiscuously by the whole of the tubes composing it, or is it confined in its passage to any peculiar set? The earliest conjectures recorded on this subject are those of Grew and Malpighi, who, though they maintained that the sap ascends chiefly by the bark, did not yet deny that it ascends also partly by the alburnum or wood. It occurred to succeeding phytologists that the progress of the sap, and the vessels through which it passes, might be traced or ascertained by means of making plants vegetate in colored infusions. Du Hamel steeped the extremities of branches of the fig, elder, honeysuckle, and filbert in common ink. In examining the two former, after being steeped for several days, the part immersed was found to be black throughout, but the upper part was tinged only in the wood, which was coloured for the length of a foot, but more faintly and partially in proportion to the height. The pith indeed exhibited some traces of ink, but the bark and buds none. In some other examples the external layers of the wood only were tinged. In the honeysuckle the deepest shade was about the middle of the woody layers; and in the filbert there was also observed a colored circle surrounding the pith, but none in the pith itself, nor in the bark. Thus it is proved that the sap ascends through the vessels of the longitudinal fibre composing the alburnum of woody plants, and through the vessels of the several bundles of longitudinal fibre constituting the woody part of herbaceous plants. But it has been already shown that the vessels composing the woody fibre are not all of the same species. There are simple tubes, porous tubes, spiral tubes, mixed tubes, and interrupted tubes. Through which of these, therefore, does the sap pass in its ascent? The best reply to this inquiry has been furnished by Knight and Mirbel, whose experiments on the subject are considerably more luminous than the preceding. Knight prepared some annual shoots of the apple and horse-chestnut, by means of circular incisions, so as to leave detached rings of bark with insulated leaves remaining on the stem. He then placed them in coloured infusions obtained by macerating the skins of very black grapes in water; and, on examining the transverse section at the end of the experiment, it was found that the infusion had ascended by the wood beyond his incisions, and also into the insulated leaves, but had not coloured the pith nor bark, nor the sap between the bark and wood. From the above experiment Knight concludes that the sap ascends through what are called the common tubes of the wood and alburnum, at least till it reaches the leaves. Thus the sap is conveyed to the summit of the alburnum. But Knight's next object was to trace the vessels by which it is conveyed into the leaf. The apple-tree and horse-chestnut were still his subjects of experiment. In the former the leaves are attached to the plant by three strong fibres, or rather bundles of tubes, one in the middle of the leaf-stalk, and one on each side. In the latter they are attached by means of several such bundles. Now the coloured fluid was found in each case to have passed through the centre of the several bundles, and through the centre only, tinging the tubes throughout almost the whole length of the leaf-stalk. In tracing their direction from the leaf-stalk upwards, they were found to extend to the extremity of the leaves; and in tracing their direction from the leaf-stalk downwards, they were found to penetrate the bark and alburnum, the tubes of which they join, descending obliquely till they reach the pith which they surround. From their position Knight calls them central tubes, thus distinguishing them from the common tubes of the wood and alburnum, and from the spiral tubes with which they were every where accompanied as appendages; as well as from a set of other tubes which surrounded them, but were not coloured, and which he designates by the appellation of external tubes. — The experiment was now transferred to the flower-stalk and fruit-stalk, which was done by placing branches of the apple, pear, and vine, furnished with flowers not yet expanded, in a decoction of logwood. The central vessels were rendered apparent as in the leaf-stalk. When the fruit of the two former was fully formed, the experiment was then made upon the fruit-stalk, in which the central vessels were detected as before; but the colouring matter was found to have penerated into the fruit also, diverging round the core, approaching again in the eye of the fruit, and terminating at last in the stamens. It was by means of a prolongation of the central vessels, which did not however appear to be accompanied by the spiral tubes beyond the fruit-stalk. Such then are the parts of the plant through which the sap ascends, and the vessels by which it is conveyed. Entering by the pores of the epidermis, it is received into the longitudinal vessels of the root by which it is conducted to the collar. Thence it is conveyed by the longitudinal vessels of the alburnum, to the base of the leaf-stalk and peduncle; from which it is further transmitted to the extremity of the leaves, flower, and fruit. There remains a question to be asked intimately connected with the sap's ascent. Do the vessels conducting the sap communicate with one another by inosculation or otherwise, so as that a portion of their contents may be conveyed in a lateral direction, and consequently to any part of the plant; or do they form distinct channels throughout the whole of their extent, having no sort of communication with any other set of tubes, or with one another? — Each of the two opinions implied in the question has had its advocates and defenders. But Du Hamel and Knight have shown that a branch will still continue to live though the tubes leading directly to it are cut in the trunk; from which it follows that the sap, though flowing the most copiously in the direct line of ascent, is at the same time also diffused in a transverse direction.

419. *Causes of the Sap's Ascent.* — By what power is the sap propelled? Grew states two hypotheses: its volatile nature and magnetic tendency, aided by the agency of fermentation. Malpighi was of opinion that the sap ascends by means of the contraction and dilatation of the air contained in the air-vessels. M. De la Hire attempted to account for the phenomenon by combining together the theories of Grew and Malpighi; and Borelli, who endeavoured to render their theory more perfect by bringing to its aid the influence of the condensation and rarification of the air and juices of the plant. Du Hamel directed his efforts to the solution of the difficulty, by endeavouring to account for the phenomena from the agency of heat, and chiefly on the following grounds: Because the sap begins to flow more copiously as the warmth of spring returns; because the sap is sometimes found to flow on the south side of a tree before it flows on the north side, that is, on the side exposed to the influence of

the sun's heat sooner than on the side deprived of it; because plants may be made to vegetate even in the winter, by means of forcing them in a hot-house; and because plants raised in a hot-house produce their fruit earlier than such as vegetate in the open air. There can be no doubt of the great utility of heat in forwarding the progress of vegetation; but it will not therefore follow that the motion and ascent of the sap are to be attributed to its agency. On the contrary, it is very well known that if the temperature exceeds a certain degree, it becomes then prejudicial both to the ascent of the sap and also to the growth of the plant. Hales found that the sap flows less rapidly at mid-day than in the morning; and every body knows that vegetation is less luxuriant at midsummer than in the spring. So also in the case of forcing it happens but too often that the produce of the hothouse is totally destroyed by the unskilful application of heat; and if heat is actually the cause of the sap's ascent, how comes it that the degree necessary to produce the effect is so very variable even in the same climate. For there are many plants, such as the *Arbutus*, *Laurustinus*, and the Mosses, that will continue not only to vegetate, but to protrude their blossoms and mature their fruit, even in the midst of winter, when the temperature is at the lowest. And in the case of submarine plants the temperature can never be very high; so that although heat does no doubt facilitate the ascent of the sap by its tendency to make the vessels expand, yet it cannot be regarded as the efficient cause, since the sap is proved to be in motion even throughout the whole of the winter. Du Hamel endeavours, however, to strengthen the operation of heat by means of the influence of humidity, as being also powerful in promoting the ascent of the sap, whether as relative to the season of the year or time of the day. The influence of the humidity of the atmosphere cannot be conceived to operate as a propelling cause, though it may easily be conceived to operate as affording a facility to the ascent of the sap in one way or other; which under certain circumstances is capable of most extraordinary acceleration, but particularly in that state of the atmosphere which forebodes or precedes a storm. In such a state a stalk of wheat was observed by Du Hamel to grow three inches in three days; a stalk of barley six inches, and a shoot of a vine almost two feet; but this is a state that occurs but seldom, and cannot be of much service in the general propulsion of the sap. On this intricate but important subject Linnæus appears to have embraced the opinion of Du Hamel, or an opinion very nearly allied to it; but does not seem to have strengthened it by any new accession of argument; so that none of the hitherto alleged causes can be regarded as adequate to the production of the effect. Perhaps the only cause that has ever been suggested as appearing to be at all adequate to the production of the effect, is that alleged by M. Saussure. According to Saussure the cause of the sap's ascent is to be found in a peculiar species of irritability inherent in the sap vessels themselves, and dependant upon vegetable life; in consequence of which they are rendered capable of a certain degree of contraction, according as the internal surface is affected by the application of stimuli, as well as of subsequent dilatation according as the action of the stimulus subsides; thus admitting and propelling the sap by alternate dilatation and contraction. In order to give elucidation to the subject, let the tube be supposed to consist of an indefinite number of hollow cylinders united one to another, and let the sap be supposed to enter the first cylinder by suction, or by capillary attraction, or by any other adequate means; then the first cylinder being excited by the stimulus of the sap, begins gradually to contract, and to propel the contained fluid into the cylinder immediately above it. But the cylinder immediately above it, when acted on in the same manner, is affected in the same manner; and thus the fluid is propelled from cylinder to cylinder till it reaches the summit of the plant. So also when the first cylinder has discharged its contents into the second, and is no longer acted upon by the stimulus of the sap, it begins again to be dilated to its original capacity, and prepared for the introsusception of a new portion of fluid. Thus a supply is constantly kept up, and the sap continues to flow. The above is by far the simplest as well as most satisfactory of all theories accounting for the ascent of the sap. But Knight has presented us with another which, whatever may be its real value, merits at least our particular notice, as coming from an author who stands deservedly high in the list of phytological writers. This theory rests upon the principle of the contraction and dilatation, not of the sap-vessels themselves, as in the theory of Saussure, but of what Knight denominates the *silver grain*, assisted perhaps by heat and humidity expanding or condensing the fluids. (*Phil. Trans.* 1801.) P. Keith considers this theory of Knight as beset with so many difficulties, and the agency of the alleged cause as so totally inadequate to the production of the effect to be accomplished, that of all theories on the subject it is perhaps the least satisfactory.

420. *Elaboration of the Sap.* The moisture of the soil is no sooner absorbed into the plant than it begins to undergo a change. This is proved by the experiment of making a bore or incision in the trunk of a tree during the season of bleeding; the sap that issues

from the wound possesses properties very different from the mere moisture of the soil, as is indicated by means of chemical analysis, and sometimes also by means of a peculiar taste or flavor, as in the case of the birch-tree. Hence the sap has already undergone a certain degree of elaboration; either in passing through the glands of the cellular tissue, which it reaches through the medium of a lateral communication, or in mingling with the juices contained in the cells, and thus carrying off a portion of them; in the same manner, we may suppose, that water by filtering through a mineral vein becomes impregnated with the mineral through which it passes. But this primary and incipient stage of the process of elaboration must always of necessity remain a mystery to the phytologist, as being wholly effected in the interior of the plant, and consequently beyond the reach of observation. All he can do, therefore, is to trace out its future progress, and to watch its succeeding changes, in which the *rationalé* of the process of elaboration may be more evident. The next, and indeed the principal part of the process of the elaboration of the sap is operated in the leaf: for the sap no sooner reaches the leaf than part of it is immediately carried off by means of perspiration, perceptible or imperceptible; effecting a change in the proportion of its component parts, and by consequence a change in its properties. — Hales reared a sun-flower in a pot of earth till it grew to the height of three feet and a half; he then covered the mouth of the pot with a plate of lead, which he cemented so as to prevent all evaporation from the earth contained in it. In this plate he fixed two tubes, the one nine inches in length and of but small diameter, left open to serve as a medium of communication with the external air; the other two inches in length and one in diameter, for the purpose of introducing a supply of water, but kept always shut except at the time of watering. The holes of the bottom of the pot were also shut, and the pot and plant weighed for fifteen successive days in the months of July and August; hence he ascertained not only the fact of transpiration by the leaves, from a comparison of the supply and waste; but also the quantity of moisture transpired in a given time, by subtracting from the total waste the amount of evaporation from the pot. The final result proved that the absorbing power of the root is greater than the transpiring power of the leaves, in the proportion of five to two. Similar experiments were also made upon some species of cabbage, whose mean transpiration was found to be 1 lb. 3 oz. per day; and on some species of evergreens, which were found, however, to transpire less than other plants. The same is the case also with succulent plants, which transpire but little in proportion to their mass, and which as they become more firm transpire less. It is known, however, that they absorb a great deal of moisture, though they give it out thus sparingly; which seems intended by nature for the purpose of resisting the great droughts to which they are generally exposed, inhabiting, as they do for the most part, the sandy desert or the sunny rock. Along with his own experiments Hales relates also some others that were made by Miller of Chelsea; the result of which was that, other circumstances being the same, transpiration is in proportion to the transpiring surfaces; and is affected by the temperature of the air, sunshine, or drought, promoting it, and cold and wet diminishing or suppressing it entirely. It is also greatest from six o'clock in the morning till noon, and is least during the night. But when transpiration becomes too abundant, owing to excess of heat or drought, the plant immediately suffers and begins to languish; and hence the leaves droop during the day, though they are again revived during the night. For the same or for a similar reason, transpiration has been found also to increase as the heat of summer advances; being more abundant in July than in June, and still more in August than in either of the preceding months, from which last period it begins again to decrease. Hales and Guettard could discover nothing in the fluid exhaled different from common water, except that in some cases it had the odour of the plant; but Du Hamel found that it became sooner putrid than water. Such then are the facts that have been ascertained with regard to the imperceptible perspiration of plants, from which it unavoidably follows that the sap undergoes a very considerable modification in its passage through the leaf. But it often undergoes also a further modification in consequence of what may be called perceptible perspiration, which is an exudation of sap too gross or too abundant to be dissipated immediately, and which hence accumulates on the surface of the leaf. It is very generally to be met with in the course of the summer on the leaves of the maple, poplar, and lime-tree; but particularly on the surface exposed to the sun, which it sometimes wholly covers. Its physical as well as chemical qualities are very different in different species of plants; so that it is not always merely an exudation of sap, but of sap in a high state of elaboration, or mingled with the peculiar juices or secretions of the plant. Sometimes it is a clear and watery fluid conglomerating into large drops, such as are said to have been observed by Miller, exuding from the leaves of the *Musa arbor*, or plantain-tree; and such as are sometimes to be seen in hot and calm weather exuding from the leaves of the poplar or willow, and trickling down in such abundance as to resemble a slight shower. This phenomenon was observed by Sir J. E. Smith, under a grove of willows in Italy, and is said to occur sometimes even in England. Sometimes it is glutinous, as on the leaf of the lime-tree; sometimes it is waxy, as on the leaves of rosemary; sometimes it is saccharine, as on the orange-leaf; or resinous, as on the leaves of the *Cistus creticus*. The cause of this excess of perspiration has not yet been altogether satisfactorily ascertained; though it seems to be merely an effort and institution of nature to throw off all such redundant juices as may have been absorbed, or secretions as may have been formed, beyond what are necessary to the due nourishment or composition of the plant, or beyond what the plant is capable of assimilating at the time. Hence the watery exudation is perhaps nothing more than a redundancy of the fluid thrown off by imperceptible perspiration, and the waxy and resinous exudations nothing more than a redundancy of secreted juices; all which may be still perfectly consistent with a healthy state of the plant. But there are cases in which the exudation is to be regarded as an indication of disease, particularly in that of the exudation known by the name of honey-dew, a sweet and viscid substance covering the leaves like a varnish, and sometimes occasioning their decay. Such at least seems to be the fact with regard to the honey-dew of the hop, which, according to the observations of Linnæus, is the consequence of the attacks of the caterpillar of the ghost moth injuring the root. And such seems also to be the fact with regard to the honey-dew of the beech-tree, and perhaps also the honey-dew of the oak. The sap then in the progress of its ascent from the extremity of the root to the extremity of the leaf undergoes a considerable change, first in its mixing with the juices already contained in the plant, and then in its throwing off a portion at the leaf. Perhaps it is also further affected by means of the gases entering into the root along with the moisture of the soil, but certainly, by means of the gases inhaled into the leaf; the action and elaboration of which shall now be elucidated.

421. *Elaboration of carbonic Acid.* — The utility of carbonic acid gas as a vegetable food has been already shown; plants being found not only to absorb it by the root along with the moisture of the soil, but also to inhale it by the leaves, at least when vegetating in the sun or during the day. But how is the elaboration of this gas effected? Is it assimilated to the vegetable substance immediately upon entering the plant, or is its assimilation effected by means of intermediate steps? The gas thus inhaled or absorbed is not assimilated immediately, or at least not wholly: for it is known that plants do also evolve carbonic acid gas when vegetating in the shade, or during the night. Priestley ascertained that plants vegetating in confined atmospheres evolve carbonic acid gas in the shade, or during the night; and that the vitiated state of their atmospheres after experiment is owing to that evolution, and Saussure that the elaboration of carbonic acid gas is essential to vegetation in the sun; and finally Senebier and Saussure proved that the carbonic acid gas contained in water is abstracted and inhaled by the leaf, and immediately decomposed; the carbon being assimilated to the substance of the plant, and the oxygen in part evolved, and in part also assimilated. The decomposition of carbonic acid gas takes place only during the light of day, though Saussure has made it also probable that plants decompose a part of the carbonic acid gas which they form with the surrounding oxygen even in the dark. But the effect is operated chiefly by means of the leaves and other green parts of vegetables, that is, chiefly by the parenchyma; the wood, roots, petals, and leaves that have lost their green color not being found to exhale oxygene gas. It may be observed, however, that the green color is not an absolutely essential character of the parts decomposing carbonic acid; because the leaves of a peculiar variety of the *Atriplex hortensis*, in which all the green parts change to red, do still exhale oxygene gas.

422. *Elaboration of Oxygen.* It has been already shown that the leaves of plants abstract oxygen from confined atmospheres, at least when placed in the shade, though they do not inhale all the oxygen that disappears; and it has been further proved, from experiment, that the leaves of plants do also evolve a gas in the sun. From a great variety of experiments relative to the action and influence of oxygen on the plant, and the contrary, the following is the sum of the results. The green parts of plants, but especially the leaves, when exposed in atmospheric air to the successive influence of the light and shade, inhale and evolve alternately a portion of oxygene gas mixed with carbonic acid. But the oxygen is not immediately assimilated to the vegetable substance; it is first converted into carbonic acid by means of combining with the carbon of the plant, which withers if this process is prevented by the application of lime or potass. The leaves of aquatics, succulent plants, and evergreens consume, in equal circumstances, less oxygen than the leaves of other plants. The roots, wood, and petals, and in short all parts not green, with the exception of some colored leaves, do not effect the successive and alternate inhalation and extrication of oxygen; they inhale it indeed, though they do not again give it out, or assimilate it immediately, but convey it under the form of carbonic acid to the leaves, where it is decomposed. Oxy-

gen is indeed assimilated to the plant, but not directly, and only by means of the decomposition of carbonic acid; when part of it, though in a very small proportion, is retained also and assimilated along with the carbon. Hence the most obvious influence of oxygen, as applied to the leaves, is that of forming carbonic acid gas, and thus presenting to the plant elements which it may assimilate; and perhaps the carbon of the extractive juices absorbed even by the root is not assimilated to the plant till it is converted by means of oxygen into carbonic acid. But as an atmosphere composed of nitrogen and carbonic acid gas only is not favourable to vegetation, it is probable that oxygen performs also some other function beyond that of merely presenting to the plant, under the modification of carbonic acid, elements which it may assimilate. It may effect also the disengagement of caloric by its union with the carbon of the vegetable, which is the necessary result of such union. But oxygen is also beneficial to the plant from its action on the soil; for when the extractive juices contained in the soil have become exhausted, the oxygen of the atmosphere, by penetrating into the earth and abstracting from it a portion of its carbon, forms a new extract to replace the first. Hence we may account for a number of facts observed by the earlier phytologists, but not well explained. Du Hamel remarked that the lateral roots of plants are always the more vigorous the nearer they are to the surface; but it now appears that they are the most vigorous at the surface because they have there the easiest access to the oxygen of the atmosphere, or to the extract which it may form. It was observed also by the same phytologist that perpendicular roots do not thrive so well, other circumstances being the same, in a stiff and wet soil as in a friable and dry soil; while plants with slender and divided roots thrive equally well in both: but this is no doubt owing to the obstacles that present themselves to the passage of the oxygen in the former case, on account of the greater depth and smaller surface of the root. It was further observed, that roots which penetrate into dung or into pipes conducting water divide into immense numbers of fibres, and form what is called the fox-tail root; but it is because they cannot continue to vegetate, except by increasing their points of contact, with the small quantity of oxygen found in such mediums. Lastly, it was observed that plants, whose roots are suddenly overflowed with water remaining afterwards stagnant, suffer sooner than if the accident had happened by means of a continued current. It is because in the former case the oxygen contained in the water is soon exhausted, while in the latter it is not exhausted at all. And hence also we may account for the phenomenon exhibited by plants vegetating in distilled water under a receiver filled with atmospheric air, which having no proper soil to supply the root with nourishment, effect the developement of their parts only at the expense of their own proper substance; the interior of the stem, or a portion of the root, or the lower leaves decaying and giving up their extractive juices to the other parts. — Thus it appears that oxygene gas, or that constituent part of the atmospheric air which has been found to be indispensable to the life of animals is also indispensable to the life of vegetables. But although the presence and action of oxygen is absolutely necessary to the process of vegetation, plants do not thrive so well in an atmosphere of pure oxygen, as in an atmosphere of pure or common air. This was proved by an experiment of Saussure's, who having introduced some plants of *Pisum sativum* that were but just issuing from the seed into a receiver containing pure oxygene gas, found that in the space of six days they had acquired only half the weight of such as were introduced at the same time into a receiver containing common air. From whence it follows that oxygen, though the principal agent in the process of vegetation is not yet the only agent necessary to the health and growth of the plant, and that the proportion of the constituent parts of the atmospheric air is well adapted for the purposes both of vegetable and animal life.

423. *Decomposition of Water.* — Although the opinion was proved to be groundless, by which water had been supposed to be convertible into all the different ingredients entering into the composition of the vegetable substance by means of the action of the vital energy of the plant; yet when water was ultimately proved to be a chemieal compound, it was by no means absurd to suppose that plants may possess the power of decomposing part, at least, of what they absorb by the root, and thus acquire the hydrogen as well as a portion of the oxygen which, by analysis, they are found to contain. This opinion was accordingly pretty generally adopted, but was not yet proved by any direct experiment. Senebier pointed out several phenomena from which he thought it was to be inferred, but particularly that of the germination of some seeds moistened merely with water, and so situated as to have no apparent contact with oxygen. — The decompostion of water was inferred also by Ingenhoutz, from the amelioration of an atmosphere of common air into which he had introduced some succulent plants vegetating in pure water. Saussure having gathered a number of plants of the same species, as nearly alike as possible in all circumstances likely to be affected by the experiment,

dried part of them to the temperature of the atmosphere, and ascertained their weight; the rest he made to vegetate in pure water, and in an atmosphere of pure oxygen for a given period of time, at the end of which he dried them as before, and ascertained their weight also, which it was thus only necessary to compare with the weight of the former, in order to know whether the plants had increased in solid vegetable substance or not. But after many experiments on a variety of plants, the result always was, that plants when made to vegetate in pure water only, and in an atmosphere of pure oxygen, or of common air deprived of its carbonic acid, scarcely added any thing at all to their weight in a dried state; or if they did, the quantity was too small to be appreciated. But from a subsequent experiment, in which carbonic acid gas was mixed with common air by the same experiment, the decomposition and fixation of water by the vegetating plant is legitimately inferred. It does not appear, however, that plants do in any case decompose water directly; that is, by appropriating its hydrogen and at the same time disengaging its oxygen in the form of gas, which is extricated only by the decomposition of carbonic acid.

424. *Descent of the proper Juice.* — When the sap has been duly elaborated in the leaf by means of the several processes that have just been described, it now assumes the appellation of the *Cambium*, or proper juice of the plant. In this ultimate state of elaboration it is found chiefly in the bark, or rather between the bark and wood, and may very often be distinguished by a peculiar color, being sometimes white, as in the several species of spurge, and sometimes yellow, as in celandine. It is said to be the principal seat of the medical virtues of plants; and was regarded by Malpighi as being to the plant what the blood is to the animal body — the immediate principle of nourishment, and grand support of life; which opinions he endeavours to establish by the following analogies: if the blood escapes from the vessels of the animal body, it forms neither flesh nor bone, but tumors; if the proper juices of the plant are extravasated, they form neither bark nor wood, but a lump of gum, resin, or inspissated juice. The disruption of the blood-vessels and consequent loss of blood, injures and often proves fatal to the animal. The extravasation of the proper juice injures and often proves fatal to vegetables, unless the evil is prevented by the skill and management of the gardener. Whatever may be the value of these remarks as tending to establish the analogy in question, it cannot be doubted that the *cambium* or proper juice constitutes at least the grand principle of vegetable organization; generating and developing in succession the several organs of the plant, or furnishing the vital principle with the immediate materials of assimilation. But how is the proper juice, which is thus so indispensable to the process of vegetation, conveyed to the several parts or organs of the plant? As the sap in its ascent to the summit of the leaf is conducted by an appropriate set of vessels, so also is the proper juice in its descent to the extremity of the root. One of the earliest and most satisfactory experiments on this subject, at least as far as regards the return of the proper juice through the leaf and leaf-stalk, is that of Dr. Darwin, which was conducted as follows: a stalk of the *Euphorbia heliscopia*, furnished with its leaves and seed-vessels, was placed in a decoction of madder-root, so as that the lower portion of the stem and two of the inferior leaves were immersed in it. After remaining so for several days the color of the decoction was distinctly discerned passing along the midrib of each leaf. On the upper side of the leaf many of the ramifications, going from the midrib towards the circumference, were observed to be tinged with red; but on the under side there was observed a system of branching vessels, originated in the extremities of the leaf and carrying not a red but a pale milky fluid, which, after uniting in two sets, one on each side the midrib, descended along with it into the leaf-stalk. These were the vessels returning the elaborated sap. The vessels observable on the upper surface Darwin calls arteries, and those on the under surface he calls veins. To this may be added the more recent discoveries of Knight, who in his experiments, instituted with a view to ascertain the course of the sap, detected in the leaf-stalk, not only the vessels which he calls central tubes, through which the coloured infusion ascended, together with their appendages, the spiral tubes; but also another set of vessels surrounding the central tubes, which he distinguishes by the appellation of external tubes, and which appeared to be conveying in one direction or other a fluid that was not colored, but that proved, upon further investigation, to be the descending proper juice. In tracing them upwards they were found to extend to the summit of the leaf; and in tracing them downwards they were found to extend to the base of the leaf-stalk, and to penetrate even into the inner bark. According to Knight then there are three sets of vessels in leaves, the central tubes, the spiral tubes, and the external tubes. But by what means is the proper juice conducted from the base of the leaf-stalk to the extremity of the root? This was the chief object of the inquiry of the earlier phytologists who had not yet begun to trace its progress in the leaf and leaf-stalk; but who were acquainted with facts indicating at least the descent of a fluid in the trunk. Du Hamel stript sixty trees of their

bark in the course of the spring, laying them bare from the upper extremity of the sap and branches to the root; the experiment proved indeed fatal to them, as they all died in the course of three or four years. But many of them had made new productions both of wood and bark from the buds downwards, extending in some cases to the length of a foot; though very few of them had made any new productions from the root upwards. Hence it is that the proper juice not only descends from the extremity of the leaf to the extremity of the root, but generates also in its descent new and additional parts. The experiments of Knight on this subject are, if possible, more convincing than even those of Du Hamel. From the trunks of a number of young crab-trees he detached a ring of bark of half an inch in breadth. The sap rose in them, and the portion of the trunk above the ring augmented as in other subjects that were not so treated, while the portion below the ring scarcely augmented at all. The upper lips of the wounds made considerable advances downwards, while the lower lips made scarcely any advances upwards; but if a bud was protruded under the ring, and the shoot arising from it allowed to remain, then the portion of the trunk below that bud began immediately to augment in size, while the portion between the bud and incision remained nearly as before. When two circular incisions were made in the trunk so as to leave a ring of bark between them with a leaf growing from it, the portion above the leaf died, while the portion below the leaf lived; and when the upper part of a branch was stripped of its leaves the bark withered as far as it was stript. Whence it is evident that the sap which has been elaborated in the leaves and converted into proper juice, descends through the channel of the bark, or rather between the bark and alburnum to the extremity of the root, effecting the developement of new and additional parts. But not only is the bark thus ascertained to be the channel of the descent of the proper juice, after entering the trunk; the peculiar vessels through which it immediately passes, have been ascertained also. In the language of Knight they are merely a continuation of the external tubes already noticed, which after quitting the base of the foot-stalk he describes as not only penetrating the inner bark, but descending along with it and conducting the proper juice to the very extremity of the root. In the language of Mirbel they are the large or rather simple tubes so abundant in the bark of woody plants, though not altogether confined to it; and so well adapted by the width of their diameter to afford a passage to the proper juice.

425. *Causes of Descent.* — The proper juice then, or sap elaborated in the leaf, descends by the returning vessels of the leaf-stalk, and by the longitudinal vessels of the inner bark, the large tubes of Mirbel and external tubes of Knight, down to the extremity of the root. What is the cause of its descent? It appears that the descent of the proper juice was regarded by the earlier phytologists as resulting from the agency of gravitation, owing perhaps more to the readiness with which the conjecture suggests itself than to the satisfaction which it gives. But the insufficiency of this cause was clearly pointed out by Du Hamel, who observed in his experiments with ligatures that the tumor was always formed on the side next to the leaves, even when the branch was bent down, whether by nature or art, so as to point to the earth, in which case the power propelling the proper juice is acting not only in opposition to that of gravitation, but with such force as to overcome it. This is an unanswerable argument; and yet it seems to have been altogether overlooked, or at least undervalued in its importance by Knight, who endeavours to account for the effect by ascribing it to the joint operation of gravitation, capillary attraction, the waving motion of the tree, and the structure of the conducting vessels; but the greatest of these causes is gravitation. Certain it is that gravitation has considerable influence in preventing the descent of the sap in young shoots of trees which have grown upright, which, when bent down after being fully grown, form larger buds, and often blossom instead of leaf-buds. This practice, with a view to the production of blossom-buds is frequently adopted by gardeners (*Hort. Trans.* i. 237.) in training fruit-trees. — These causes are each perhaps of some efficacy; and yet even when taken altogether they are not adequate to the production of the effect. The greatest stress is laid upon gravitation; but its agency is obviously over-rated, as is evident from the case of the pendant shoots of the weeping willow; and if gravitation is so very efficacious in facilitating the descent of the proper juice, how comes its influence to be suspended in the case of the ascending sap? The action of the silver grain will scarcely be sufficient to overcome it; and if it should be said that the sap ascends through the tubes of the alburnum by means of the agency of the vital principle, why may not the same vital principle conduct also the proper juice through the returning vessels of the bark. In short if, with Saussure, we admit the existence of a contracting power in the former case sufficient to propel the sap from ring to ring, it will be absolutely necessary to admit it also in the latter. Thus we assign a cause adequate to the production of the effect, and avoid at the same time the transgression of that most fundamental principle of all sound philosophy which forbids us to multiply causes without necessity.

Sect. IV. *Process of Vegetable Developement.*

426. When the sap has been elaborated in the leaf, and converted into proper juice, it is now finally prepared for immediate assimilation, and for the production of such parts and organs as are peculiar to the species, or necessary to the perfection of the individual. The next object of our inquiry, therefore, will be that of tracing out the order of the developement of the several parts, together with the peculiar mode of operation adopted by the vital principle. But this mode of operation is not exactly the same in herbaceous and annual plants, as in woody and perennial plants. In the former, the process of developement comprises as it were but one act of the vital principle, the parts being all unfolded in immediate succession and without any perceptible interruption till the plant is complete. In the latter, the process is carried on by gradual and definite stages easily cognisable to the senses, commencing with the approach of spring, and terminating with the approach of winter; during which, the functions of the vital principle seem to be altogether suspended, till it is aroused again into action by the warmth of the succeeding spring. The illustration of the latter, however, involves also that of the former; because the growth of the first year exemplifies at the same time the growth of annuals, while the growth of succeeding years exemplifies whatever is peculiar to perennials.

427. *Elementary Organs.* — If the embryo, on its escape from the seed and conversion into a plant, is taken and minutely inspected, it will be found to consist of a root, plumelet, and incipient stem, which have been developed in consecutive order; and if the plant is taken and dissected at this period of its growth it will be found to be composed merely of an epidermis enveloping a soft and pulpy substance, that forms the mass of the individual; or it may be furnished also with a central and longitudinal fibre; or with bundles of longitudinal fibres giving tenacity to the whole. These parts have been developed no doubt by means of the agency of the vital principle operating on the proper juice; but what have been the several steps of operation? Perhaps no satisfactory explication of the phenomenon has yet been offered. It is likely, however, that the rudiments of all the different parts of the plant do already exist in the embryo in such specific order of arrangement as shall best fit them for future developement, by the intro-susception of new and additional particles. The pellicle constituting the vegetable epidermis has generally been regarded as a membrane essentially distinct from the parts which it covers, and as generated with a view to the discharge of some particular function. Some phytologists, however, have viewed it in a light altogether different, and have regarded it as being merely the effect of accident, and nothing more than a scurf formed on the exterior and pulpy surface of the parenchyma indurated by the action of the air. It is more probably, however, formed by the agency of the vital principle, even while the plant is yet in embryo, for the very purpose of protecting it from injury when it shall have been exposed to the air in the process of vegetation. There are several respects in which an analogy between the animal and vegetable epidermis, is sufficiently striking: they are both capable of great expansion in the growth of the subject; they are both easily regenerated when injured (excepting in the case of induration), and seemingly in the same manner; they are both subject, in certain cases, to a constant decay and repair; and they both protect from injury the parts enclosed.

428. *Composite Organs.* — The elucidation of the developement of the composite organs involves the discussion of the two following topics: — the formation of the annual plant, and of the original shoot of the perennial; and the formation of the subsequent layers that are annually added to the perennial.

429. *Annuals and Annual Shoots.* — If a perennial of a year's growth is taken up in the beginning of winter when the leaves, which are only temporary organs, have fallen, it will be found to consist of a root and trunk, surmounted by one or more buds. The root is the radicle expanded into the form peculiar to the species, but the trunk and buds have been generated in the process of vegetation. Let the root or trunk be now taken and cut into two by means of a transverse section, and it will be found to consist already of bark, wood, and pith. Here then is the termination of the growth of the annual, and of the first stage of the growth of the perennial: how have their several parts or organs been formed. As the pith seems only a modification of the original pulp, the same hypothesis that accounts for the formation of the one will account also for the formation of the other; but the pith and pulp, or parenchyma, are ultimately converted into organs essentially distinct from one another; though phytologists have been much puzzled to assign to each its respective functions. In the ages in which phytological opinions were formed without inquiry, one of the vulgar errors of the time seems to have been an opinion, by which the function of the pith was supposed to be that of generating the stone of fruit, and by which it was thought that a tree deprived of its pith would produce fruit without a stone. (*Phys. des Arb.* liv. i. chap. iii.) But

this opinion is by much too absurd to merit a serious refutation. Another early opinion, exhibiting however indications of legitimate inquiry, is that by which the pith was regarded as being analogous to the heart and brain of animals, as related by Malpighi; who did not himself adopt it, but believed the pith to be like the cellular tissue, the viscera in which the sap is elaborated for the nourishment of the plant, and for the protrusion of future buds. Magnol thought that it produces the flower and fruit, but not the wood. Du Hamel regarded it as being merely an extension of the pulp or cellular tissue, without being destined to perform any important function in the process of vegetation. But Linnæus was of opinion that it produces even the wood; regarding it not only as the source of vegetable nourishment, but as being also to the vegetable what the brain and spinal marrow are to animals, the source and seat of life. In these opinions there may be something of truth, but they have all the common fault of ascribing to the pith either too little or too much. M. Lindsay of Jamaica suggested a new opinion on the subject, regarding it as being the seat of the irritability of the leaves of the *mimosa*, and Sir J. E. Smith says he can see nothing to invalidate the arguments on which this opinion is founded. Plenk and Knight, regard it as destined by nature to be a reservoir of moisture to supply the leaves when exhausted by excess of perspiration. Hence it appears that the peculiar function of the pith has not yet been altogether satisfactorily ascertained; and the difficulty of ascertaining it has been thought to be increased from the circumstance of its seeming to be only of a temporary use in the process of vegetation, by its disappearing altogether in the aged trunk. But although it is thus only temporary as relative to the body of the trunk, yet it is by no means temporary as relative to the process of vegetation; the central part of the aged trunk being now no longer in a vegetating state, and the pith being always present in one shape or other in the annual plant, or in the new additions that are annually made to perennials. The pith then is essential to vegetation in all its stages: and from the analogy of its structure to that of the pulp or parenchyma which is known to be an organ of elaboration, as in the leaf, the function of the pith is most probably that of giving some peculiar elaboration to the sap.

The next topic of inquiry is that of the generation of the layer of wood in woody plants, or of the parts analogous to wood in the case of herbaceous plants; a topic that has been hitherto but little attended to. If we suppose the rudiments of all the different parts to exist already in the embryo, then we have only to account for their developement by means of the intro-susception and assimilation of sap and proper juice; but if we suppose them to be generated in the course of vegetation, then the difficulty of the case is augmented: and at the best we can only state the result of operations that have been so long continued as to present an effect cognizable to the sense of sight, though the detail of the process is often so very minute as to escape even the nicest observation. All, then, that can be said on the subject is merely that the tubes, however formed, do, by virtue of the agency of the vital principle operating on the proper juice, always make their appearance at last in an uniform and determinate manner, according to the tribe or species to which the plant belongs, uniting and coalescing so as to form either a circular layer investing the pith, as in woody plants; or a number of divergent layers intersecting the pith, as in some herbaceous plants; or bundles of longitudinal and woody fibre interspersed throughout the pith, as in others. In the same manner we may account for the formation of the layer of bark.

430. *Perennials, and their Annual Layers.* — If a perennial is taken at the end of the second year and dissected as in the example of the first year it will be found to have increased in height by the addition of a perpendicular shoot consisting of bark, wood, and pith, as in the shoot of the former year; and in diameter by the addition of a new layer of wood, and of bark generated between the wood and bark of the former year, and covering the original cone of wood, like the paper that covers a sugar-loaf: this is the fact of the mode of augmentation about which phytologists have not differed, though they have differed widely with regard to the origin of the additional layer by which the trunk is increased in diameter. Malpighi was of opinion that the new layer of wood is formed from the liber of the former year. Linnæus thought the new layer of wood was formed from the pith, which is absurd, because the opinion goes to the inversion of the very order in which the layer is formed, the new layer being always exterior to the old one. But according to the most general opinion, the layer was thought to be formed from a substance oozing out of the wood or bark — first, a limpid fluid, then a viscid pulp, and then a thin layer attaching itself to the former; the substance thus exuding from the wood or bark was generally regarded as being merely an extravasated mucilage, which was somehow or other converted into wood and bark: but Du Hamel regarded it as being already an organized substance, consisting of both cellular and tubular tissue, which he designated by the appellation of the *Cambium*, or Proper Juice.

Knight has thrown the highest degree of elucidation on this, one of the most obscure and intricate processes of the vegetable economy, in having shown that the sap is elaborated, so to render it fit for the formation of new parts in the leaf only. If a leaf or branch of the vine is grafted even on the fruit-stalk or tendril, the graft will still succeed; but if the upper part of a branch is stripped of its leaves the bark will wither as far as it is stripped; and if a portion of bark furnished with a leaf is insulated by means of detaching a ring of bark above and below it, the wood of the insulated portion that is above the leaf is not augmented: this shows evidently that the leaf gives the elaboration necessary to the formation of new parts, and that without the agency of the leaf no new part is generated. Such then is the mode of the augmentation of the plant in the second year of its growth. It extends in width by a new layer of wood and of bark insinuated between the wood and bark of the former year; and in height by the addition of a perpendicular shoot, or of branches, generated as in the shoot of the first year. But if the plant is taken and dissected at the end of the third year, it will be found to have augmented in the same manner; and so also at the end of the succeeding year as long as it shall continue to live; so that the outermost layer of bark, and innermost layer of wood, must have been originally tangent in the first year of the plant's growth; the second layer of bark, and second layer of wood, in the second year; and so on in the order of succession till you come to the layer of the present year, which will in like manner divide into two portions, the outer forming one or more layers of bark, and the inner forming one or more layers of wood. And hence the origin of the concentric layers of wood and of bark of the trunk. But how are we to account for the formation of the divergent layers, which Du Hamel erroneously supposed to proceed from the pith? The true solution of the difficulty has been furnished by Knight, who, in tracing the result of the operation of budding, observed that the wood formed under the bark of the inserted bud unites indeed confusedly with the stock, though still possessing the character and properties of the wood from which it was taken, and exhibiting divergent layers of new formation which originate evidently in the bark, and terminate at the line of union between the graft and stock. But how is the formation of the wood to be accounted for, that now occupies the place of the pith? It appears that the tubes of which the medullary is composed do, in the process of vegetation, deposit a *cambium,* which forms an interior layer that is afterwards converted into wood for the purpose of filling up the medullary canal.

But in consequence of the increase of the trunk by means of the regular and gradual addition of an annual layer, the layers whether of wood or of bark are necessarily of different degrees of solidity in proportion to their age; the inner layer of bark, and the outer layer of wood, being the softest; and the other layers increasing in their degree of solidity till you reach the centre on the one hand, and the circumference on the other, where they are respectively the hardest, forming perfect wood or highly indurated bark, which sloughs or splits into chinks, and falls off in thick crusts, as in the plane-tree, fir, and birch. What length of time then is requisite to convert the alburnum into perfect wood, or the liber into indurated bark; and by what means are they so converted? There is no fixed and definite period of time that can be positively assigned as necessary to the complete induration of the wood or bark, though it seems to require a period of a good many years before any particular layer is converted from the state of alburnum to that of perfect wood; and perhaps no layer has received its final degree of induration till such time as the tree has arrived at its full growth. The induration of the alburnum, and its consequent durability, are attributed by many to the loss of sap which the layer sustains after the period of its complete developement; when the supply from the root diminishes, and the waste by evaporation or otherwise is still kept up, inducing a contraction or condensation of its elementary principles that augments the solidity of the layer, in the first degree, and begins the process that future years finish. But Knight believes the induration of the alburnum as distinguishable in the winter to be owing rather to some substance deposited in it in the course of the preceding summer, which he regards as being the proper juice in a concrete or inspissated state, but which is carried off again by the sap as it ascends in the spring.

431. *Circulation of Vegetable Juices.* — After the discovery of the circulation of the blood of animals, phytologists, who were fond of tracing analogies between the animal and vegetable kingdoms, began to think that there perhaps existed in plants also, a circulation of fluids. The sap was supposed to be elaborated in the root. The vessels in which it was propelled to the summit of the plant were denominated arteries; and the vessels in which it is again returned to the root were denominated veins. Du Hamel, while he admits the ascent of the sap, and descent of the proper juice, each in peculiar and appropriate vessels, does not however admit the doctrine of a circulation; which seems, about the middle of the last century, to have fallen into disrepute. For Hales, who contended for an alternate ascent and descent of fluids in the day and night, and in the same vessels, or for a sort of vibratory motion as he also describes it, gave no

countenance whatever to the doctrine of a circulation of juices. But the doctrine, as it appears, has been again revived, and has met with the support of some of the most distinguished of modern phytologists. Hedwig is said to have declared himself to be of opinion, that plants have a circulation of fluids similar to that of animals. Corti is said to have discovered a species of circulation in the stem of the *Chara*, but confined, it is believed, within the limits of the internodia. Willdenow has also introduced the subject, and defended the doctrine (*Principles of Botany*, p. 85.); but only by saying he believes a circulation to exist, and that it is impossible for the leafless tree to resist the cold if there be not a circulation of fluids. And Knight has given his reasons somewhat in detail. And though his doctrine of a circulation should be false, yet the account which he gives of the progress and agency of the sap and proper juice, short of circulation, may be true. The sum of the account is as follows: — When the seed is deposited in the ground under proper conditions, moisture is absorbed and modified by the cotyledons, and conducted directly to the radicle, which is by consequence first developed. But the fluid which has been thus conducted to the radicle, mingling no doubt with the fluid which is now also absorbed from the soil, ascends afterwards to the plumelet through the medium of the tubes of the alburnum. The plumelet now expands and gives the due preparation to the ascending sap, returning it also in its elaborated state to the tubes of the bark, through which it again descends to the extremity of the root, forming in its progress new bark and new alburnum; but mixing also, as he thinks, with the alburnum of the former year, where such alburnum exists, and so completing the circulation.

432. *Decomposite Organs.* — To the above brief sketch of the agency of the vital principle in the generation or growth of the elementary and composite organs, there now remains to be added that of the progress and mode of the growth of the decomposite organs, or organs immediately constituting the plant, as finishing the process of the vegetable developement. This will include the phenomena of the ultimate developement of the root, stem, branch, bud, leaf, flower, and fruit.

433. *The Root.* — From the foregoing observations and experiments, it appears that the roots of plants, or at least of woody plants, are augmented in their width by the addition of an annual layer, and in their length by the addition of an annual shoot, bursting from the terminating fibre. But how is the developement of the shoot effected? Is it by the intro-susception of additional particles throughout the whole of its extent; or only by additions deposited at the extremity? In order to ascertain the fact, with regard to the elongation of the root, Du Hamel instituted the following experiment: — Having passed several threads of silver transversely through the root of a plant, and noted the distances, he then immersed the root in water. The upper threads retained always their relative and original situation, and the lowest thread which was placed within a few lines of the end was the only one that was carried down. Hence he concluded that the root is elongated merely by the extremity. Knight, who from a similar experiment obtained the same result, deduced from it also the same conclusion. We may regard it then as certain, that the mode of the elongation of the root is such as is here represented, though in the progress of its developement, it may affect a variety of directions. The original direction of the root is generally perpendicular, in which it descends to a considerable depth if not interrupted by some obstacle. In taking up some young oak-trees that had been planted in a poor soil, Du Hamel found that the root had descended almost four feet, while the height of the trunk was not more than six inches. If the root meets with an obstacle it then takes a horizontal direction, not by the bending of the original shoot, but by the sending out of lateral shoots. The same effect also follows if the extremity of the root is cut off, but not always so, for it is a common thing in nursery gardens, to cut off the tap roots of drills of seedling oaks without removing them, by a sharp spade, and these generally push out new tap roots, though not so strong as the former. When a root ceases of its own accord to elongate, it sends out also lateral fibres which become branches, and are always the more vigorous the nearer they are to the trunk, but the lateral branches of horizontal roots are the less vigorous the nearer they are to the end next the trunk. In the former case, the increased luxuriance is perhaps owing to the easy access of oxygen in the upper divisions; but in the latter case, the increased luxuriance of the more distant divisions is not so easily accounted for, if it is not to be attributed to the more ample supply of nutriment which the fibres meet with as they recede from the trunk, particularly if you suppose a number of them lying horizontally and diverging like the *radii* of a circle. But the direction of roots is so liable to be affected by accidental causes, that there is often but little uniformity even in roots of the same species. If plants were to be sown in a soil of the same density throughout, perhaps there might be at least as much uniformity in the figure and direction of their roots, as of their branches; but this will seldom happen. For if the root is injured by the attacks of insects, or interrupted by stones, or earth

of too dense a quality, it then sends out lateral branches, as in the above cases; sometimes extending also in length by following the direction of the obstacle, and sometimes ceasing to elongate, and forming a knot at the extremity. But where the soil has been loosened by digging or otherwise, the root generally extends itself to an unusual length, and where it is both loosened and enriched, it divides into a multiplicity of fibres. This is also the case with the roots of plants vegetating in pots, near a river, but especially in water. Where roots have some considerable obstacle to overcome they will often acquire a strength proportioned to the difficulty; sometimes they will penetrate through the hardest soil to get at a soil more nutritive, and sometimes they will insinuate their fibres into the crevices even of walls and rocks which they will burst or overturn. This of course requires much time, and does much injury to the plant. Roots consequently thrive best in a soil that is neither too loose nor too dense; but as the nourishment which the root absorbs is chiefly taken up by the extremity, so the soil is often more exhausted at some distance from the trunk than immediately around it. Du Hamel regards the small fibres of the root which absorb the moisture of the soil as being analogous to the lacteals of the animal system, which absorb the food digested by the stomach. But the root is rather to be regarded as the mouth of the plant, selecting what is useful to nourishment and rejecting what is yet in a crude and indigestible state; the larger portions of it serving also to fix the plant in the soil and to convey to the trunk the nourishment absorbed by the smaller fibres, which ascending by the tubes of the alburnum, is thus conveyed to the leaves, the digestive organs of plants. Du Hamel thinks that the roots of plants are furnished with pre-organized germs by which they are enabled to send out lateral branches when cut, though the existence of such germs is not proved; and affirms that the extremities of the fibres of the root die annually like the leaves of the trunk and branches, and are again annually renewed; which last peculiarity Professor Willdenow affirms also to be the fact, but without adducing any evidence by which it appears to be satisfactorily substantiated. On the contrary, Knight, who has also made some observations on this subject, says, it does not appear that the terminating fibres of the roots of woody plants die annually, though those of bulbous roots are found to do so. But the fibres of creeping plants as the common crowfoot and strawberry certainly die annually as do those of the vine.

434. *The Stem.* — The stem, like the root, or at least the stem of woody plants, is also augmented in width by the addition of an annual layer, and in length by the addition of an annual shoot bursting from the terminating bud. Is the developement of the shoot issuing from the stem effected in the same manner also? The developement of the shoot from the stem is not effected in the same manner as that of the root — by additions to the extremity only — but by the intro-susception of additional particles throughout its whole extent, at least in its soft and succulent state: the longitudinal extension diminishing in proportion as the shoot acquires solidity, and ceasing entirely when the wood is perfectly formed; though often continuing at the summit after it has ceased at the base. The extension of the shoot is inversely as its induration, rapid while it remains herbaceous, but slow in proportion as it is converted into wood. Hence moisture and shade are the most favorable to its elongation, because they prevent or retard its induration; and hence the small cone of wood which is formed during the first year of the plant's growth increases no more after the approach of winter, neither in height nor thickness. Such is the mode of the growth and developement of the trunk of perennial and woody plants, to which there exists a striking exception in the growth of the trunk of palms. Their internal structure has been already taken notice of as presenting no concentric or divergent layers, and no medullary canal, but merely an assemblage of large and woody fibres, interspersed without order in a pulp or parenchyma, softer at the centre and gradually becoming harder as it approaches the circumference. When the seed of the palm-tree germinates, it protrudes a circular row of leaves, or of fronds, which crowns the radicle, and is succeeded in the following year by a similar row issuing from the centre or bosom of the former leaves, which ultimately die down to the base. This process is continued for four or five years successively without exhibiting as yet any appearance of a stem, the remaining bases of the leaves or frond forming by their union merely a sort of knob or bulb. At last, however, they constitute by their union an incipient stem, as thick the first year as it ever is after; which in the following year is augmented in height as before, and so on in succession as long as the plant lives, the leaves always issuing from the summit and crowning the stem, which is a regular column, but decaying at the end of the year, and leaving circular marks at their points of insertion, which furrow the surface of the plant, and indicate the years of its growth.

435. The *Branches*, in their mode of growth and developement, exhibit nearly the same appearances as the trunk from which they issue. They originate in a bud, and form also a cone that consists of pith, wood, and bark; or rather they form a double cone. For the insertion of the branch into the trunk resembles also a cone whose base

is at the circumference, and whose apex is at the centre, at least if it is formed in the first year of the plant's growth, or on the shoot of the present year; but falling short of the centre in proportion to the lateness of its formation, and number of intervening layers. Branches in their developement assume almost all varieties of position from the reflected to the horizontal and upright; but the lower branches of trees are said to be generally parallel to the surface of the soil on which they grow, even though that surface should be the sloping side of a hill — owing, as it has been thought, to the evolution of a greater number of buds on the side that forms the obtuse angle with the soil, in consequence of its being exposed to the action of a greater mass of air.

436. The *Bud*, which in the beginning of spring is so very conspicuous on the trees of this country as to be obvious to the most careless observer, is by no means common to all plants, nor to plants of all climates; shrubs in general, and annuals universally, are destitute of buds as well as all plants whatever growing within the tropics, the leaf being in them immediately protruded from the bark. It is only in the woody plants of cold climates therefore that we are to look for buds, and in them no new part is added, whether proper to the leaf or flower, without the intervention of a bud. For when the young shoot is produced, it is at the same time furnished with new buds which are again extended into new shoots in the following spring; and thus the bud is to be regarded, as forming, not only the cradle but also the winter quarters of the shoot, for which its coat of tiled and glutinous scales seems admirably well adapted. It is found chiefly in the extremity, or on the surface of the young shoot or branch, and but rarely on the stem, except it be at the collar where it produces suckers. It is also generated for the most part in the axil of the leaves, as may be seen by inspecting the annual shoot of almost any tree at random, though not universally so; for to this rule there exists a curious and singular exception in the bud of the *Platanus*, which is generated in the very centre of the base of the foot-stalk, and is not discoverable till after the fall of the leaf. But how are the buds formed which are thus developed? Malpighi thought they were formed from the pith or cellular tissue, which the latter regarded as viscera destined for the elaboration of the sap and protrusion of future buds. Du Hamel thinks the exterior scales of the bud originate in the interior part of the bark, and Knight relates an experiment from which he thinks it follows that the buds are formed from the descending proper juice. But whatever may be the actual origin of the bud, it is evident that its developement does not take place except through the medium of the proper juice, which has been elaborated in the leaves of preceding buds, and originally in those of the plumelet; as the young bud does not make its appearance till the leaves of the preceding buds have expanded, and will not ultimately succeed if deprived of them too soon.

Bulbs are so very similar to buds both in their origin and developement as to require no specific investigation.

437. *The Leaf.* — When the leaves burst from the expanding bud, and even long before that period, as may be seen by the dissection of the bud in the winter, they are complete in all their parts. Hence it is obvious that the leaf, like the young shoot, effects its final developement by means of the intro-susception of new particles throughout the whole of its dimensions: and yet this law of developement is not common to all leaves whatever, for the leaves of liliaceous plants extend chiefly at the point of their junction with the bulb. The effect perhaps of their peculiarity of structure, in being formed of parallel tubes which extend throughout their whole length, without those transverse and branching fibres that constitute what are called the nerves of the leaves of woody plants.

438. *The Flower and Fruit.*—When the flower bursts from the expanding bud, and even long before that period, it is already complete in all its parts, as may be seen also by the dissection of the bud in winter. Linnæus represents the pistil as originating in the pith, the stamens in the wood, and the corolla and calyx in the inner and outer bark respectively: but this account of their origin, though extremely plausible at first sight, will not bear the test of minute examination, being contradicted by the anatomy of the parts themselves; particularly in the case of compound flowers. Knight in investigating the organization of the apple and pear, endeavoured to ascertain the origin of the several parts by tracing the organs of the fruit-stalk to their termination. In the fruit-stalk he thought he could discover the pith, the central tubes, spiral tubes, and tubes of the bark, together with its epidermis: and in tracing them to their termination, he thought the pith seemed to end in the pistils; the central vessels in the stamens, after diverging round the core and approaching again in the eye of the fruit; and the bark and epidermis, in the two external skins. Hence he infers that the flower is a prolongation of the pith, wood, and bark. A question of some considerable importance has arisen out of this subject: does the flower or fruit elaborate sap for its own developement, or is it supplied with nourishment from the leaf? By placing small branches of the apple, pear, and vine, with blossoms not

expanded in a decoction of logwood, Knight found that the central vessels were colored by the decoction. By means of a similar experiment on the same subjects after the fruit was formed, the coloring matter was traced through the mass of the fruit to the base of the stamina. And hence it appears that the flower and fruit do possess the power of elaborating sap for their own developement. Knight infers from the foregoing data, that the blossom is nourished from the albumum, by means of the mingling of the proper juice, which the albumum may be supposed to contain with the sap in its ascent.

Sect. V. *Anomalies of Vegetable Developement.*

439, In the growth of the vegetable subject as well as in that of the animal, it often happens that a deviation from the general laws of developement is occasioned by the intervention of some accidental cause; or of some cause operating permanently in certain subjects. Hence the anomaly may regard the developement either of an individual or a species, and may occur either in the root, stem, branch, leaf, bud, flower, or fruit, according to the circumstances in which it is placed; or it may affect the habit, duration or physical virtues of the plant.

440. *The Root.* — According to the general laws of vegetable developement, plants of the same species are furnished with the same species of root — not producing at one time a woody or fibrous root, and at another time a bulbous root. And yet it is found that there are cases in which changes of this kind do occur. If part of the root of a tree planted by a pond or river, protrudes beyond the bank so as to be partially immersed, it divides at the extremity into innumerable ramifications, or sends out innumerable fibres from the surface, which become again subdivided into fibres still more minute, and give to the whole an appearance something resembling that of the tail of a fox; which has accordingly been denominated by Du Hamel the foxtail root. The *Phleum pratense*, when growing in a moist soil, which it naturally affects, is uniformly furnished with a fibrous root; but when growing in a dry soil, where it is also often to be found, it is furnished with a bulbous root. The same is the case also with the *Alopecurus geniculatus;* which, when growing in its native marshes protrudes a fibrous root, though when growing in a very dry situation, as on the top of a dry wall, it is found to be furnished with an ovate and juicy bulb. This anomaly also seems to be merely the result of a provision of nature by which the plant is endowed with the capacity of collecting a supply of moisture suited to existing circumstances, and hence of adapting itself to the soil in which it grows. The roots of *Utricularia minor*, which consist of a number of slender and hair-like filaments, exhibit the singular anomaly of being furnished with a multitude of small and membraneous bladders, each containing a transparent and watery fluid, and a small bubble of air, by means of which the plant is kept floating in the water. Some perennials present the anomaly of what has been called the descending root, which is at first spindle-shaped and perpendicular, sending out some lateral fibres; but dying at the lower extremity in the course of the succeeding winter, and protruding new fibres from the remaining portion, and even from the lower portion of the stem, in the course of the following spring, which by descending into the soil, draw down the plant with them, so that part of what was formerly stem is now converted into root. This process is repeated every year, and by consequence a portion of the stem is made to descend every year into the earth. The anomaly may be exemplified in the roots of *Valeriana dioica, Tanacetum vulgare*, and *Oxalis acetosella;* and will also account for the bitten and truncated appearance of *Scabiosa succisa*, or Devil's-bit.

The beet root, if dissected when about a year old, presents the singular anomaly of being already furnished with from five to eight distinct and concentric circles of longitudinal tubes or sap-vessels, imbedded at regular intervals in its pulp; whereas other biennial roots form only an individual circle each year, and are, consequently at no time furnished with more than two. There are also some roots that may be called migratory, upon a principle similar to the foregoing. If the stem of a descending root happens to be creeping or procumbent instead of being erect, then the lateral shoots from above are carried forward in the direction of that procumbency, so that in the course of a few years the plant has actually changed its place by so much as the stem has been converted into a root. This is well exemplified in the genus *Iris*, which as it enlarges in circumference, dies in the centre and presents a ring of plants instead of a solitary one. In the case of some aquatics, which float about on the surface of the water as they happen to be driven by the winds, the whole plant may be said to be migratory, as in the case of the genus *Lemna* and some marine plants. If the stem of a young plum or cherry-tree, but particularly of a willow, is taken in the autumn and bent so as that one-half of the top may be laid in the earth, one half of the root being at the same time taken carefully out, but sheltered at first from the cold and then gradually exposed to it, and the remaining part of the top and root subjected to the same process in the following year; the branches of the top will become roots, and the ramifications of the root will become branches, protruding leaves, flowers, and fruit in due season.

441. If the *stem* of a tree planted by a pond or river is so bent in its growth as to come near to the surface of the water and to be occasionally immersed in it, it will sometimes send out from the under surface a multitude of shoots that will descend into the water, and develope themselves in the manner of the fox-tail-root. Sometimes it happens that a stem, instead of assuming the cylindrical form common to the species, assumes a compressed and flattened form similar to the herbage of the *Cactus*, as in the fir tribe, ash, &c. Du Hamel accounts for the anomaly of the flattened stem by supposing that an unnatural graft must have taken place in the leaf bud; and so united shoots that would otherwise have been distinct. Sometimes the stem is disfigured by accidental tumors or bunches projecting from the surface, and forming ultimately what are called knots in the wood. They are very common in the oak and elm, and are produced perhaps by means of some obstruction in the channel of the sap's motion, by which the vessels become convoluted and swell up into a bunch. But bunches are also to be met with on the stem of herbaceous plants, as on that of the *Carduus pratensis*; of which you will often find a portion near the top swollen out into an egg-shaped or egg oblong bunch, extending from an inch to two inches in length, and about an inch across. If this bunch is cut open in the month of August, it will be found to contain several large and white maggots. It has consequently been occasioned by the puncture of the parent insect depositing its eggs. It does not seem to affect the general health of a vigorous plant, though it might prove seriously injurious to a weak one. Sometimes two or more contiguous stems, extending in the process of their growth till they meet and press against one another, become incorporated at length into one, and form a sort of bundle. This is what may be termed a natural graft, in opposition to an artificial graft, of which it is the model and prototype. The natural graft is always affected by means of the union of the liber of the respective stems composing it; so that the perfection of the art of grafting consists in applying the liber of the graft and stock together in such a manner as shall the most facilitate their incorporation.

442. If *the branch* of a tree is situated as in the foregoing case of the stem, so as to be partially or periodically immersed in water, it will send out also the same sort of brush-like shoots. Like the stem it is also liable to be disfigured by bunches or knots; exhibiting a plexus of young shoots issuing from nearly the same point, and crossing in all directions, and finally incorporating together by means of a sort of natural graft. These bunches are frequently to be met with on the branches of the birch-tree, and are known among the peasantry of Scotland by the name of witches' knots. They are occasioned, like the bunches of the stem, by some obstruction in the channel of the sap or proper juice. A peculiar sort of knot or bunch is also often formed on the branches of the dog-rose. The nucleus, which is generally from an inch to an inch and a half in diameter, is covered with a long and winged shag, first of a green and then of a purple color, presenting the appearance of a small bunch of moss. It has been occasioned like that of the stem of the thistle, by the puncture of an insect depositing its eggs in the tender shoot; for if it is cut open about the month of August, it contains maggots. These anomalies remind us always of that singular disease in the human species, the *Plica polonica*.

443. *The Bud.* — The regular developement of the bud is also often prevented by means of the puncture of insects, and converted into a large globular tumor. This is very often effected by a species of *Cynips* that lances its piercer into the heart of the bud while yet tender, and penetrates with its saw into the very pith; injecting at the same time a drop of the corroding liquor contained in its bag, and then laying its egg. The bud being thus wounded, and the juices corrupted by the injected poison, the circulation is not only impeded, but a fermentation is induced which burns the contiguous parts and changes their color. The extravasated juice flows round the egg, and is there accumulated and converted into a sort of spongy lump which vegetates and augments till it forms what is called a gall. The gall thus formed affords both shelter and nourishment to the young maggot, which, after being converted into a fly, pierces its enclosure and launches into the open air. The most remarkable of such galls are those produced on the oak-tree, and known in this country by the vulgar name of oak-apples. The bud of the willow, particularly *Salix Helix*, is apt also to be punctured by insects and converted into a gall. But the conversion is not always complete; and in this case the shoot remains dwarfish, and the leaves, which are now protruded from nearly the same point, assume something of the figure of a rose. Hence it has obtained the common name of the rose-willow. The galls of the *Salvia pomifera* formed in the above manner are said to be of a very pleasant flavor, and are esteemed a great delicacy in eastern countries.

444. The *leaves*, like the buds, are also frequently chosen for the nidus of insects, and disfigured with galls or excrescences. But the most remarkable gall produced on the leaf, and indeed the most remarkable and important of all galls, is that which is so extremely useful in the arts of dying and making ink, the nut-gall of the shops. It is generated on the leaf of a species of oak that grows plentifully in the Levant, and is so well known in commerce as to require no particular description. It is occasioned by the puncture of the *Cynips quercifolii*, which deposits its egg in the substance of the leaf, by making a small perforation on the under surface. Galls and tumors are to be found on the leaves of many plants; and indeed almost all leaves are liable to deformities giving them a blistered, wrinkled, or curled appearance; and often producing disease. Sometimes the anomaly consists in the excess or deficiency of the usual number of leaves protruded in a group, as in the case of the *Trefoils*. Sometimes in the natural figure of the leaf itself, as in *Asparagus officinalis*, where they are bristle-shaped; *Salsola Kali*, awl-shaped; and *Allium Cepa*, in which they are tubular, tapering to a point. But one of the most remarkable anomalies of figure is that which occurs in the leaves of the genus *Sarracenia*, of which the lower portion is tubular, ascending and approaching to funnel-shaped, or rather pitcher-shaped reversed, with a flattened and concave limb attached by the one side to the orifice of the tube, and constituting the upper portion of the leaf. Linnæus, who was acquainted with this singularity of structure, accounted for it by supposing that it was an institution of nature, meant for the purpose of furnishing the plant with a supply of water, which it could thus catch and retain in the leaf. But as some species of the genus do not readily admit water notwithstanding their capacity to retain it, this hypothesis is regarded by Sir J. E. Smith as being extremely doubtful, who accordingly offers a different solution founded upon the following facts. An insect of the *Sphex* or *Ichneumon* kind, had been observed by one of the gardeners of the botanic garden at Liverpool, to drag several large flies to a leaf of *Sarracenia adunca*, and to force them into the tubular part of it. On examination the leaf was found to be about half filled with water, in which the flies were now struggling; the other leaves were also examined, and were found crammed with dead or drowning flies. The leaves of *Sarracenia purpurea* are said to exhibit also the same phenomena, and seem peculiarly well adapted to entrap and confine flies, by having the margin beset with inverted hairs rendering the escape of such insects as may have accidentally fallen into the watery tube, or are intentionally forced into it, impracticable; so that the putrid exhalation from the dead insects contained in the leaf often offends the nostrils, even in passing near the plant. Hence Sir J. E. Smith infers, that the growth of the plant is perhaps benefited by means of the air evolved by the dead flies, which the water has been intended to tempt, and the leaves to entrap and retain. This ingenious conjecture is no doubt sufficiently plausible as far as the plant may be affected; but cannot be regarded as quite satisfactory till such time as it shall have been shown that the health of the plant is injured when insects are prevented from approaching it. The celebrated *Nepenthes distillatoria* exhibits also an anomaly similar to that of *Sarracenia*, and holding an ounce or two of a fluid which appears to be secreted from the leaf, and to be intended as a lure to insects, which gain admission either by the spontaneous opening of the lid, or by forcibly raising it themselves. The consequence is that they fall into the fluid and are drowned, no insect being capable of living in it, except a certain small squilla or shrimp, with a protuberant back, which, according to Rumphius, sometimes crawls into it and can live there. To this phenomenon Sir J. E. Smith applies the same explication as above, which is of course liable to the same objection. But the figure of the leaf, however singular, is generally the same throughout the same individual, except in the case of accidental deformity, and yet there are exceptions even to this rule. For sometimes the lower leaves of a plant are entire while the upper leaves are divided, as occurs in a variety of mountainous plants, such as burnet, saxifrage, anise, coriander; and sometimes the lower leaves are divided while the upper leaves are entire, as in the case of a variety of aquatics, particularly *Ranunculus aquaticus*, in which the lower leaves are capillary and immersed, and the upper leaves flat and circular, floating on the surface of the water. But sometimes the dissimilitude of the leaves is still more remarkable. The Chinese mulberry, a Botany Bay tree, has not two leaves alike in form on the whole plant. And lastly, there are some plants, as in the case of the *Fungi*, that are wholly destitute of leaves, and hence called aphyllous; while there are others, as in the case of the *Fuci*, that seem to be wholly leaf.

445. The principal anomaly relative to the *flower*, is that by which one of its parts is unduly augmented, to the exclusion or diminution of some of the rest. The flower is then said to be luxuriant, and comprises the three following varieties: the multiplicate, the full, and the proliferous flower. The multiplicate flower is sometimes, though rarely, occasioned by an unusual multiplication of the divisions of the calyx, as in *Dianthus Caryophyllus*, and some of the Alpine grasses. But the anomaly most gene-

rally consists in the undue multiplication of the divisions of the corolla, by the conversion of part of the stamens into petals, which is occasionally to be met with both in monopetalous and polypetalous flowers. It occurs but seldom, however, in flowers growing in their natural state and habitat, though now and then a double flower is met with even in such circumstances. The full flower is generally described to be that in which the divisions of the corolla are so multiplied as to exclude the stamens and pistils wholly by means of their conversion into petals; which conversion is most readily effected in polypetalous flowers, such as the tulip, poppy, pink, and *ranunculus;* monopetalous flowers seldom being found full. This complete metamorphose is, always either the effect of cultivation, or of some concurrence of natural circumstances analogous to it, and is indeed, one of the principal objects of the art of the florist; the beauty of the flower, according to general estimation, being thus much augmented. In the full flower the stamens are almost always converted into petals, whence we should perhaps infer their identity of origin. But the pistil is often converted into a leaf, as may be seen by inspecting the flower of the double-blossomed cherry, which generally protrudes from the centre, a leaf in miniature. But a flower may become full also by the multiplication of the parts of the nectary, as is sometimes the case in the genus *Aquilegia*, which produces full flowers in three different ways, by the multiplication of the petals to the exclusion of the nectaries, by the multiplication of the nectaries to the exclusion of the petals, and by the multiplication of the nectaries while the proper petals remain. There are also some peculiarities in the manner in which compound flowers become full. Radiated flowers become full sometimes by the multiplication of the floscules of the ray to the exclusion of the floscules of the disk, as in *Helianthus, Anthemis,* and *Centaurea;* and sometimes by the multiplication of the floscules of the disk to the exclusion of those of the ray, as in *Matricaria* and *Bellis.* The proliferous flower is that out of which another flower or another shoot is produced. It is seldom found but in flowers already full; from the centre of which, that is, from the ovary or pistil, it sometimes happens that a new flower and foot-stalk is produced, if the flower is simple, as in the *Ranunculus, Anemone,* and pink; or several flowers and foot-stalks, issuing from the common calyx, if the flower is compound, as in the daisy, hawkweed, and marigold; or a new umbel issuing from the centre of the original umbel, if the flower is umbellate, as in *Cornus.* Sometimes the proliferous issue of the full flower is not itself a flower, but a shoot furnished with leaves, as has been sometimes, though rarely, observed in the case of the anemone and rose. Such are the several varieties of luxuriant flowers, constituting anomalies of excess; but it sometimes happens that there is also in the flower an anomaly of defect in the absence of one of its parts. Examples of this sort are occasionally to be met with in the flowers of *Cherianthus cheri, Campanula pentagonia,* and *Tussilago Anandria,* in which the corolla is altogether wanting, though proper to the species; and in this case the flower is said to be mutilated. Sometimes the anomaly consists in the situation of the flower, which is generally protruded from the extremity or sides of the branches. But the flower of the *Ruscus* is protruded from the surface of the leaf; or it may consist in the relative situation of the several parts of the flower. In simple flowers the pistil is invariably central with regard to the stamens; but in compound flowers the pistils are often situated in the circumference and the stamens in the centre. This seems to be the case also with some monoecious plants having their flowers on the same peduncle, as in the examples of the *Carex* and *Arum,* in which the stamens are more central than the pistils. Sometimes the anomaly consists in the color of the corolla, which will often deviate even in the same species. The general color of the common cowslip, *Primula veris,* is a bright yellow; but an individual is occasionally to be met with, though very rarely, in which the limb or expansion of the corolla is purple with a line of yellow around the border. Sometimes the anomaly consists in the time of flowering. The season proper for the flowering of the apple and pear-tree is the month of May; but trees of that sort have been known to protrude both buds and blossoms even in the month of November. Some plants, however, blow only in the winter, as in the case of the *Laurustinus* and *Arbutus Unedo;* while others blow only in the night, and refuse to expand their petals to the light of the sun. Such is the case of the *Cactus grandiflorus,* that produces one of the most magnificent of flowers; but blows only in the night; and is hence known also by the appellation of the night-blowing *Cereus.* Some plants, such as the ferns, *Algæ,* and *Fungi,* are altogether destitute of conspicuous flowers; and are hence called *Cryptogamous;* but in this respect the fig is perhaps the most singular. The flowers, which in other cases uniformly precede the fruit, are in this case concealed within what is generally denominated the fruit; as may be proved by cutting open a green fig by means of a longitudinal section passing through its axis. Great numbers of flowers are then discovered lining a sort of cavity in the axis of the fruit; and hence what is called the fruit or fig, in common language is rather the receptacle of the flower than any thing else. Most plants have their flowers furnished both with stamens and pistils, and are hence hermaphrodites; but there are also many genera that have the stamens in one flower and the pistils in another, both on the same individual. These are denominated *Monoecious* plants, and are exemplified in the oak and hazel. Other genera have the flowers with stamens on one plant, and the flowers with pistils on another; these are denominated *Dioecious*, and are exemplified in the hop and willow. Others have flowers of all the previous kinds on one and the same plant; these are denominated *Polygamous*, and are exemplified in the genus *Atriplex*.

446. *The Fruit.*—The anomalies of the fruit may affect either its number, figure, color, or appendages. The common hazel-nut produces in general but one kernel in one shell; but in the course of opening up a considerable number, you will now and then meet with one containing two or three kernels in a shell. This is perhaps best accounted for by supposing, with Du Hamel, that it is the result of an unnatural graft effected in the bud; though some think that the shell does always contain the rudiments of two or more kernels, although it rarely happens that more than one is developed. But if two apples or pears are developed in an incorporated state, which is a case that now and then occurs, it is no doubt best accounted by the graft of Du Hamel. Sometimes the anomaly consists in the figure of the fruit which is deformed by the tumors or excrescences, in consequence of the bite of insects, or injuries of weather producing warts, moles, or specks. Sometimes it consists in the color, producing green melons and white cucumbers. Sometimes it consists in an appendage of leaves.

447. *Habit.* — Some plants which, when placed in a rich soil grow to a great height, and affect the habit of a tree, are, when placed in a poor soil, converted into dwarfish shrubs. This may be exemplified in the case of the box-tree; and so also in the case of herbaceous plants; as in that of *Myosotis*, which in dry situations is but short and dwarfish, while in moist situations it grows to such a size as to seem to be altogether a different plant. The habit of the plant is sometimes totally altered by means of cultivation; the *Pyrus sativa*, when growing in a wild and uncultivated state, is furnished with strong thorns; but when transferred to a rich and cultivated soil the thorns disappear. This phenomenon, which was observed by Linnæus, was regarded as being equivalent to the taming of animals. But this explication is, like some others of the same great botanist, much more plausible than profound, in place of which Professor Willdenow substitutes the following: The thorns protruded in the uncultivated state of the plant, are buds rendered abortive from want of nourishment, which when supplied with a sufficiency of nourishment, are converted into leaves and branches.

448. *Physical Virtues.* — When plants are removed from their native soil and taken into a state of culture, it alters not only their habit but their physical virtues. Thus the sour grape is rendered sweet, the bitter pear pleasant, the dry apricot pulpy, the prickly lettuce smooth, and the acrid celery wholesome. Pot-herbs are also rendered more tender by means of cultivation, and better fitted for the use of man; and so also are all our fine varieties of fruit.

449. *Duration.* — Plants are either annuals, biennials, or perennials, and the species is uniformly of the same class. But it has been found that some plants which are annuals in a cold climate, such as that of Sweden, will become perennials in a hot climate, such as that of the West Indies. This anomaly has been exemplified in *Tropæolum*, beet root, and *Malva arborica*; and on the contrary some plants, which are perennials in hot climates, are reduced to annuals when transplanted into a cold climate; this has been exemplified in *Mirabilis* and *Ricinus*.

SECT. VI. *Of the Sexuality of Vegetables.*

450. The doctrine of the sexuality of vegetables and foundation of the Linnæan system, though but lately established upon the basis of logical induction, is by no means a novel doctrine. It appears to have been entertained even among the original Greeks, from the antiquity of their mode of cultivating figs, and the *Phœnix dactylifera*, or Babylonian palm, in the age of Herodotus, that is at least 400 years before the Christian æra. Aristotle and Theophrastus maintain also the doctrine of the sexuality of vegetables; and Pliny, Dioscorides, and Galen, adopted the division by which plants were then distributed into male and female; but chiefly upon the erroneous principle of habit or aspect, and without any reference to a distinction absolutely sexual. Pliny seems, to admit the distinction of sex in all plants whatever, and quotes the case of the palm-tree as exhibiting the most striking example.

451. *Discoveries of the Moderns.* — Cæsalpinus, in the sixteenth century, denominates trees which produce fruit only, females; and trees of the same kind which are barren, males; adding, that the fruit is found to be more abundant and of a better quality where the males grow in the neighbourhood of the females, which is, he says,

occasioned by certain exhalations from the males dispersing themselves all over the females, and by an operation not to be explained, disposing them to produce more perfect seed. About the middle of the seventeenth century, the doctrine of the sexes of plants began to assume a more fixed and determinate character. Malpighi describes the stamens, anthers, and pollen: the merit of suggesting the use of the latter seems to be between Sir T. Millington, Savilian Professor at Oxford, and the celebrated Dr. Grew. The opinion of Grew was adopted also by Ray. The first example of experiment recorded on this subject is that of Camerarius, Professor of Botany at Tubingen, who having adopted the opinions of Grew and Ray, though without perhaps regarding their arguments as the best that could be adduced, conceived that the subject might be still further illustrated by means of depriving the plant of its male flowers altogether, or of removing the individuals of a different sex to a distance from one another. Accordingly having selected some plants of *Mercurialis*, *Morus*, *Zea Mays*, and *Ricinus*, and stripped them of their stameniferous flowers, or removed the male plant to a great distance from the female, he found that the fruit did not now ripen; the inference from which was, that the generation of plants is analogous to that of animals, and that the stamens of the flowers of the former correspond to the sexual organs of the males of the latter. The great and illustrious Linnæus, reviewing with his usual sagacity the evidence on which the doctrine rested, and perceiving that it was supported by a multiplicity of the most incontrovertible facts, resolved to devote his labors peculiarly to the investigation of the subject, and to prosecute his inquiries throughout the whole extent of the vegetable kingdom; which great and arduous enterprise be not only undertook but accomplished with a success equal to the unexampled industry with which he pursued it. So that by collecting into one body all the evidence of former discovery or experiment, and by adding much that was original of his own, he found himself at length authorised to draw the important conclusion — that no seed is perfected without the previous agency of the pollen; and the doctrine of the sexes of plants is consequently founded in fact.

Proofs from the ancient practice in the culture of the palm and fig are known to almost every one, we shall merely offer one from the economy of the aquatics. Many plants of this class that vegetate for the most part wholly immersed in water, and often at a considerable depth, gradually begin to elevate their stems as the season of flowering advances, when they at last rear their heads above the surface of the water, and present their opening blossoms to the sun, till the petals have begun to fade, when they again gradually sink down to the bottom to ripen and to sow their seeds. This very peculiar economy may be exemplified in the case of *Ruppia maritima*, and several species of *Potamogeton*, common in our ponds and ditches; from which we may fairly infer, that the flowers rise thus to the surface merely to give the pollen an opportunity of reaching the stigma uninjured. But the most remarkable example of this kind is that of the *Valisneria spiralis*, a plant that grows in the ditches of Italy. The plant is of the class *Diœcia*, producing its fertile flowers on the extremity of a long and slender stalk twisted spirally like a cork-screw, which uncoiling of its own accord, about the time of the opening of the blossom, elevates the flowers to the surface of the water, and leaves them to expand in the open air. The barren flowers are produced in great numbers upon short upright stalks issuing from a different root, from which they detach themselves about the time of the expansion of the female blossom, mounting up like little air bubbles, and suddenly expanding when they reach the surface, where they float about in great numbers among the female blossoms, and often cling to them in clusters so as to cover them entirely; thus bringing the stamens and pistils into immediate contact, and giving the anthers an opportunity of discharging their pollen immediately over the stigma. When this operation has been performed, the now uncoiled stalk of the female plant begins again to resume its original and spiral form, and gradually sinks down as it gradually rose, to ripen its fruit at the bottom of the water. We have gathered (in 1819) these stalks in the canals near Padua, upwards of ten feet long.

Sect. VII. *Impregnation of the Seed.*

452. Admitting that the stamens and pistils are the male and female organs of vegetable generation, and that the pollen is the substance by which the impregnation of the seed is effected, how is it conveyed to the ovary? And what is the amount of its action.

Access of the Pollen. — When the stamens and pistils are situated near each other, the elastic spring with which the anther flies open will generally be sufficient to disperse the pollen, so as that part of it must infallibly reach the stigma in such flowers as do not perfect their stamens and pistils at the same time. The pollen is very generally conveyed from the anther to the stigma through the instrumentality of bees, and other insects peculiar to a species. The object of the insect is the discovery of honey, in quest of which, whilst it roves from flower to flower, and rummages the recesses of the corolla, it unintentionally covers its body with pollen, which it conveys to the next flower it visits, and brushes off as it acquired it by rummaging for honey; so that part of it is almost unavoidably deposited on the stigma, and impregnation thus effected. Nor is this altogether so much a work of random as it at first appears. For it has been observed that even insects, which do not upon the whole confine themselves to one species of flower, will yet very often remain during the whole day upon the species they happen first to alight on in the morning; hence the impregnation of the females of *Diœcious* plants where no male is near. Hence also a sort of natural crossing of the breed of plants which might probably otherwise degenerate.

Admitting that the pollen is conducted to the ovary through the channel of the tubes of the style, how after all is the ovary fecundated; or the seed rendered fertile? On this subject naturalists have been much divided; and according to their several opinions have been classed under the respective appellations of ovarists, animalculists, and epigenesists.

According to the opinion of the *Ovarist*, the embryo pre-exists in the ovary, and is fecundated by the agency of the pollen as transmitted to it through the style.

453. *Theory of the Animalculist.* — But the theory of the ovarists is not without its difficulties; for as the embryo is never found to make its appearance till after fecundation, it has been thought that it must necessarily pre-exist in the pollen of the anther; from which it is conveyed to the ovary through the medium of the style, and afterwards matured. This theory was founded upon that of Leuwenhoeck, with regard to animal generation; which supposes the pre-existence of animalcula in the seminal principle of the male; the animalcula being conveyed *in coitu* to the ovary of the female where alone they are capable of developement.

The difficulties inseparable from both theories, together with the phenomenon of hybrid productions, have given rise also to a third; this is the *Theory of the Epigenesists*, who maintain that the embryo pre-exists neither in the ovary nor pollen, but is generated by the union of the fecundating principles of the male and female organs; the former being the fluid issuing from the pollen when it explodes; and the latter, the fluid that exudes from the surface of the stigma when mature. But if the seed is generated from the union of two fecundating principles which form an intermediate offspring, then female plants of the class *Diœcia* ought occasionally to produce seeds whose offspring shall be *Hermaphrodite*, or at least *Monœcious*, which was never yet known to happen.

454. *Hybrids.* — Although the arguments of the epigenesists are by no means satisfactory, yet it cannot be denied, that hybrid productions partake of the properties both of the male and female from which they spring. This was long ago proved to be the fact by Bradley, and more recently confirmed by the experiments of Knight; as well as happily converted to the advantage of the cultivator. Observing that farmers who rear cattle improve the progeny by means of crossing the breed, he presumed from analogy, that the same improvement might be introduced into vegetables. His principal object was that of procuring new and improved varieties of the apple and pear to supply the place of such as had become diseased and unproductive, by being cultivated beyond the period which nature seems to have assigned to their perfection. But as the necessary slowness of all experiments of the kind, with regard to the fruit in question, did not keep pace with the ardor of his desire to obtain information on the subject, he was induced to institute some tentative experiments upon the common pea, a plant well suited to his purpose, both from its quickness of growth, and from the many varieties in form, size, and color, which it afforded. In 1787, a degenerate sort of pea was growing in his garden, which had not recovered its former vigor even when removed to a better soil. Being thus a good subject of experiment, the male organs of a dozen of its immature blossoms were destroyed, and the female organs left entire. When the blossoms had attained their mature state, the pollen of a very large and luxuriant grey pea was introduced into the one half of them, but not into the other. The pods of both grew equally; but the seeds of the half that were unimpregnated withered away, without having augmented beyond the size to which they had attained before the blossoms expanded. The seeds of the other half were augmented and matured as in the ordinary process of impregnation; and exhibited no perceptible difference from those of other plants of the same variety, perhaps, because the external covering of the seed was furnished entirely by the female. But when they were made to vegetate in the succeeding spring, the effect of the experiment was obvious. The plants rose with great luxuriance, indicating in their stem, leaves, and fruit, the influence of this artificial impregnation; the seeds produced were of a dark grey. By impregnating the flowers of this variety with the pollen of others, the color was again changed, and new varieties obtained superior in every respect to the original

on which the experiment was first made, and attaining in some cases, to a height of more than twelve feet. (*Phil. Trans.* 1789.) Knight thinks his experiments on this subject afford examples of superfetation, a phenomenon, the existence of which has been admitted amongst animals, but of which the proof amongst vegetables is not yet quite satisfactory. Of one species of superfetation he has certainly produced examples; that is, when, by impregnating a white pea blossom with the pollen both of a white and grey pea, white and grey seeds were obtained. But of the other species of superfetation, in which one seed is supposed to be the joint issue of two males, the example is not quite satisfactory. Such a production is perhaps possible, and further experiments may probably ascertain the fact; but it seems to be a matter of mere curiosity, and not apparently connected with any views of utility. But the utility of the experiments, in as far as they show the practicability of improving the species, is very obvious. And the ameliorating effect is the same whether by the male or female; as was ascertained by impregnating the largest and most luxuriant plants with the pollen of the most diminutive and dwarfish, or the contrary. By which means any number of varieties may be obtained, according to the will of the experimenter, amongst which some will no doubt be suited to all soils and situations. Knight's experiments of this kind were extended also to wheat; but not with equal success. For though some very good varieties were obtained, yet they were found not to be permanent. But the success of his experiments on the apple-tree were equal to his hopes. This was indeed his principal object, and no means of obtaining a successful issue were left untried. The plants which were obtained in this case were found to possess the good qualities of both of the varieties employed, uniting the greatest health and luxuriance, with the finest and best flavored fruit. Many experiments of a similar nature were tried on other plants also; from which it appeared that improved varieties of every fruit and esculent plant may be obtained by means of artificial impregnation, as they were obtained in the cases already stated. Whence Knight thinks, that this promiscuous impregnation of species has been intended by nature to take place, and that it does in fact often take place, for the purpose of correcting such accidental varieties as arise from seed, and of confining them within narrower limits. All which is thought to be countenanced from the consideration of the variety of methods which nature employs to disperse the pollen, whether by the elastic spring of the anthers, the aid of the winds, or the instrumentality of insects. But although he admits the existence of vegetable hybrids, that is, of varieties obtained from the intermixture of different species of the same genus, yet he does not admit the existence of vegetable mules, that is, of varieties obtained from the intermixture of the species of different genera; in attempting to obtain which he could never succeed, in spite of all his efforts. Hence he suspects that where such varieties have been supposed to take place, the former must have been mistaken for the latter. It may be said, indeed, that if the case exists in the animal kingdom, why not in the vegetable kingdom? to which it is perhaps difficult to give a satisfactory reply. But from the narrow limits within which this intercourse is in all cases circumscribed, it scarcely seems to have been the intention of nature that it should succeed even among animals. Salisbury is of a different opinion, and considers (*Hort. Trans.* 1.364.) that new species may be created both by bees and the agency of man.

Sect. VIII. *Changes consequent upon Impregnation.*

455. Whatever may be thought of the different opinions of the ovarist, animalculist, and epigenesist, and whichsoever of them may be adopted by the phytological inquirer, it is at all events an object of the first importance to trace out the peculiar changes consequent upon impregnation, as effected, whether in the flowers or fruit.

External Changes. — At the period of the impregnation of the ovary the flower has attained to its ultimate stage of perfection, and displayed its utmost beauty of coloring and richness of perfume. But as it is now no longer wanted, so it is no longer provided for in the economy of vegetation. Its period of decline has commenced; as is indicated, first by the decay of the stamens, then of the petals, and then of the calyx, which wither and shrink up, and finally detach themselves from the fruit altogether, except in some particular cases in which one or other of them becomes permanent and falls only with the fruit. The stigma exhibits also similar symptoms of decay, and the style itself often perishes. The parts contiguous to the flower, such as the bractes and floral leaves, are sometimes also affected; and finally the whole plant, at least in the case of annuals, begins to exhibit indications of decay. But while the flower withers and falls, the ovary is advancing to perfection, swelling and augmenting in size, and receiving now all the nutriment by which the decayed parts were formerly supported. Its color begins to assume a deeper and richer tinge; its figure is also often altered, and new parts are even occasionally added — wings, crests, prickles, hooks, bloom, down. The common receptacle of the fruit undergoes also similar changes, becoming sometimes large and succulent, as in the fig and strawberry; and sometimes juiceless and indurated, as in compound flowers.

456. *Internal Changes.* — If the ovary is cut open as soon as it is first discoverable in the flower, it presents to the eye merely a pulpy and homogeneous mass. But if it is allowed to remain till immediately before the period of its impregnation, it will now be found to be divisible into several distinct parts, exhibiting an apparatus of cells, valves, and membranes, constituting the pericarp, and sometimes the external coats of the seed. In this case the umbilical cord is also to be distinguished; but the embryo is not yet visible. These changes therefore are to be attributed merely to the operation of the ordinary laws of vegetable developement, and are not at all dependent upon impregnation. But impregnation has no sooner taken place than its influence begins to be visible; the umbilical cord, which was formerly short and distended, is now generally converted into a long and slender thread. Sometimes the position of the seed is altered. Before impregnation the seeds of *Caryophyllus aromaticus*, and *Metrosideros gummifera*, are horizontal; after impregnation they become vertical. Before impregnation the seeds of *Magnolia* are erect; after impregnation they become inverted and pendulous. The figure of the seed is often also altered in passing from its young to its mature state; changing from smooth to angular, from tapering to oval, from oval to round, and from round to kidney-shaped. But all seeds are not brought to maturity, of which the rudiments may exist in the ovary. *Lagœcia* and *Hasselquestia*, produce uniformly the rudiments of two seeds, of which they mature but one. But the principal changes resulting from impregnation are operated in the seed itself, which, though previously a homogeneous and gelatinous mass, is now converted into an organized body, or embryo. Such are the phenomena, according to the description of Gærtner, accompanying or following the impregnation of all flowers producing seeds; exceptions occur where the fecundation is spurious or incomplete; when the ovary swells but exhibits no traces of perfect seed within, as often happens in the vine and *Tamus*; or when barren and fertile seeds are intermingled together in the same ovary. This proceeds from some defect either in the quantity or quality of the pollen; but rather in the quality, as it is not always plants having the most pollen that produce the most seeds. The two stamens of the *Orchideæ* fecundate 8000 seeds, and the five stamens of tobacco fecundate 900: while the 50 stamens of *Barringtonia*, the 230 of *Thea*, and the 80 of the *Caryophilli*, fecundate only two or three ovaries.

Sect. IX. *The Propagation of the Species.*

457. As the life of the vegetable, like that of the animal, is limited to a definite period, and as a continued supply of vegetables is always wanted for the support of animals, what we call art, or nature operating by means of the animal man, has taken care to institute such means as shall secure the multiplying and perpetuating of the species in all possible cases.

Equivocal Generation. — It was long a vulgar error, countenanced even by the philosophy of the times, that vegetables do often spring up from the accidental mixture of putrid water and earth, or other putrid substances, in the manner of what was called the equivocal generation of animals; or at the very least, that the earth contains the principle of vegetable life in itself, which in order to develope it is only necessary to expose to the action of the air. The former alternative of the error has been long ago refuted; the latter has been also refuted by Malpighi, and has lost its hold, who proved that the earth produces no plant without the intervention of a seed, or of some other species of vegetable germ deposited in it by nature or by art.

458. *Seeds.* — When the seed has reached maturity in the due and regular course of the developement of its several parts, it detaches itself sooner or later from the parent plant, either singly or along with its pericarp, and drops into the soil, where it again germinates and takes root, and springs up into a new individual. Such is the grand means instituted by nature for the replenishing and perpetuating of the vegetable kingdom. If seeds were to fall into the soil merely by dropping down from the plant, then the great mass of them, instead of germinating and springing up into distinct plants, would grow up only to putrefy and decay; to prevent which consequence nature has adopted a variety of the most efficacious contrivances, all tending to the dispersion of the seed. The first means to be mentioned, is that of the elasticity of the pericarp of many fruits, by which it opens when ripe with a sort of sudden spring, ejecting the seed with violence, and throwing it to some considerable distance from the plant. This may be exemplified in a variety of cases; the seeds of oats when ripe are projected from the calyx with such violence, that in a fine and dry day you may even hear them thrown out with a slight and sudden snap in passing through a field that is ripe. The pericarp of the *Dorsiferous Ferns* is furnished with a sort of peculiar elastic ring, intended, as it would appear, for the very purpose of projecting the seeds.

The capsules of the cucumber, *Geranium Geum*, and *Fraxinella*, discharge their seeds also when ripe with an elastic jerk. But the pericarp of *Impatiens*, which consists of one cell with five valves, exhibits perhaps one of the best examples of this mode of dispersion. If it is accidentally touched when ripe it will immediately burst open, while the valves, coiling themselves up in a spiral form, and springing from the stem, discharge the contained seeds and scatter them all around. The bursting of the pericarp of some species of *Pines* is also worthy of notice. The pericarp, which is a cone, remains on the tree till the summer succeeding that on which it was produced, the scales being still closed. But when the hot weather has commenced and continued for some time, so as to dry the cone thoroughly, the scales open of their own accord with a sudden jerk, ejecting the contained seeds: and if a number of them happens to burst together, which is often the case, the noise is such as to be heard at some considerable distance. The twisted awn of *Avena fatua*, or wild oat, as well as that of *Geranium cicutarium*, and some others, seems to have been intended particularly for the purpose of aiding the further dispersion of the seed, after being discharged from the plant or pericarp. This spiral awn or spring, which is beset with a multitude of fine and minute hairs, possesses the property of contracting by means of drought, and of expanding by means of moisture. Hence it remains of necessity in a perpetual state of contraction or dilatation, dependent upon change of weather; from which, as well as from the additional aid of the fine hairs, which act as so many fulcra, and cling to whatever object they meet, the seed to which it is attached is kept in continual motion till it either germinates or is destroyed. The awn of barley, which is beset with a multitude of little teeth all pointing to its upper extremity, presents also similar phenomena. For when the seed with its awn falls from the ear and lies flat upon the ground, it is necessarily extended in its dimensions by the moisture of the night, and contracted by the drought of the day. But as the teeth prevent it from receding in the direction of the point, it is consequently made to advance in the direction of the base of the seed, which is thus often carried to the distance of many feet from the stalk on which it grew. If any one is yet sceptical with regard to the travelling capacity of the awn, let him only introduce an awn of barley with the seed uppermost between his coat and shirt sleeve at the wrist, when he walks out in the morning, and by the time he returns to breakfast, if he has walked to any great distance he will find it up at his arm-pit. This journey has been effected by means of the continued motion of the arm, and consequently of the teeth of the awn acting as feet to carry it forward. It is obvious, however, that the modes of dispersion now stated can never carry the seed to any great distance; but where distance of dispersion is required, nature is also furnished with a resource. One of the most common modes by which seeds are conveyed to a distance from their place of growth is that of the instrumentality of animals. Many seeds are thus carried to a distance from the place of growth merely by their attaching themselves to the bodies of such animals as may happen accidentally to come in contact with the plant in their search after food; the hooks or hairs with which one part or other of the fructification is often furnished serving as the medium of attachment, and the seed being thus carried about with the animal till it is again detached by some accidental cause, and at last committed to the soil. This may be exemplified in the case of the *Bidens* and *Myosotis*, in which the hooks or prickles are attached to the seed itself; or in the case of *Galium aparine* and others, in which they are attached to the pericarp; or in the case of the thistle and burdock, in which they are attached to the general calyx. Many seeds are dispersed by animals in consequence of their pericarps being used as an animal food. This is often the case with the seeds of the drupe, as cherries, sloes, and haws, which birds often carry away till they meet with some convenient place for devouring the pulpy pericarp, and then drop the stone into the soil. And so also fruit is dispersed that has been hoarded up for the winter, though even with the view of feeding on the seed itself, as in the case of nuts hoarded up by squirrels, which are often dispossessed by some other animal, that not caring for the hoard scatters and disperses it. Sometimes the hoard is deposited in the ground itself, in which case part of it is generally found to take root and spring up into plants. Though it has been observed that the ground squirrel often deprives the kernel of its germ before it deposits the fruit it collects. Crows have been also observed to lay up acorns and other seeds in the holes of fence-posts, which being either forgot or accidentally thrust out, fall ultimately into the earth and germinate. But sometimes the seed is even taken into the stomach of the animal, and afterwards deposited in the soil, having passed through it unhurt. This is often the case with the seed of many species of berry, such as the misletoe, which the thrush swallows and afterwards deposits upon the boughs of such trees as it may happen to alight upon. The seeds of the *Loranthus americanus*, another parasitical plant, are said to be deposited in like manner on the branches of the *Coccoloba grandiflora*, and other lofty trees; as also the seeds of *Phytolacca decandria*, the berries of which are eaten by the robin, thrush, and wild pigeon. And so also the seeds of currants or roans are sometimes deposited, after having been swallowed by black-birds or other birds, as may be seen by observing a currant-bush or young roan-tree growing out of the cleft of another tree, where the seed has been left, and where there may happen to have been a little dust collected by way of soil; or where a natural graft may have been effected by the insinuation of the radicle into some chink or cleft. It seems indeed surprising that any seeds should be able to resist the heat and digestive action of the stomach of animals; but it is undoubtedly the fact. Some seeds seem even to require it. The seeds of *Magnolia glauca*, which have been brought to this country, are said to have generally refused to vegetate till after undergoing this process, and it is known that some seeds will bear a still greater degree of heat without any injury. Spallanzani mentions some seeds that germinated after having been boiled in water: and Du Hamel gives an account of some others that germinated even after having been exposed to a degree of heat measuring 235° of Fahrenheit. In addition to the instrumentality of brute animals in the dispersion of the seed might be added also that of man, who for purposes of utility or of ornament, not only transfers to his native soil seeds indigenous to the most distant regions, but sows and cultivates them with care. One of the most effective modes of dispersion instituted by nature, is that of the agency of winds. Some seeds are fitted for this mode of dispersion from their extreme minuteness, such as those of the mosses, lichens, and fungi, which float invisibly on the air, and vegetate wherever they happen to meet with a suitable soil. Others are fitted for it by means of an attached wing, as in the case of the fir-tree and *Liriodendron tulipifera*, so that the seed in falling from the cone or capsule, is immediately caught by the wind and carried to a distance. Others are peculiarly fitted for it by means of their being furnished with an aigrette or down, as in the case of the dandelion, goat's-beard, and thistle, as well as most plants of the class *Syngenesia*; the down of which is so large and light in proportion to the seed it supports, that it is wafted on the most gentle breeze, and often seen floating through the atmosphere in great abundance at the time the seed is ripe. Others are fitted for this mode of dispersion by means of the structure of their pericarp, which is also wafted along with them, as in the case of *Staphylea trifolia*, the inflated capsule of which seems as if obviously intended thus to aid the dispersion of the contained seed by its exposing to the wind a large and distended surface with but little weight. And so also in the case of the maple, elm, and ash, the capsules of which are furnished, like some seeds, with a membranous wing, which when they separate from the plant the wind immediately lays hold of and drives before it. Finally, a further means adopted by nature for the dispersion of the seeds of vegetables is that of the instrumentality of streams, rivers, and currents of the ocean. The mountain-stream or torrent washes down to the valley the seeds which may accidentally fall into it, or which it may happen to sweep from its banks when it suddenly overflows them. The broad and majestic river, winding along the extensive plain, and traversing the continents of the world, conveys to the distance of many hundreds of miles the seeds that may have vegetated at its source. Thus the southern shores of the Baltic are visited by seeds which grew in the interior of Germany, and the western shores of the Atlantic by seeds that have been generated in the interior of America. But fruits indigenous to America and the West Indies have sometimes been found to be swept along by the currents of the ocean to the western shores of Europe. The fruit of *Mimosa scandens*, *Dolichos pruriens*, *Guilindina bonduc*, and *Anacardium occidentale*, or cashew-nut, have been thus known to be driven across the Atlantic to a distance of upwards of 2000 miles: and although the fruits now adduced as examples are not such as could vegetate on the coast on which they were thrown, owing to soil or climate; yet it is to be believed that fruits may have been often thus transported to climates or countries favorable to their vegetation.

459. *Gems.* — Though plants are for the most part propagated by means of seeds, yet many of them are propagated also by means of gems, that is bulbs and buds. The gem is an organized substance bursting from the surface of the plant without the aid of sexual apparatus, or previous fecundation; and developing its parts, either by forming a continued extension of the parent plant, or by detaching itself from the parent plant altogether, and forming a new individual. This definition is obviously applicable, in one alternative or other, both to the bud and bulb; by which last it is well known that the species is often propagated, as in the very common case of bulbous rooted plants. But the species is also often propagated by means of the caulinary bulb, which generally appears in the axil of the leaves, as in *Dentaria bulbifera* and *Lilium bulbiferum*; or between the spokes of their umbels, as in *Allium canadense*; in the midst of the spike of flowers, as in *Polygonum viviparum* and *Poa alpina*. As plants of this last kind are mostly alpine, it has been thought to be an institution or resource of nature to secure the propagation of the species in situations where the seed may fail to ripen. The bud, though it does not spontaneously detach itself from the plant and form a new

individual, will yet sometimes strike root and develope its parts if carefully separated by art and planted in the earth: but this is to be understood of the leaf-bud only, for the flower-bud, according to Mirbel, if so treated, always perishes. The species may sometimes be propagated even by means of the leaves; as in the aloe, sea-onion, and some species of arum, which if carefully deposited in the soil will grow up into new plants, by virtue, no doubt, of some latent gem contained in them. The *Fungi* and *Lichens*, according to Gærtner, are all gemmiferous, having no sexual organs, and no pollen impregnating a germ. In the genus *Lycoperdon*, the gelatinous substance that pervades the cellular tissue is converted into a proliferous powder; in *Clavaria*, the fluid contained in the cavities of the plant is converted into a proliferous powder also: and in the *Agarics*, *Hydnum*, and *Boletus*, vesicles containing soboliferous granules are found within the *lamina*, pores, or tubes. Hedwig, on the contrary, ascribes to the *Fungi* a sexual apparatus, and maintains that the pollen is lodged in the volva. But here it is to be recollected as in the cases of the *Scutellæ* of the *Lichens*, that all *Fungi* are not furnished with a volva, and consequently not furnished with pollen. The *Confervæ* and *Ulva*, together with the genera *Blasia* and *Riccia*, are also, according to Gærtner, propagated only by gems; while *Marchantia*, *Anthoceros*, *Jungermania*, and *Lycoperdon*, are said to be propagated both by gems and seeds.

460. *Runners* are young shoots issuing from the collar or summit of the root, and creeping along the surface of the soil; but producing a new root and leaves at the extremity, and forming a new individual, by the decay of the connecting link, as in the strawberry.

461. The process of raising perennials by *slips* is well-known to gardeners, and should perhaps be regarded as an extension of the old plant, rather than as the generation of a new one; though it serves the purpose of the cultivator equally well as a plant raised from seed, with the additional advantage of bearing fruit much sooner. But how is the root generated which the slip thus produces? If the trunk of a tree is lopped, and all its existing buds destroyed, then there will be protruded from between the wood and bark a sort of protuberant lip or ring formed from the proper juice, and from which there will spring a number of young shoots. The formation of the root in the case of the slip is effected in the same manner, the moisture of the soil encouraging the protrusion of buds at and near the section; and the bud that would have been converted into a branch above ground is converted into a root below.

462. The mode of propagation by layers is practised upon trees that are delicate, and which cannot readily be propagated by means of slips; in which case the root is generated nearly as in the former, the soil stimulating the protrusion of buds which are converted into roots. In many plants, such as the currant and laurel, this is altogether a natural process effected by the spontaneous bending down of a branch to the surface of the soil.

463. Many plants protrude annually from the collar a number of young shoots, encircling the principal stem and depriving it of a portion of its nourishment, as in the case of most fruit-trees. Others send out a horizontal root, from which there at last issues a bud that ascends above the soil and is converted into a little stem, as in the case of the elm-tree and *Syringa*. Others send out a horizontal shoot from the collar or its neighbourhood; or a shoot that ultimately bends down by its own weight till it reaches the ground, in which it strikes root and again sends up a stem as in the currant-bush and laurel. The two former are called *suckers* or *off-sets*, though the term off-set should perhaps be restricted to the young bulbs that issue and detach themselves annually from bulbous roots. The latter is not designated by any particular name, but may be regarded as a sort of natural layer, resembling also, in some respect, the runner; from which, however, it is distinguished in that it never detaches itself spontaneously from the parent plant, as is the case also with the two former. But if either of them is artificially detached together with a portion of root, or a slice of the collar adhering to it, it will now bear transplanting, and will constitute a distinct plant.

464. The species is also often propagated, or at least the variety is multiplied, by means of *grafting*, which is an artificial application of a portion of the shoot of one tree to the stem or branch of another, so as that the two shall coalesce together and form but one plant. The shoot which is to form the summit of the new individual is called the graft; and the stem to which it is affixed is called the stock. As the graft is merely an extension of the parent plant from which it came, and not properly speaking a new individual, so it is found to be the best method of propagating approved varieties of fruit-trees without any danger of altering the quality of the fruit, which is always apt to be incurred in propagating from seed, but never in propagating from the graft. The graft will also bear fruit much sooner than the tree that is raised from seed; and, if effected on a proper stock, will be much more hardy and vigorous than if left on the

parent plant. And hence the great utility of grafting in the practice of gardening. Inarching and inoculation are varieties of this operation.

Sect. X. *Causes limiting the Propagation of the Species.*

465. From the various sources of vegetable reproduction, but particularly from the fertility and dispersion of the seed, the earth would soon be over-run with plants of the most prolific species, and converted again into a desert, if it were not that nature has set bounds to their propagation by subjecting them to the control of man, and to the depredations of the great mass of animals; as well as in confining the germination of their seeds to certain and peculiar habitations arising from soil, climate, altitude, and other circumstances. In order to form an idea of the manner in which these act upon vegetation; imagine that every year an enormous quantity of seeds, produced by the existing vegetables, are spread over the surface of the globe, by the winds and other causes already mentioned, all of these seeds which fall in a scite suitable for their vegetation, and are not destroyed by animals, germinate and produce plants; then among these plants, the strongest, the largest, and those to which the soil is best suited, develope themselves in number and magnitude so as to choke the others. Such is the general progress of nature, and among plants, as among animals, the strong florish at the expense of the weak. These causes have operated for such a length of time, that the greater number of species are now fixed and considered as belonging to certain soils, situations, and climates, beyond which they seldom propagate themselves otherwise than by the hands of man.

Sect. XI. *Evidence and Character of Vegetable Vitality.*

466. The best and most satisfactory evidence of the presence and agency of a vital principle as inherent in any subject is, perhaps, that of its rendering the subject in which it inheres capable of counteracting the laws of chemical affinity. This rule, which seems to have been first instituted by Humboldt, is obviously applicable to the case of animals, as is proved by the process of the digestion of the food, and its conversion into chyle and blood; as well as from the various secretions and excretions effected by the several organs, and effecting the growth and developement of the individual, in direct opposition to the acknowledged laws of chemical affinity, which, as soon as the vital principle is extinct, begin immediately to give indication of their action in the incipient symptoms of the putrefaction of the dead body. But the rule is also applicable to the case of vegetables, as is proved by the introsusception, digestion, and assimilation of the food necessary to their developement; all indicating the agency of a principle capable of counteracting the laws of chemical affinity; which, at the period of what is usually called the death of the plant, begin also immediately to act, and to give evidence of their action in the incipient symptoms of the putrefaction of the vegetable. Vegetables are therefore obviously endowed with a species of vitality. But admitting the presence and agency of a vital principle inherent in the vegetable subject, what are the peculiar properties by which this principle is characterised?

467. One of the most distinguishable properties of the vital principle of vegetables is that of its *excitability*, or capacity of being acted upon by the application of natural *stimuli*, impelling it to the exertion of its vegetative powers; the natural stimuli thus impelling it being light and heat.

The stimulating influence of light upon the vital principle of the plant is discoverable, whether in the stem, leaf, or flower. The direction of the stem is influenced by the action of light, as well as the color of its leaves. Distance from direct rays of light or weak light produces etiolation, and its absence blanching. The luxuriance of branches depends on the presence and action of light, as is particularly observable in the case of hot-house plants, the branches of which are not so conspicuously directed, either to the flue in quest of heat, or to the door or open sash in quest of air, as to the sun in quest of light. Hence also the branches of plants are often more luxuriant on the south than on the north side; or at least on the side that is best exposed to light. The position of the leaf is also strongly affected by the action of light to which it uniformly turns its upper surface. This may be readily perceived in the case of trees trained to a wall, from which the upper surface of the leaf is by consequence always turned; being on a south wall turned to the south, and on a north wall turned to the north. And if the upper surface of the leaf is forcibly turned towards the wall, and confined in that position for a length of time, it will soon resume its primitive position upon regaining its liberty, but particularly if the atmosphere is clear. The leaves of the mallow are said to exhibit but slight indications of this susceptibility, as also sword-shaped leaves; and also those of the mistletoe, are equally susceptible on both sides. It had been conjectured that these effects are partly attributable to the agency of heat; and to try the value of the conjecture, Bonnet placed some plants of the *Atriplex* in a stove, heated to 25° of Reaumur. Yet the stems were not inclined to the side from which the greatest degree of heat came; but to a small opening in the stove. Heat then does not seem to exert any perceptible influence in the production of the above effects. Does moisture? Bonnet found that the leaves of the vine exhibited the same phenomenon when immersed in water, as when left in the open air. Whence it seems probable that light is the sole agent in the production of the effects in question. But as light produces such effects upon the leaves, so darkness or the absence of light produces an effect quite the contrary; for it is known that the leaves of many plants assume a very different position in the night from what they have in the day. This is particularly the case with winged leaves, which, though fully expanded during the day, begin to droop and bend down about sun-set and during the fall of the evening dew, till they meet together on the inferior side of the leaf-stalk, the terminal lobe, if the leaf is furnished with one, folding itself back till it reaches the first pair; or the two side lobes, if the leaf is trifoliate, as in the case of common clover. So also the leaflets of the false acacia and liquorice hang down during the night, and those of *Mimosa pudica*, fold themselves up along the common foot-stalk so as to overlap one another. Linnæus has designated the above phenomenon by the appellation of *The Sleep of Plants*. The expansion of the flower is also effected by the action of light. Many plants do not fully expand their petals except when the sun shines; and hence alternately open them during the day and shut them up during the night. This may be exemplified in the case of papilionaceous flowers in general, which spread out their wings in fine weather to admit the rays of the sun, and again fold them up as the night approaches. It may be exemplified also in the case of compound flowers, as in that of the dandelion and hawkweed. But the most singular case of this kind is perhaps that of the *Lotus* of the Euphrates, as described by Theophrastus, which he represents as rearing and expanding its blossom by day, closing and sinking down beneath the surface of the water by night, so as to be beyond the grasp of the hand, and again rising up in the morning to present its expanded blossom to the sun. The same phenomenon is related also by Pliny. But although many plants open their flowers in the morning and shut them again in the evening, yet all flowers do not open and shut at the same time. Plants of the same species are tolerably regular as to time, other circumstances being the same; and hence the daily opening and shutting of the flower has been denominated by botanists *The Horologium Floræ*. Flowers requiring but a slight application of stimulus open early in the morning, while others requiring more open somewhat later. Some do not open till noon, and some, whose extreme delicacy cannot bear the action of light at all, open only at night, such as the *Cactus grandiflora*, or night-blowing *Cereus*. But it seems somewhat doubtful whether or not light is the sole agent in the present case; for it has been observed that equatorial flowers open always at the same hour, and that tropical flowers change their hour of opening according to the length of the day. It has been observed also, that the flowers of plants that are removed from a warmer to a colder climate expand at a later hour in the latter. A flower that opens at six o'clock in the morning at Senegal, will not open in France or England till eight or nine; nor in Sweden till ten. A flower that opens at ten o'clock at Senegal will not open in France or England till noon or later, and in Sweden it will not open at all. And a flower that does not open till noon or later at Senegal, will not open at all in France or England. This seems as if heat or its absence were also an agent in the opening and shutting of flowers; though the opening of such as blow only in the night cannot be attributed either to light or heat. But the opening or shutting of some flowers depends not so much on the action of the stimulus of light as on the existing state of the atmosphere, and hence their opening or shutting betokens change. If the Siberian sowthistle shuts at night, the ensuing day will be fine; and if it opens, it will be cloudy and rainy. If the African marigold continues shut after seven o'clock in the morning, rain is near at hand. And if the *Convolvulus arvensis*, *Calendula fluvialis*, or *Anagallis arvensis*, are even already open, they will shut upon the approach of rain, the last of which, from its peculiar susceptibility, has obtained the name of the poor man's weather-glass. But some flowers not only expand during the light of day; they incline also towards the sun, and follow his course, looking towards the east in the morning, towards the south at noon, and towards the west in the evening; and again returning in the night to their former position in the morning. Such flowers are designated by the appellation of *Heliotropes*, on account of their following the course of the sun; and the movement they thus exhibit is denominated their *nutation*. This phenomenon had been observed by the ancients long before they had made any considerable progress in botany, and had even been interwoven into their mythology, having originated, according to the records of fabulous history, in one of the metamorphoses of early times. Clytie, inconsolable for the loss of the affections of Sol, by whom she had been formerly beloved, and of whom she was still enamoured, is represented as brooding over her griefs in silence and solitude; where, refusing all sustenance, and seated upon the cold ground, with her eyes invariably fixed on the sun during the day, and watching for his return during the night, she is at length transformed into a flower, retaining, as much as a flower can retain it, the same unaltered attachment to the sun. This is the flower which is denominated *Heliotropium* by the ancients, and described by Ovid as *Flos qui ad solem vertitur.* But it is to be observed, that the flower alluded to by Ovid cannot be the *Heliotropium* of the moderns, because Ovid describes it as resembling the violet: much less can it be the sun-flower of the moderns, which is a native of America, and could not consequently have been known to Ovid; so that the true *Heliotropium* of the ancients is perhaps not yet ascertained. Bonnet has further remarked that the ripe ears of corn, which bend down with weight of grain, scarcely ever incline to the north, but always less or more to the south; of the accuracy of which remark any one may easily satisfy himself by looking at a field of wheat ready for the sickle; he will find the whole mass of ears nodding, as if with one consent to the south. The cause of the phenomenon has been supposed to be a contraction of the fibres of the stem or flower-stalk on the side exposed to the sun; and this contraction has been thought by De la Hire and Dr. Hales to be occasioned by an excess of transpiration on the sunny side; which is probably the fact, though there seems upon this principle to be some difficulty in accounting for its returning at night; because if you say that the contracted side expands and relaxes by moisture, what is it that contracts the side that was relaxed in the day? The moisture, of which it is no doubt still full, would counteract the contraction of its fibres, and prevent it from resuming its former position in the morning.

468. Heat as well as light acts also as a powerful stimulus to the exertion of the vital principle. This has been already shown in treating of the process of germination; but the same thing is observable with regard to the developement and maturation of the leaves, flower, and fruit; for although all plants produce their leaves, flower, and fruit, annually, yet they do not all produce them at the same period or season. This forms the foundation of what Linnæus has called the *Calendarium Floræ*, including a view of the several periods of the frondescence and efflorescence of plants, together with that of the maturation of the fruit.

469. *Frondescence.* — It must be plain to every observer, that all plants do not protrude their leaves at the same season, and that even of such as do protrude them in the same season, some are earlier and some later. The honeysuckle protrudes them in the month of January; the gooseberry, currant, and elder, in the end of February, or beginning of March; the willow, elm, and lime-tree, in April; and the oak and ash, which are always the latest among trees, in the beginning or towards the middle of May. Many annuals do not come up till after the summer solstice; and many mosses not till after commencement of winter. This gradual and successive unfolding of the leaves of different plants seems to arise from the peculiar susceptibility of the species to the action of heat, as requiring a greater or less degree of it to give the proper stimulus to the vital principle. But a great many circumstances will always concur to render the time of the unfolding of the leaves somewhat irregular; because the mildness of the season is by no means uniform at the same period of advancement; and because the leafing of the plant depends upon the peculiar degree of temperature, and not upon the return of a particular day of the year. Hence it has been thought that no rule could be so good for directing the husbandman in the sowing of his several sorts of grain as the leafing of such species of trees as might be found by observation to correspond best to each sort of grain respectively, in the degree of temperature required. Linnæus (Stillingfleet informs us) instituted some observations on the subject about the year 1750, with a view chiefly to ascertain the time proper for the sowing of barley in Sweden, regarded the leafing of the birch-tree as being the best indication for that grain, and recommended the institution of similar observations with regard to other sorts of grain, upon the ground of its great importance to the husbandman: who may be said to attend to it in a manner instinctively, though all trees of the same species do not come into leaf precisely at the same time, and as the weather may alter even after the most promising indications, no guide natural or artificial can be absolutely depended on with a view to future results.

470. *Efflorescence.* — The flowering of the plant, like the leafing, seems to depend upon the degree of temperature induced by the returning spring, as the flowers are also protruded pretty regularly at the same successive periods of the season. The mezereon and snow-drop protrude their flowers in February; the primrose in the month of March; the cowslip in April; the great mass of plants in May and June; many in July, August, and September; some not till the month of October, as the meadow saffron; and some not till the approach or middle of winter, as the *Laurustinus* and *Arbutus.* Such at least is the period of their flowering in this

country; but in warmer climates they are earlier, and in colder climates they are later.

Between the tropics, where the degree of heat is always high, it often happens that plants will flower more than once in the year; because they do not there require to wait till the temperature is raised to a certain height, but merely till the developement of their parts can be effected in the regular operation of nature, under a temperature already sufficient. For the greater part, however, they flower during our summer, though plants in opposite hemispheres flower in opposite seasons. But in all climates the time of flowering depends also much on the altitude of the place as well as on other causes affecting the degree of heat. Hence plants occupying the polar regions, and plants occupying the tops of the high mountains of southern latitudes are in flower at the same season; and hence the same flowers are later in opening in North America than in the same latitudes in Europe, because the surface of the earth is higher, or the winters more severe.

471. *Maturation of the Fruit.* — Plants exhibit as much of diversity in the warmth and length of time necessary to mature their fruit as in their frondescence and flowering; but the plant that flowers the soonest does not always ripen its fruit the soonest. The hazle-tree, which blows in February, does not ripen its fruit till autumn; while the cherry, that does not blow till May, ripens its fruit in June. It may be regarded, however, as the general rule, that if a plant blows in spring it ripens its fruit in summer, as in the case of the currant and gooseberry; if it blows in summer it ripens its fruit in autumn, as in the case of the vine; and if it blows in autumn it ripens its fruit in the winter. But the meadow saffron, which blows in the autumn, does not ripen its fruit till the succeeding spring.

472. Such are the primary facts on which a *Calendarium Floræ* should be founded. They have not hitherto been very minutely attended to by botanists; and perhaps their importance is not quite so much as has been generally supposed: but they are at any rate sufficiently striking to have attracted the notice even of savages. Some tribes of American Indians act upon the very principle suggested by Linnæus, and plant their corn when the wild plum blooms, or when the leaves of the oak are about as large as a squirrel's ears. The names of some of their months are also designated from the state of vegetation. One is called the budding month, and another the flowering month; one the strawberry month, and another the mulberry month: and the autumn is designated by a term signifying the fall of the leaf. Thus the proposed nomenclature of the French for the months and seasons is founded in nature. As the elevation of temperature induced by the heat of summer is essential to the full exertion of the energies of the vital principle, so the depression of temperature consequent upon the colds of winter has been thought to suspend the exertion of the vital energies altogether. But this opinion is evidently founded on a mistake, as is proved by the example of such plants as protrude their leaves and flowers in the winter season only, such as many of the mosses; as well as by the dissection of the yet unfolded buds at different periods of the winter, even in the case of such plants as protrude their leaves and blossoms in the spring and summer, and in which it has been already shown there is a regular, and gradual, and incipient developement of parts, from the time of the bud's first appearance till its ultimate opening in the spring. The sap, it is true, flows much less freely, but is not wholly stopped. Du Hamel planted some young trees in the autumn, cutting off all the smaller fibres of the root, with a view to watch the progress of the formation of new ones. At the end of every fortnight he had the plants taken up and examined with all possible care to prevent injuring them, and found that, when it did not actually freeze, new roots were always uniformly developed. Hence it follows, that even during the period of winter, when vegetation seems totally at a stand, the tree being stripped of its foliage, and the herb apparently withering in the frozen blast, still the energies of vegetable life are exerted; and still the vital principle is at work, carrying on in the interior of the plant, concealed from human view, and sheltered from the piercing frosts, operations necessary to the preservation of vegetable life, or protrusion of future parts; though it requires the returning warmth of spring to give that degree of velocity to the juices which shall render their motion cognizable to man, as well as that expression to the whole plant which is the most evident token of life: in the same manner as the processes of respiration, digestion, and the circulation of the blood are carried on in the animal subject even while asleep; though the most obvious indications of animal life are those of the motions of the animal when awake. Heat then acts as a powerful stimulus to the operations of the vital principle, accelerating the motion of the sap, and consequent developement of parts; as is evident from the sap's beginning to flow much more copiously as the warmth of spring advances, as well as from the possibility of anticipating the natural period of their developement by forcing them in a hot-house. But it is known that excessive heat impedes the progress of vegetation as well as excessive

cold; both extremes being equally prejudicial. And hence the sap flows more copiously in the spring and autumn, than in either the summer or winter; as may readily be seen by watching the progress of the growth of the annual shoot, which, after having been rapidly protruded in the spring, remains for a while stationary during the great heat of summer, but is again elongated during the more moderate temperature of autumn. There are also several substances which have been found to operate as stimulants to the agency of the vital principle when artificially dissolved in water, and applied to the root or branch. Oxygenated muriatic acid has been already mentioned: and the vegetation of the bulbs of the hyacinth and narcissus is accelerated by means of the application of a solution of nitre. Dr. Barton of Philadelphia, found that a decaying branch of *Liliodendron tulipifera*, and a faded flower of the yellow iris recovered and continued long fresh when put into water impregnated with camphor; though flowers and branches, in all respects similar, did not recover when put into common water.

473. *Irritability.*—Plants are not only susceptible to the action of the natural stimuli of light and heat, exciting them gradually to the exercise of the functions of their different organs in the regular progress of vegetation; they are susceptible also to the action of a variety of accidental or artificial stimuli, from the application of which they are found to give indications of being endowed also with a property similar to what we call irritability in the animal system. This property is well exemplified in the genus *Mimosa*; but particularly in that species known by the name of the *Sensitive Plant*; and the *Dionæa Muscipula* and *Drosera*. But sometimes the irritability resides in the flower, and has its seat either in the stamens or style. The former case is exemplified in the flower of the berberry and *Cactus Tuna*, and the latter in *Stylidium glandulosum*.

474. From the facts adduced in the preceding sections, it is evident that plants are endowed with a capacity of being acted upon by the application of *stimuli*, whether natural or artificial, indicating the existence of a vital principle, and forming one of the most prominent features of its character. But besides this obvious and acknowledged property, it has been thought by some phytologists that plants are endowed also with a species of *sensation*. Sir J. E. Smith seems rather to hope that the doctrine may be true, than to think it so.

475. There is also a variety of phenomena exhibited throughout the extent of the vegetable kingdom, some of which are common to plants in general, and some peculiar to certain species, that have been thought by several botanical writers to exhibit indications, not merely of sensation, but of *instinct*. The tendency of plants to incline their stem and to turn the upper surface of the leaves to the light, the direction which the extreme fibres of the root will often take to reach the best nourishment, the folding up of the flower on the approach of rain, the rising and falling of the water-lily, and the peculiar and invariable direction assumed by the twining stem in ascending its prop, are among the phenomena that have been attributed to instinct. P. Keith has endeavoured (*Lin. Trans.* xi. p. 11.) to establish the doctrine of the existence and agency of an instinctive principle in the plant, upon the ground of the direction invariably assumed by the radicle and plumelet respectively in the germination of the seed.

476. *Definition of the Plant.* — But if vegetables are living beings endowed with sensation and instinct, or any thing approaching to it, so as to give them a resemblance to animals, how are we certainly to distinguish the plant from the animal? At the extremes of the two kingdoms the distinction is easy; the more perfect animals can never be mistaken for plants, nor the more perfect plants for animals, but at the mean, where the two kingdoms may be supposed to unite, the shades of discrimination are so very faint or evanescent that of some individual productions it is almost impossible to say to which of the kingdoms they belong. Hence it is that substances which have at one time been classed among plants, have at another time been classed among animals; and there are substances to be met with whose place has not yet been satisfactorily determined. Of these I may exemplify the genus *Corollina*, which Linnæus placed among animals, but which Gærtner places among plants. Linnæus, Bonnet, Hedwig, and Mirbel, have each given particular definitions. According to P. Keith, a vegetable is an organized and living substance springing from a seed or gem, which it again produces; and effecting the developement of its parts by means of the introsusception and assimilation of unorganized substances, which it derives from the atmosphere or the soil in which it grows. The definition of the animal in the counterpart: an animal is an organized and living being proceeding from an egg or embryo, which it again produces; and effecting the developement of its parts by means of the introsusception of organized substances, or their products. For all practical purposes, perhaps plants may be distinguished from animals with sufficient accuracy by means of the trial of burning; as animal substances in a state of ignition exhale a strong and phosphoric odour, which vegetable substances do not.

Chap. IX.

Vegetable Pathology, or the Diseases and Casualties of Vegetable Life.

As plants are, like animals, organized and living beings, they are, like animals also, liable to such accidental injuries and disorders as may affect the health and vigour, or occasion the death of the individual. These are wounds, diseases, and natural decay.

Sect. I. *Wounds.*

477. A wound is a forcible separation of the solid parts of the plant effected by means of some external cause, intentional or accidental.

Incisions are sometimes necessary to the health of the tree, in the same manner perhaps as bleeding is necessary to the health of the animal. The trunk of the plum and cherry-tree seldom expand freely till a longitudinal incision has been made in the bark; and hence this operation is often practised by gardeners. If the incision affects the epidermis only it heals up without leaving any scar; if it penetrates into the interior of the bark, it heals up only by means of leaving a scar; if it penetrates into the wood, the wound in the wood itself never heals up completely, but new wood and bark are formed above it as before.

478. *Boring* is an operation by which trees are often wounded for the purpose of making them part with their sap in the season of their bleeding, particularly the birch-tree and American maple. A horizontal or rather slanting hole is bored in them with a wimble, so as to penetrate an inch or two into the wood, from this the sap flows copiously; and though a number of holes is often bored in the same trunk, the health of the tree is not very materially affected. For trees will continue to thrive though subjected to this operation for many successive years; and the hole, if not very large, will close up again like the deep incision, not by the union of the broken fibres of the wood, but by the formation of new bark and wood projecting beyond the edge of the orifice, and finally shutting it up altogether.

479. *Girdling* is an operation to which trees in North America are often subjected when the farmer wishes to clear his land of timber. It consists in making parallel and horizontal incisions with an axe into the trunk of a tree, and carrying them quite round the stem so as to penetrate through the *alburnum*, and then to scoop out the intervening portion. If this operation is performed early in the spring, and before the commencement of the bleeding season, the tree rarely survives it; though some trees that are peculiarly tenacious of life, such as *Acer saccharinum* and *Nyssa integrifolia*, have been known to survive it a considerable length of time.

480. If a tree is bent so as to *fracture* part only of the cortical and woody fibres, and the stem or branch but small, the parts will again unite by being put back into their natural position, and well propped up. Especially the cure may be expected to succeed if the fracture happens in the spring; but it will not succeed if the fracture is accompanied with contusion, or if the stem or branch is large; and even where it succeeds the woody fibres do not contribute to the union, but the granular and herbaceous substance only which exudes from between the wood and liber, insinuating itself into all interstices and finally becoming indurated into wood.

481. Wounds are necessarily inflicted by the gardener or forester in the *pruning* or lopping off of superfluous branches, but this is seldom attended with any bad effects to the health of the tree, if done by a skilful practitioner: indeed no further art is required merely for the protection of the tree beyond that of cutting the branch through in a sloping direction so as to prevent the rain from lodging. In this case the wound soon closes up by the induration of the exposed surface of the section, and by the protrusion of a granular substance, forming a sort of circular lip between the wood and bark; and hence the branch is never elongated by the growth of the same vessels that have been cut, but by the protrusion of new buds near the point of section.

482. In the operation of *grafting* there is a wound both of the stock and graft; which are united, not by the immediate adhesion of the surfaces of the two sections, but by means of a granular and herbaceous substance exuding from between the wood and bark, and insinuating itself as a sort of cement into all open spaces: new wood is finally formed within it, and the union is complete.

483. *Felling* is the operation of cutting down trees close to the ground, which certain species will survive, if the stump is protected from the injuries of animals, and the root fresh and vigorous. In this case the fibres of the wood are never again regenerated, but a lip is formed as in the case of pruning; and buds, that spring up into new shoots, are protruded near the section: so that from the old shoot, ten, twelve, or even twenty new stems may issue according to its size and vigour. The stools of the oak and ash-tree will furnish good examples; but there are some trees, such as the fir, that never send out any shoots after the operation of felling.

484. If *buds are destroyed* in the course of the winter, or in the early part of the spring, many plants will again generate new buds that will develope their parts as the others would have done, except that they never contain blossom or fruit. Du Hamel thought these buds sprang from pre-organized germs which he conceived to be dispersed throughout the whole of the plant; but Knight thinks he has discovered the true source of the regeneration of buds, in the proper juice that is lodged in the alburnum. Buds thus regenerated never contain or produce either flower or fruit. Perhaps because the fruit bud requires more time to develope its parts, or a peculiar and higher degree of elaboration; and that this hasty production is only the effect of a great effort of the vital principle for the preservation of the individual, and one of those wonderful resources to which nature always knows how to resort when the vital principle is in danger. But though such buds do not produce flowers directly, as in the case of plants that bear their blossoms on last year's wood; yet they often produce young shoots which produce blossoms and fruit the same season, as in the case of cutting down an old vine, or pruning the rose.

485. Sometimes the *leaves of a tree are destroyed* partially or totally as soon as they are protruded from the bud, whether by the depredations of caterpillars or other insects, or by the browsing of cattle. But if the injury is done early in the spring, new leaves will be again protruded with subsequent shoots. Some trees will bear to be stripped even more than once in a season, as is the case with the mulberry-tree, which they cultivate in the south of France and Italy for the purpose of feeding the silk-worm. But if it is stripped more than once in the season it requires now and then a year's rest.

486. The *decortication* of a tree, or the stripping it of its bark, may be either intentional or accidental, partial or total. If it is partial, and affects the epidermis only, then it is again regenerated, as in the case of slight incision, without leaving any scar. But if the epidermis of the petal, leaf, or fruit, is destroyed, it is not again regenerated, nor is the wound healed up, except by means of a scar. Such is the case also with all decortications that penetrate deeper than the epidermis, particularly if the wound is not protected from the action of the air: if the decortication reaches to the wood, then new bark issues from between the bark and wood, and spreads till it covers the wound. But the result is not the same when the wound is covered from the air. In the season of the flowing of the sap Du Hamel detached a ring of bark, of three or four inches in breadth, from the trunks of several young elm-trees, taking care to defend the decorticated part from the action of the air, by surrounding it with a tube of glass cemented above and below to the trunk. After a few days the tubes became cloudy within, particularly when it was hot; but when the air became cool, the cloud condensed and fell in drops to the bottom. At last there began to appear as if exuding from between the bark and wood of the upper part of the wound, a sort of rough scurfy substance; and on the surface of the wood, as if exuding from between the longitudinal fibres of the alburnum, a number of gelatinous drops. They were not connected with the scurfy substance at the top, but seemed to arise from small slips of the liber that had not been completely detached. Their first appearance was that of small reddish spots changing by degrees into white, and finally into a sort of grey, and extending in size till they at last united and formed a cicatrice, which was a new bark.

Sect. II. *Diseases.*

487. Diseases are corrupt affections of the vegetable body, arising from a vitiated state of its juices, and tending to injure the habitual health either of the whole or part. The diseases that occur the most frequently among vegetables are the following: — Blight, smut, mildew, honey-dew, dropsy, flux of juices, gangrene, etiolation, suffocation, contortion, consumption.

488. *Blight.* — Much has been written on the nature of blight; and in proportion as words have been multiplied on the subject, the difficulties attending its elucidation have increased. This disease was well known to the ancient Greeks, who were however totally ignorant of its cause, regarding it merely as a blast from heaven, indicating the wrath of their offended deities, and utterly incapable of prevention or cure. It was known also to the Romans under the denomination of *rubigo*, who regarded it in the same light as the Greeks, and even believed it to be under the direction of a particular deity, Rubigus, whom they solemnly invoked that blight might be kept from corn and trees. It is still well known from its effects to every one having the least knowledge of husbandry or gardening; but it has been very differently accounted for. And, perhaps, there is no one cause that will account for all the different cases of blight, or disease going by the name of blight; though they have been supposed to have all the same origin. If we take the term in its most general acceptation I think it will include at least three distinct species — blight originating in cold and frosty winds, blight originating in a sort of sultry and pestilential vapour, and blight originating in the immoderate propagation of a sort of small and

parasitical fungus. The first species is often occasioned by the cold and easterly winds of spring, which nip and destroy the tender shoots of the plant, b ystopping the current of the juices. The leaves which are thus deprived of their due nourishment wither and fall, and the juices that are now stopped in their passage swell and burst the vessels, and become the food of innumerable little insects that soon after make their appearance. Hence they are often mistaken for the cause of the disease itself; the farmer supposing they are wafted to him on the east wind, while they are only generated in the extravasated juices as forming a proper nidus for their eggs. Their multiplication will no doubt contribute to the spreading of the disorder, as they always breed fast where they find plenty of food. But a similar disease is often occasioned by the early frost of spring. If the weather is prematurely mild, the blossom is prematurely protruded, which though it is viewed by the unexperienced with delight, yet it is viewed by the judicious with fear. For it very often happens that this premature blossom is totally destroyed by subsequent frosts, as well as both the leaves and shoots, which consequently wither and fall, and injure if they do not actually kill the plant. This evil is also often augmented by the unskilful gardener, even in attempting to prevent it; that is, by matting up his trees too closely, or by keeping them covered in the course of the day, and thus rendering the shoots so tender that they can scarcely fail to be destroyed by the next frost. — The second species generally happens in the summer when the grain has attained to its full growth, and when there are no cold winds or frosts to occasion it. Such was the blight that used to damage the vineyards of ancient Italy, and which is yet found to damage our hop plantations and wheat crops. The Romans had observed that it generally happened after short but heavy showers occurring about noon, and followed by clear sunshine, about the season of the ripening of the grapes, and that the middle of the vineyard suffered the most. This corresponds pretty nearly to what is in this country called the fire-blast among hops, which has been observed to take place, most commonly about the end of July, when there has been rain with a hot gleam of sunshine immediately after; the middle of the hop-ground is also the most affected whether the blight is general or partial, and is almost always the point in which it originates. In a particular case that was minutely observed, the damage happened a little before noon, and the blight ran in a line forming a right angle with the sunbeams at that time of the day. There was but little wind, which was however in the line of the blight. (*Hale's Body of Husbandry.*) Wheat is also affected with a similar sort of blight, and about the same season of the year, which totally destroys the crop. In the summer of 1809, a field of wheat on rather a light and sandy soil, came up with every appearance of health, and also into ear, with a fair prospect of ripening well. About the beginning of July it was considered as exceeding any thing expected from such a soil. A week afterwards a portion of the crop, on the east side of the field, to the extent of several acres was totally destroyed; being shrunk and shrivelled up to less than one-half the size of what it had formerly been, and so withered and blasted as not to appear to belong to the same field. The rest of the field produced a fair crop. — The third species attacks the leaves or stem both of herbaceous and woody plants, such as *Euphorbia Cyparissias*, *Berberis vulgaris*, and *Rhamnus catharticus*, but more generally grasses; and particularly our most useful grains, wheat, barley, and oats. It generally assumes the appearance of a rusty-looking powder that soils the finger when touched. In March 1807, some blades of wheat were examined by Keith that were attacked with this species of blight; the appearance was that of a number of rusty-looking spots or patches dispersed over the surface of the leaf, exactly like that of the seeds of dorsiferous ferns bursting their indusium. Upon more minute inspection these patches were found to consist of thousands of small globules collected into groups beneath the epidermis, which they raised up in a sort of blister and at last burst. Some of the globules seemed as if imbedded even in the longitudinal vessels of the blade. They were of a yellowish or rusty brown, and somewhat transparent. But these groups of globules have been ascertained by Sir J. Banks to be patches of a minute fungus, the seeds of which, as they float in the air, enter the pores of the epidermis of the leaf, particularly if the plant is sickly; or they exist in the manure or soil, and enter by the pores of the root. (*Sir J. Banks on Blight*, 1805.) This fungus has been figured by Sowerby and by F. Bauer and Grew. It is known among farmers by the name of red rust, and as it affects the stalks and leaves only it does not materially injure the crop. But there is another species of fungus known to the farmer by the name of red gum, which attacks the ear only, and is extremely prejudicial. In the aggregate it consists of groups of minute globules interspersed with transparent fibres. The globules are filled with a fine powder which explodes when they are put into water. It is very generally accompanied with a maggot of a yellow colour, that preys also upon the grain, and increases the amount of injury. The only means of preventing or lessening the effect of any of the different varieties of blight mentioned is proper culture. Palliatives are to be found in topical applications, such as flower of sulphur, and where the disease proceeds from, or consists of innumerable minute insects, it may occasionally be removed. Grissenthwaite conjectures that in many cases in which the blight and mildew attack corn crops it may be for want of the peculiar food requisite for perfecting the grain; it being known that the fruit or seeds of many plants contain primitive principles not found in the rest of the plant. Thus the grain of wheat contains gluten and phosphate of lime, and where these are wanting in the soil, that is in the manured earths in which the plant grows, it will be unable to perfect its fruit, which of consequence becomes more liable to disease.

489. *Smut* is a disease incidental to cultivated corn by which the farina of the grain, together with its proper integuments and even part of the husk, is converted into a black soot-like powder. If the injured ear is struck with the finger, the powder will be dispersed like a cloud of black smoke; and if a portion of the powder is wetted by a drop of water and put under the microscope, it will be found to consist of millions of minute and transparent globules, which seem to be composed of a clear and glary fluid encompassed by a thin and skinny membrane. This disease does not affect the whole body of the crop, but the smutted ears are sometimes very numerously dispersed throughout it. Some have attributed it to the soil in which the grain is sown, and others have attributed it to the seed itself, alleging that smutted seed will produce a smutted crop. But in all this there seems to be a great deal of doubt. Willdenow regards it as originating in a small fungus, which multiplies and extends till it occupies the whole ear. (*Princip. of Bot.* p. 356.) But F. Bauer of Kew, seems to have ascertained it to be merely a morbid swelling of the ear, and not at all connected with the growth of a fungus. (*Smith's Introd.* p. 348.) It is said to be effectually prevented by steeping the grain before sowing in a weak solution of arsenic. But besides the disease called smut there is also a disease analogous to it, or a different stage of the same disease, known to the farmer by the name of bags or smut-balls, in which the nucleus of the seed only is converted into a black powder, whilst the ovary, as well as the husk, remains sound. The ear is not much altered in its external appearance, and the diseased grain contained in it will even bear the operation of threshing, and consequently mingle with the bulk. But it is always readily detected by the experienced buyer, and fatal to the character of the sample. It is prevented as in the case of smut.

490. *Mildew* is a thin and whitish coating with which the leaves of vegetables are sometimes covered, occasioning their decay and death, and injuring the health of the plant. It is frequently found on the leaves of *Tussilago Farfara*, *Humulus Lupulus*, *Corylus Avellana*, and the white and yellow dead-nettle. It is found also on wheat in the shape of a glutinous exudation, particularly when the days are hot and the nights without dew. Willdenow says it is occasioned by the growth of a fungus of great minuteness, the *Mucor Erisyphe* of Linnæus; or by a sort of whitish slime which some species of *aphides* deposit upon the leaves. In cultivated crops it is said to be prevented by manuring with soot. It is to be prevented or palliated by the means recommended for the blight, with which it is by many confounded.

491. *Honey-dew* is a sweet and clammy substance which coagulates on the surface of the leaves during hot weather, particularly on the leaves of the oak-tree and beech, and is regarded by Curtis, as being merely the dung of some species of *aphides*. This seems to be the opinion of Willdenow also, and it is no doubt possible that it may be the case in some instances or species of the disease. But Sir J. E. Smith contends that it is not always so, or that there are more species of honey-dew than one, regarding it particularly as being an exudation, at least in the case of the beech, whose leaves are, in consequence of an unfavorable wind, apt to become covered with a sweet sort of glutinous coating, similar in flavor to the fluid obtained from the trunk. It is certain, however, that saccharine exudations are found on the leaves of many plants, though not always distinguished by the name of honey-dew; which should not perhaps be applied except when the exudation occasions disease. But if it is to be applied to all saccharine exudations whatever, then we must include under the appellation of honey-dew, the saccharine exudations observed on the orange-tree by De la Hire, together with that of the lime-tree which is more glutinous, and of the poplar which is more resinous; as also that of the *Cistus creticus*, and of the manna which exudes from the ash-tree of Italy and Larch of France. It is also possible that the exudation of excrement constituting honey-dew may occasionally occur without producing disease; for if it should happen to be washed off soon after by rains or heavy dews, then the leaves will not suffer. Washing is therefore the palliative: judicious culture the preventative.

492. Plants are also liable to a disease which affects them in a manner similar to that of the *dropsy* in animals, arising from long continued rain or too abundant watering. Willdenow describes it as occasioning a preternatural swelling of particular parts, and inducing putrefaction. It is said to take place chiefly in bulbous and tuberous roots, which are often found much swelled after rain. It affects fruits also, which it

renders watery and insipid. It prevents the ripening of seeds, and occasions an immoderate production of roots from the stem. Succulent plants in particular are apt to suffer from too profuse waterings, and the disease thus occasioned is generally incurable. The leaves drop, even though plump and green; and the fruit rots before reaching maturity. In this case the absorption seems to be too great in proportion to the transpiration; but the soil when too much manured produces similar effects. Du Hamel planted some elms in a soil that was particularly well manured, and accordingly they pushed with great vigour for some time; but at the end of five or six years they all died suddenly. The bark was found to be detached from the wood, and the cavity filled up with a reddish-colored water. The symptoms of this disease suggest the palliatives, and the preventatives are ever the same — judicious culture.

493. *Flux of Juices.* — Some trees, but particularly the oak and birch, are liable to a great loss of sap either bursting out spontaneously, owing to a superabundance of sap, or issuing from accidental wounds; sometimes it is injurious to the health of the plant, and sometimes not. There is a spontaneous extravasation of the sap of the vine, known by the name of the tears of the vine, which is not always injurious. As it often happens that the root imbibes sap, which the leaves are not yet prepared to throw off, because not yet sufficiently expanded, owing to an inclement season, the sap which is first carried up, being propelled by that which follows, ultimately forces its way through all obstructions, and exudes from the bud. But this is observed only in cold climates; for in hot climates where the developement of the leaves is not obstructed by cold, they are ready to elaborate the sap as soon as it reaches them. There is also a spontaneous extravasation of proper juice in some trees, which does not seem in general to be injurious to the individual. Thus the gum which exudes from cherry, plum, peach, and almond trees, is seldom detrimental to their health, except when it insinuates itself into the other vessels of the plant and occasions obstructions. But when the sap ascends more copiously than it can be carried off, it sometimes occasions a fissure of the solid parts, inducing disease or deformity by encouraging the extravasation and corruption of the ascending or descending juices. Sometimes the fissure is occasioned by means of frost, forming what is called a double alburnum; that is, first a layer that has been injured by the frost, and then a layer that passes into wood. Sometimes a layer is partially affected, and that is generally owing to a sudden and partial thaw on the south side of the trunk, which may be followed again by a sudden frost. In this case the alburnum is split into clefts or chinks, by means of the expansion of the frozen sap. But a cleft thus occasioned often degenerates into a chilblain, that discharges a blackish and acrid fluid to the great detriment of the plant, particularly if the sore is so situated that rain or snow will readily lodge in it, and become putrid. The same injury may be occasioned by the bite or puncture of insects while the shoot is yet tender; and as no vegetable ulcer heals up of its own accord, the sooner a cure is attempted the better, as it will, if left to itself, ultimately corrode and destroy the whole plant, bark, wood, and pith. The only palliative is the excision of the part affected, and the application of a coat of grafting wax. *Willdenow*, p. 354.

494. *Gangrene.* — Of this disorder there are two varieties, the dry and the wet. The former is occasioned by means of excessive heat or excessive cold. If by means of cold, it attacks the leaves or young shoots, and causes them to shrink up, converting them from green to black; as also the inner bark, which it blackens in the same manner, so that it is impossible to save the plant except by cutting it to the ground. If by means of heat, the effects are nearly similar, as may oftentimes be seen in gardens, or even in forests, where the foresters are allowed to clear away the moss and withered leaves from the roots. Sometimes the disease is occasioned by the too rapid growth of a particular branch, depriving the one that is next it of its due nourishment, and hence inducing its decay. Sometimes it is occasioned by means of parasitical plants, as in the case of the bulbs of the saffron, which a species of lycoperdon often attaches itself to and totally corrupts. The harmattan winds of the coast of Africa kill many plants, by means of inducing a sort of gangrene that withers and blackens the leaves, and finally destroys the whole plant. The nopal of Mexico is also subject to a sort of gangrene that begins with a black spot, and extends till the whole leaf or branch rots off, or the plant dies. But plants are sometimes affected with a gangrene by which a part becomes first soft and moist, and then dissolves into foul ichor. This is confined chiefly to the leaves, flowers, and fruit. Sometimes it attacks the roots also, but rarely the stem. It seems to be owing, in many cases, to too wet or too rich a soil; but it may originate in contusion, and may be caught by infection. But the nopal is subject also to a disease called by Thiery *la dissolution*, considered by Sir J. E. Smith as distinct from gangrene, and which appears to be Willdenow's dry gangrene. A joint of the nopal, or a whole branch, and sometimes an entire plant, changes in the space of a single hour from a state of apparent health to a state of putrefaction or dissolution. Now its surface is verdant and shining, and in an instant it changes to a yellow, and its brilliancy

is gone. If the substance is cut into, the parts are found to have lost all cohesion, and are quite rotten; the attempt at a cure is by speedy amputation below the diseased part. Sometimes the vital principle collecting and exerting all its energies, makes a stand as it were against the encroaching disease, and throws off the infected part. *Smith's Introduction*, p. 340.

495. *Etiolation.* — Plants are sometimes affected by a disease which entirely destroys their verdure, and renders them pale and sickly. This is called *etiolation*, and may arise merely from want of the agency of light, by which the extrication of oxygen is effected, and the leaf rendered green. And hence it is that plants placed in dark rooms, or between great masses of stone, or in the clefts of rocks, or under the shade of other trees, look always peculiarly pale. But if they are removed from such situations and exposed to the action of light, they will again recover their green colour. Etiolation may also ensue from the depredation of insects nestling in the radicle, and consuming the food of the plant, and thus debilitating the vessels of the leaf so as to render them insusceptible to the action of light. This is said to be often the case with the radicles of *Secale cereale;* and the same result may also arise from poverty of soil.

496. *Suffocation.* — Sometimes it happens that the pores of the epidermis are closed up and transpiration consequently obstructed, by means of some extraneous substance that attaches itself to and covers the bark. This obstruction induces disease, and the disease is called *suffocation.* Sometimes it is occasioned by the immoderate growth of *Lichens* upon the bark covering the whole of the plant, as may be often seen in fruit trees, which it is necessary to keep clean by means of scraping off the *Lichens*, at least from the smaller branches. For if the young branches are thus coated, so as that the bark cannot perform its proper functions, the tree will soon begin to languish, and will finally become covered with *Fungi*, inducing or resulting from decay, till it is at last wholly choaked up. But a similar effect is also occasionally produced by insects, in feeding upon the sap or shoot. This may be exemplified in the case of the aphides, which sometimes breed or settle upon the tender shoot in such multitudes as to cover it from the action of the external air altogether. It may be exemplified also in the case of *Coccus Hesperidum* and *Acarus tellarius*, insects that infest hot-house plants, the latter by spinning a fine and delicate web over the leaf, and thus preventing the access of atmospheric air. Sometimes the disease is occasioned by an extravasation of juices which coagulate on the surface of the stalk so as to form a sort of crust, investing it as a sheath, and preventing its further expansion. Sometimes the disease is occasioned from want of an adequate supply of nourishment as derived from the soil, in which the lower part of the plant is the best supplied, while the upper part of it is starved. Hence the top shoots decrease in size every succeeding year, because a sufficient supply of sap cannot be obtained to give them their proper developement. This is analogous to the phenomena of animal life when the action of the heart is too feeble to propel the blood through the whole of the system. For then the extremities are always the first to suffer. And perhaps it may account also for the fact, that in bad soils and unfavorable seasons, when the ear of barley is not wholly perfected, yet a few of the lower grains are always completely developed (*Smith's Introduction*, p. 344.) Where insects are the cause of suffocation, or otherwise injurious to plants, they are to be removed either by the hand or other mechanical means, or destroyed by excess of some of the elements of their nutrition, as heat, or cold, or moisture, where such excess does not prove injurious to the plant; or by a composition either fluid or otherwise, which shall have the same effects. Prevention is to be attempted by general culture, and particular attention to prevent the propagation of the insects or vermin, by destroying their embryo progeny, whether oviparous or otherwise.

497. *Contortion.* — The leaves of plants are often injured by means of the puncture of insects, so as to induce a sort of disease that discovers itself in the contortion or convolution of the margin, or wrinkled appearance of the surface. The leaves of the apricot, peach, and nectarine, are extremely liable to be thus affected in the months of June and July. The leaf that has been punctured soon begins to assume a rough and wrinkled figure, and a reddish and scrophulous appearance, particularly on the upper surface. The margins roll inwards on the under side, and enclose the eggs which are scattered irregularly on the surface, giving it a blackish and granular appearance, but without materially injuring its health. In the vine the substance deposited on the leaf is whitish, giving the under surface a sort of a frosted appearance, but not occasioning the red and scrophulous aspect of the upper surface of the leaf of the nectarine. In the poplar the eggs when first deposited resemble a number of small and hoary vesicles containing a sort of clear and colorless fluid. The leaf then becomes reflected and conduplicate, enclosing the eggs with a few reddish protuberances on the upper surface. The embryo is nourished by this fluid; and the hoariness is converted into a fine cottony down, which for some time envelopes the young fly. The leaf of the lime-tree in particular is liable to attacks from insects when fully expanded; and hence the gnawed

appearance it so often exhibits. The injury seems to be occasioned by some species of puceron depositing its eggs in the parenchyma, generally about the angles that branch off from the midrib. A sort of down is produced, at first green, and afterwards hoary; sometimes in patches, and sometimes pervading the whole leaf; as in the case of the vine. Under this covering the egg is hatched; and then the young insect gnaws and injures the leaf, leaving a hole, or scar of a burnt or singed appearance. Sometimes the upper surface of the leaf is covered with clusters of wart-like substances somewhat subulate and acute. They seem to be occasioned by means of a puncture made on the under surface, on which a number of openings are discoverable, penetrating into the warts, which are hollow and villous within. The disease admits of palliation by watering frequently over the leaves; and by removing such as are the most contorted and covered by larvæ.

498. *Consumption.* — From barren or improper soil, unfavorable climate, careless planting, or too frequent flowering exhausting the strength of the plant, it often happens that disease is induced which terminates in a gradual decline and wasting away of the plant, till at length it is wholly dried up. Sometimes it is also occasioned by excessive drought, or by dust lodging on the leaves, or by fumes issuing from manufactories which may happen to be situated in the neighbourhood; or by the attacks of insects. There is a consumptive affection that frequently attacks the pine-tree, called *Teredo Pinorum* (*Willdenow Princ. Bot.* p. 351.), which affects the alburnum and inner bark chiefly, and seems to proceed from long continued drought, or from frost suddenly succeeding mild or warm weather, or heavy winds. The leaves assume a tinge of yellow, bordering upon red. A great number of small drops of resin exude from the middle of the boughs, of a putrid odour. The bark exfoliates, and the alburnum presents a livid appearance. The tree swarms with insects, and the disease is incurable, inducing inevitably the total decay and death of the individual. The preventative is obviously good culture so as to maintain vigorous health: palliatives may be employed according to the apparent cause of the disease.

Sect. III. *Natural Decay.*

499. Although a plant should not suffer from the influence of accidental injury, or from disease, still there will come a time when its several organs will begin to experience the approaches of a natural decline insensibly stealing upon it, and at last inducing death. The duration of vegetable existence is very different in different species. Yet in the vegetable, as well as in the animal kingdom, there is a term or limit set, beyond which the individual cannot pass. Some plants are annuals and last for one season only, springing up suddenly from seed, attaining rapidly to maturity, producing and again sowing their seeds, and afterwards immediately perishing. Such is the character of the various species of corn, as exemplified in oats, wheat, and barley. Some plants continue to live for a period of two years, and are therefore called biennials, springing up the first year from seed, and producing roots and leaves, but no fruit; and in the second year producing both flower and fruit, as exemplified in the carrot, parsnip, and caraway. Other plants are perennials, that is, lasting for many years; of which some are called under-shrubs, and die down to the root every year; others are called shrubs, and are permanent both by the root and stem, but do not attain to a great height or great age; others are called trees, and are not only permanent by both root and stem, but attain to a great size, and live to a great age. But even of plants that are woody and perennial, there are parts which perish annually, or which are at least annually separated from the individual; namely, the leaves, flowers, and fruit, leaving nothing behind but the bare caudex which submits in its turn to the ravages of time, and ultimately to death.

500. The *Decay of the Temporary Organs* which takes place annually is a phenomenon familiar to every body, and comprehends the fall of the leaf, the fall of the flower, and the fall of the fruit.

The Fall of the Leaf, or annual defoliation of the plant, commences for the most part with the colds of autumn, and is accelerated by the frosts of winter, that strip the forest of its foliage, and the landscape of its verdure. But there are some trees that retain their leaves throughout the whole of the winter, though changed to a dull and dusky brown, and may be called *ever-clothed* trees, as the beech; and there are others that retain their verdure throughout the year, and are denominated evergreens, as the holly. The leaves of both sorts ultimately fall in the spring. Sir J. E. Smith considers that leaves are thrown off by a process similar to that of the sloughing of diseased parts in the animal economy; and P. Keith observes, that if it is necessary to illustrate the fall of the leaf by any analogous process in the animal economy, it may be compared to that of the shedding of the antlers of the stag, or of the hair or feathers of other beasts or birds, which being, like the leaves of plants, distinct and peculiar organs, fall off and are regenerated annually, but do not slough.

501. The *Flowers*, which, like the leaves, are only temporary organs, are for the most

part very short-lived; for as the object of their production is merely that of effecting the impregnation of the germs, that object is no sooner obtained than they begin again to give indications of decay, and speedily fall from the plant; so that the most beautiful part of the vegetable is also the most transient.

502. The *Fruit*, which begins to appear conspicuous when the flower falls, expands and increases in volume, and, assuming a peculiar hue as it ripens, ultimately detaches itself from the parent plant and drops into the soil. But it does not in all cases detach itself in the same manner: thus, in the bean and pea the seed-vessel opens and lets the seeds fall out; while in the apple, pear, and cherry, the fruit falls entire, enclosing the seed, which escapes when the pericarp decays. Most fruits fall soon after ripening, as the cherry and apricot, if not gathered; but some remain long attached to the parent plant after being fully ripe, as in the case of the fruit of *Cratægus*, *Evonymus*, and *Mespilus*. But these, though tenacious of their hold, detach themselves at last, as well as all others, and bury themselves in the soil, about to give birth to a new individual in the germination of the seed. The fall of the flower and fruit is accounted for in the same manner as that of the leaf.

503. *Decay of the Permanent Organs.* — Such then is the process and presumptive rationale of the decay and detachment of the temporary organs of the plant. But there is also a period beyond which even the permanent organs themselves can no longer carry on the process of vegetation. Plants are affected by the infirmities of old age as well as animals, and are found to exhibit also similar symptoms of approaching dissolution. The root refuses to imbibe the nourishment afforded by the soil, or if it does imbibe a portion, it is but feebly propelled, and partially distributed, through the tubes of the alburnum; the elaboration of the sap is now effected with difficulty as well as the assimilation of the proper juice, the descent of which is almost totally obstructed; the bark becomes thick and woody, and covered with moss or lichens; the shoot becomes stunted and diminutive; and the fruits palpably degenerate, both in quantity and quality. The smaller or terminal branches fade and decay the first, and then the larger branches also, together with the trunk and root; the vital principle gradually declines without any chance of recovery, and is at last totally extinguished. "When life is extinguished, nature hastens the decomposition; the surface of the tree is overrun with lichens and mosses, which attract and retain the moisture; the empty pores imbibe it, and putrefaction speedily follows. Then come the tribes of fungi, which flourish on decaying wood, and accelerate its corruption; beetles and caterpillars take up their abode under the bark, and bore innumerable holes in the timber; and woodpeckers in search of insects pierce it more deeply, and excavate large hollows, in which they place their nests. Frost, rain, and heat assist, and the whole mass crumbles away, and dissolves into a rich mould." *Dial. on Bot.* p. 365.

Chap. X.

Vegetable Geography, or the Distribution of Vegetables.

504. The science of the distribution of plants, Humboldt observes, (*Essai sur la Geographie des Plantes, &c.* 1807,) considers vegetables in relation to their local associations in different climates. It points out the grand features of the immense extent which plants occupy from the regions of perpetual snow, to the bottom of the ocean, and to the interior of the globe, where in obscure grottoes, cryptogamous plants vegetate, as unknown as the insects which they nourish. The superior limits of vegetation are known, but not the inferior; for every where in the bowels of the earth are germs which develope themselves when they find a space and nourishment suitable for vegetation.

On taking a general view of the disposition of vegetables on the surface of the globe, independently of the influence of man, that disposition appears to be determined by two sorts of causes, *geographical* and *physical*. The influence of man, or of cultivation, has introduced a third cause, which may be called *civil*. The different aspects of plants, in different regions, has given rise to what may be called their *characteristic*, or *picturesque distribution*; and the subject of distribution may be also considered relatively to the systematic divisions of vegetables and arithmetical proportions.

Sect. I. *Geographical Distribution of Vegetables.*

505. The geographical limits to vegetation are determined in general by three different causes. 1. By sandy deserts, which seeds cannot pass over; by winds or birds, as that of Sahara, in Africa. 2. By seas too vast for the seeds of plants to be drifted from one shore to the other, as in the ocean; while the Mediterranean sea, on the contrary, exhibits the same vegetation on both shores; and, 3. By long and lofty chains of mountains. To these causes are to be attributed the fact that similar climates and soils do

not always produce similar plants. Thus in certain parts of North America, which altogether resemble Europe in respect to soil, climate, and elevation, not a single European plant is to be found. The same remark will apply to New Holland, the Cape of Good Hope, Senegal, and other countries, as compared with countries in similar physical circumstances, but geographically different. The separation of Africa and South America, Humboldt considers, must have taken place before the developement of organized beings, since scarcely a single plant of the one country is to be found in a wild state in the other.

Sect. II. *Physical Distribution of Vegetables.*

506. This subject may be considered in respect to temperature, elevation, moisture soil, and light.

Temperature has the most obvious influence on vegetation. Every one knows that the plants of hot countries cannot in general live in such as are cold, and the contrary. The wheat and barley of Europe will not grow within the tropics; the same remark applies to plants of still higher latitudes, such as those within the polar circles, which cannot be made to vegetate in more southern latitudes; nor can the plants of more southern latitudes be made to vegetate there. In this respect, not only the medium temperature of a country ought to be studied, but the temperature of different seasons, and especially of winter. Countries where it never freezes; those where it never freezes so strong as to stagnate the sap in the stems of plants; and those where it freezes sufficiently strong to penetrate into the cellular tissue; form three classes of regions in which vegetation ought to differ. But this difference is somewhat modified by the effect of vegetable structure, which resists in different degrees the action of frost; thus, in general, trees which lose their leaves during winter resist the cold better than such as retain them; resinous trees more easily than such as are not so; herbs of which the shoots are annual and the root perennial, better than those where the stems and leaves are persisting; annuals which flower early, and whose seeds drop and germinate before winter, resist cold less easily than such as flower late, and whose seeds lie dormant in the soil till spring. Monocotyledonous-trees, which have generally persisting leaves, and a trunk without bark, as in palms, are less adapted to resist cold than dicotyledonous trees, which are more favorably organized for this purpose, not only by the nature of their proper juice, but by the disposition of the cortical and alburnous layers, and the habitual carbonization of the outer bark. Plants of a dry nature resist cold better than such as are watery; all plants resist cold better in dry winters than in moist winters; and an attack of frost always does most injury in a moist country; in a humid season, or when the plant is too copiously supplied with water.

Some plants of firm texture, but natives of warm climates, will endure a frost of a few hours' continuance, as the orange at Genoa, (*Humboldt, De Distributione Plantarum*); and the same thing is said of the palm and pine-apple, facts most important for the gardener. Plants of delicate texture, and natives of warm climates, are destroyed by the slightest attack of frost, as the phaseolus, nasturtium, &c.

The temperature of spring has a material influence on the life of vegetables; the injurious effects of late frosts are known to every cultivator. In general, vegetation is favored in cold countries by exposing plants to the direct influence of the sun; but this excitement is injurious in a country subject to frosts late in the season: in such cases, it is better to retard than to accelerate vegetation.

The temperature of summer, as it varies only by the intensity of heat, is not productive of so many injurious accidents as that of spring. Very hot dry summers, however, destroy many delicate plants, and especially those of cold climates. A very early summer is injurious to the germination and progress of seeds; a short summer, to their ripening, and the contrary.

Autumn is an important season for vegetation, as it respects the ripening of seeds; hence where that season is cold and humid, annual plants, which naturally flower late, are never abundant, as in the polar regions; the effect is less injurious to perennial plants which generally flower earlier. Frosts early in autumn are as injurious as those which happen late in spring. The conclusion, from these considerations, obviously is, that temperate climates are more favorable to vegetation than such as are either extremely cold or extremely hot. But the warmer climates, as Keith observes, are more favorable upon the whole to vegetation than the colder, and that nearly in proportion to their distance from the equator. The same plants, however, will grow in the same degree of latitude, throughout all degrees of longitude, and also in correspondent latitudes on different sides of the equator; the same species of plants, as some of the palms and others, being found in Japan, India, Arabia, the West Indies, and part of South America, which are all in nearly the same latitudes; and the same species being also found in Kamschatka, Germany, Great Britain, and the coast of Labrador, which are all also in nearly the same latitudes. *Willdenow*, p. 374.

507. *Elevation*, or the height of the soil above the level of the sea, determines, in a very marked manner, the habitation of plants. The temperature lessens in regular gradation, in the same manner as it does in receding from the equator, and six hundred feet of elevation, De Candolle states, are deemed equal to one degree of latitude; and thus the summits of the lofty mountains of the Andes, even where situated almost directly under the equator, are covered with snow as eternal as that of the north pole.

Hence it is that plants of high latitudes live on the mountains of such as are much lower, and thus the plants of Greenland and Lapland are found on the Alps and Pyrenées. At the foot of Mount Ararat, Tournefort met with plants peculiar to Armenia; above these he met with plants which are found also in France; at a still greater height he found himself surrounded with such as grow in Sweden, and at the summit with such as vegetate in the polar regions. This accounts for the great variety of plants which are often found in a Flora of no great extent; and it may be laid down as a botanical axiom, that the more diversified the surface of the country, the richer will its Flora be, at least in the same latitudes. It accounts also, in some cases, for the want of correspondence between plants of different countries though placed in the same latitudes; because the mountains or ridges of mountains, which may be found in the one and not in the other, will produce the greatest possible difference in the character of their Floras. And to this cause may often be ascribed the diversity that often actually exists between plants growing in the same latitudes, as between those of the north-west and north-east coast of North America, as also of the south-west and south-east coast; the former being more mountainous, the other more flat. Sometimes the same sort of difference takes place between the plants of an island and those of the neighbouring continent; that is, if the one is mountainous and the other flat; but if they are alike in their geographical delineation, then they are generally alike in their vegetable productions.

Cold and lofty situations are the favorite habitations of most cryptogamic plants of the terrestrial class, especially the *Fungi*, *Algæ*, and Mosses; as also of plants of the class *Tetradynamia*, and of the *Umbellate* and *Syngenesial* tribes; whereas trees and shrubs, ferns, parasitic plants, lilies, and aromatic plants, are most abundant in warm climates; only this is not to be understood merely of geographical climates, because, as we have seen, the physical climate depends upon altitude. In consequence of which, combined with the ridges and direction of the mountains, America and Asia are much colder in the same degrees of northern latitude than Europe. American plants, vegetating at forty-two degrees of northern latitude, will vegetate very well at fifty-two degrees in Europe. The same, or nearly so, may be said of Asia, which, in the former case, is perhaps owing to the immense tracts of woods and marshes covering the surface, and in the latter, to the more elevated and mountainous situation of the country affecting the degree of temperature. So also Africa is much hotter under the tropics than America; because in the latter the temperature is lowered by immense chains of mountains traversing the equatorial regions, while in the former it is increased by means of the hot and burning sands that cover the greater part of its surface.

The effects of altitude are observable also even in the case of aquatics, as modifying their habits; thus some aquatics float always on the surface of the water, as *Lemna*, while others are either partially or wholly immersed. Such aquatics as grow in the depths of the sea are not influenced by climate; but such as are near the surface are influenced by climate, and have their habitations affected by it.

Elevation, De Candolle observes, influences the habits of plants, by exposing them to the wind; — to be watered by a very fresh and pure water from the melting of adjoining snow; and to be covered in winter by a thick layer of snow, which protects them from severe frosts. Hence many alpine plants become frozen during winter in the plains, and in gardens which are naturally warmer than their natural stations. In great elevations, the diminution of the density of the air may also have some influence on vegetation. The rarity of the atmosphere admits a more free passage for the rays of light, which, being in consequence more active, ought to produce a more active vegetation. Experience seems to prove this in high mountains; and the same effect is produced in high latitudes by the length of the day. On the other hand, vegetables require to absorb a certain quantity of oxygen gas from the air during the night; and as they find less of that in the rarified air of the mountains; they ought to be proportionately feeble and languishing. According to experiments made by Theodore de Saussure, plants which grow best in the high Alps, are those which require to absorb least oxygen during the night; and, in this point of view, the shortness of the nights near the poles correspond. These causes, however, are obviously very weak, compared to the powerful action of temperature. Great anomalies are found in the comparative height in which the same plant will grow in different circumstances. In countries situated under the equator, the two sides of the mountain are of the same temperature, which is solely determined by elevation; but in countries distant from it, the warmest side is that towards the south, and the zones of plants, instead of forming lines parallel to the horizon, incline towards the north. The reason, in both cases, is sufficiently obvious.

508. The *moisture*, or mode of watering natural to vegetables, is a circumstance which has a powerful influence on the facility with which plants grow in any given soil. The quantity of water absolutely necessary for the nourishment of plants, varies according to their tissue; some are immersed, others float on its surface; some grow on the margin of waters, with their roots always moistened or soaked in it; others again live in soil slightly humid, or almost dry. Vegetables which resist extreme drought most easily are, 1. Trees and herbs with deep roots, because they penetrate to, and derive sufficient moisture from, some distance below the surface. 2. Plants which, being furnished with few pores on the epidermis, evaporate but little moisture from their surface, as the succulent tribe.

Water being the vehicle which conveys to vegetables all the substances useful for their nutrition, the nature of the substances dissolved in it must necessarily influence powerfully the possibility of certain plants growing in certain places. But the difference in this respect is much less than would be imagined, because the food of one species of plants differs very little from that of another. The most remarkable case is that of salt marshes, in which a great many vegetables will not live, whilst a number of others thrive there better than any where else. Plants which grow in marine marshes, and those which grow in similar grounds situated in the interior of a country are the same. Other substances naturally dissolved in water, appear to have much less influence on vegetation, though the causes of the habitations of some plants, such as those which grow best on walls, as *Pelitoria*, and in lime rubbish, as *Thlaspi*, and other Cruxiferæ, may doubtless be traced to some salt (nitrate of lime, &c.) or other substance peculiar to such situations.

509. The nature of the *soil* affects the habitations of vegetables in different points of view: 1. As consisting of primitive earths, or the debris of rocks or mineral bodies; and 2. As consisting of a mixture of mineral, animal, and vegetable matter. *Primitive* soils affect vegetables mechanically according to their different degrees of moveability or tenacity. In coarse sandy soils plants spring up easily, but many of them, which have large leaves or tall stems, are as easily blown about and destroyed. In fine dry sandy soils, plants with very delicate roots, as Protea and Erica, prosper; a similar earth, but moist in the growing season, is suited to bulbs. On clayey soils plants are more difficult to establish, but when established are more permanent: they are generally coarse, vigorous, and perennial in their duration.

With respect to the relative proportions of the primitive earths in these soils, it does not appear that their influence on the distribution of plants, is so great as might at first sight be imagined. Doubtless different natural soils are endowed with different degrees of absorbing, retaining, and parting with moisture and heat; and these circumstances have a material effect in a state of culture where they are comminuted and exposed to the air; but not much in a wild or natural state where they remain hard, firm, and covered with vegetation. The difference, with a few exceptions, is never so great but that the seeds of a plant which has been found to prosper well in one description of soil, will germinate and thrive as well in another, composed of totally different earths, provided they are in a nearly similar state of mechanical division and moisture.

Thus De Candolle observes, though the box is very common in calcareous soils, it is found in as great quantities in such as are schistous, or granitic. The chestnut grows equally well in calcareous and clayey soils, in volcanic ashes and in sand. The plants of Aira, a mountain entirely calcareous, grow equally well on the Vosges, or the granitic Alps. But though the kind or mixture of earths seems of no great consequence, yet the presence of metallic oxides and salts, as sulphates of iron or copper, or sulphur alone, or alum, or other similar substances in a state to be soluble in water, are found to be injurious to all vegetation, of which some parts of Derbyshire and the maremmes of Tuscany, (*Chateauvieux*, let. 8.) are striking proofs. But excepting in these rare cases, plants grow nearly indifferently on all primitive soils in the sense in which we here take these terms; the result of which is, that soils have much less influence on the distribution of plants, than temperature, elevation, and moisture. Another result is, as De Candolle has well remarked, that it is often a very bad method of culture to imitate too exactly the nature of the soil in which a plant grows in its wild state. This view of the subject of soils has been taken up and enlarged on by W. Grisenthwaite, in his new Theory of Agriculture, already (414.) recommended to the cultivator. We do not contend, however, that no nourishment is derived from the mere earths of soils, when moistened; on the contrary, viewing the habitations of mosses, and other agamous plants, we conceive with Mirbel, (who has remarked, *Traité d' Anatomie*, &c.) "That plants alone have a power of deriving nourishment, though not indeed exclusively, from inorganic matter, mere earths, salts, or airs, substances certainly incapable of serving as food for any animals, who feed universally on what is, or has been organized matter, so that it should seem to be the office of vegetable life alone to trans-form dead matter into organized living bodies." The time which must elapse, and the changes which must take place in any district of the globe which may be disorganized by internal convulsions, before imperfect prepare the way for perfect plants, is a subject yet in its infancy.

510. *Mixed* or secondary soils, include not only primitive earths, or the debris of rocks, but vegetable matters — not only the medium through which perfect plants obtain their food, but that food itself. In this view of the subject the term soil is used in a very extensive acceptation, as signifying, not only the various sorts of mould which constitute the surface of the earth, but every substance whatever on which plants are found to vegetate, or from which they derive their nourishment. The most general division of soils in this acceptation of the term is that of aquatic, terrestrial, and vegetable soils; corresponding to the division of aquatic, terrestrial, and parasitical plants.

511. *Aquatic* soils are such as are either wholly or partially inundated with water, and are fitted to produce such plants only as are denominated aquatics. Of aquatics there are several subdivisions according to the particular situations they affect, or the degree of immersion they require.

One of the principal subdivisions of aquatics is that of marine plants, such as the *Fuci* and many of the *Algæ*, which are very plentiful in the seas that wash the coasts of Great Britain, and are generally attached to stones and rocks near the shore. Some of them are always immersed; and others, which are situated above low water mark, are immersed and exposed to the action of the atmosphere alternately. But none of them can be made to vegetate except in the waters of the sea.

Another subdivision of aquatics is that of river plants, such as *Chara*, *Potamogeton*, and *Nymphæa*, which occupy the bed of fresh water rivers, and vegetate in the midst of the running stream; being for the most part wholly immersed, as well as found only in such situations.

A third subdivision of aquatics is that of paludal or fen plants, being such as are peculiar to lakes, marshes, and stagnant or nearly stagnant waters, but of which the bottom is often tolerably clear. In such situations you find the *Isoetis lacustris*, flowering rush, water ranunculus, water violet, and a variety of others which uniformly affect such situations; some of them being wholly immersed, and others immersed only in part.

512. *Earthy soils* are such as emerge above the water and constitute the surface of the habitable globe, that is every where covered with vegetable productions. Plants affecting such soils, which comprise by far the greater part of the vegetable kingdom, are denominated terrestrial, being such as vegetate upon the surface of the earth, without having any portion immersed in water, or requiring any further moisture for their support beyond that which they derive from the earth and atmosphere. This division is, like the aquatics, distributed into several subdivisions according to the peculiar situations which different tribes affect.

Some of them are maritime, that is, growing only on the sea-coast, or at no great distance from it, such as *Statice*, *Glaux*, *Samolus*, Samphire, Sea Pea. Some are fluviatic, that is, affecting the banks of rivers, such as *Lythrum*, *Lycopus*, *Eupatorium*. Some are champaign, that is, affecting chiefly the plains, meadows, and cultivated fields, such as *Cardamine*, *Tragopogon*, *Agrostemma*. Some are dumose, that is, growing in hedges and thickets, such as the Bramble. Some are ruderate, that is, growing on rubbish, such as *Senecio viscosus*. Some are sylvatic, that is, growing in woods or forests, such as *Stachys sylvatica*, *Angelica sylvestris*. And finally, some are alpine, that is, growing on the summits of mountains, such as *Poa alpina*, *Epilobium alpinum*, and many of the Mosses and Lichens.

513. *Vegetable soils* are such as are formed of vegetating or decayed plants themselves, to some of which the seeds of certain other plants are found to adhere, as being the only soil fitted to their germination and developement. The plants springing from them are denominated *Parasitical*, as being plants that will vegetate neither in the water nor earth, but on certain other plants, to which they attach themselves by means of roots that penetrate the bark, and from the juices of which they do often, though not always, derive their support. This last circumstance constitutes the ground of a subdivision of parasitical plants, into such as merely adhere to other plants, but do not feed on them, and such as do not merely adhere to other plants, but do also feed on them.

In the first subdivision we may place parasitical Mosses, Lichens, and Fungi, which are found as often, and in as great perfection on the stumps of rotten trees, and on rotten pales and stakes, as on trees that are yet vegetating; whence it is also plain that they do not derive their nourishment from the plants on which they grow, but from the atmosphere by which they are surrounded; the plant to which they cling serving merely as a basis of support.

In the second subdivision we may place all such plants as are strictly parasitical, that is, all such as do actually abstract from the juices of the plant to which they cling the nourishment necessary to the developement of their parts; and of which the most common, at least as being indigenous to Britain, are the Mistletoe, Dodder, Broomrape, and a sort of tuber that grows on the root of Saffron, and destroys it if allowed to spread.

The Mistletoe, *Viscum album*, is found for the most part on the Apple-tree; but sometimes also on the Oak. If its berry is made to adhere to the trunk or branch of either of the foregoing trees, which from its glutinous nature it may readily be made to do, it germinates by sending out a small globular body attached to a pedicle, which after it acquires a certain length bends towards the bark, whether above it or below it, into which it insinuates itself by means of a number of small fibres which it now protrudes, and by which it abstracts from the plant the nourishment necessary to its future developement. When the root has thus fixed itself in the bark of the supporting tree, the stem of the parasite begins to ascend, at first smooth and tapering, and of a pale green colour, but finally protruding a multiplicity of branches and leaves.

It seems to have been thought by some botanists that the roots of the Mistletoe penetrate even into the wood, as well as through the bark. But the observations of Du Hamel show that this opinion is not well founded. The roots are indeed often found within the wood, which they thus seem to have penetrated by their own vegetating power. But the fact is, that they are merely covered by the additional layers of wood that have been formed since the fibres first insinuated themselves into the bark.

Cuscuta europæa, or Dodder, though it is to be accounted a truly parasitical plant in the issue, is yet not originally so. For the seed of this plant when it has fallen to the ground takes root originally by sending down its radicle into the soil and elevating its stem into the air. It is not yet, therefore, a parasitical plant. But the stem which is now elevated above the surface lays hold of the first plant it meets with, though it is particularly partial to Hops and Nettles, and twines itself around it, attaching itself by means of little parasitical roots at the points of contact, and finally detaching itself from the soil altogether by the decay of the original root, and becoming a truly parasitical plant. Withering describes the plant in his arrangement as being originally parasitical; but this is certainly not the fact.

The *Orobanche*, or Broom-rape, which attaches itself by the root to the roots of other plants, is also to be regarded as being truly parasitical, though it sometimes sends out fibres which seem to draw nourishment from the earth. It is found most frequently on the roots of common Broom.

The *Epidendron flos aeris* is regarded also by botanists as a parasitical plant, because it is generally found growing on other trees. But as it is found to grow in old tan, it probably derives only support from the bark of trees, and not nourishment.

514. *Light* is a body which has very considerable influence on the structure of vegetables, and some also on their habitation. The *fungi* do not require the usual interludes of day, in order to decompose carbonic acid gas, and can live and thrive with little or no light. In green plants, which require the action of light, the intensity required is very different in different species; some require shady places, and hence the vegetable inhabitants of caves, and the plants which grow in the shade of forests. Others, and the greater number, require the direct action of the sun, and grow in exposed elevated sites. De Candolle considers that the great difficulty of cultivating Alpine plants in the gardens of plains, arises from the impossibility of giving them at once the fresh temperature and intense light which they find on high mountains.

Sect. III. *Civil Causes affecting the Distribution of Plants.*

515. Though plants in general are limited to certain habitations destined for them by nature, yet some are, and probably the greater number may be, inured to climates, soils, and situations, of which they are not indigenous. This seems to be most easily done in going from a hot to a cold climate, particularly with herbaceous plants. Because it often happens that the frosts of winter are accompanied with snow, which shelters the plant from the inclemency of the atmosphere till the return of spring. Trees and shrubs, on the contrary, are naturalized with more difficulty, because they cannot be so easily sheltered from the colds, owing to the greater length of their stem and branches. The naturalization or acclimating of vegetables is to be attempted by two modes: by sowing the seeds of successive generations, and by the difference of temperature produced by different aspects. The former is well exemplified in the case of the rice-plant which is grown in Germany, from seeds raised there, while if seeds from its native country, India, are used, they will not vegetate; (Sir J. Banks, in *Hort. Trans.* vol. i.) and the latter in the sloping banks of Professor Thouin of Paris, as described by Gerardin (*Essai de Physiologie Vegetale*, vol. i.). Some plants seem to have the capacity of vegetating in almost all climates, or of naturalizing themselves in almost any. This is particularly the case with greens and eatable roots, such as cabbages, potatoes, and carrots. See farther *Dialogues on Botany*, p. 411.

" Some plants," Humboldt observes, " which constitute the object of gardening and of agriculture, have time out of mind accompanied man from one end of the globe to the other. In Europe, the vine followed the Greeks; the wheat, the Romans; and the cotton the Arabs. In America the Tultiques carried with them the maise; the potatoes and the quinoa are found wherever have migrated the ancient Condinamarea. The migration of these plants is evident; but their first country is as little known as that of the different races of men which have been found in all parts of the globe from the earliest traditions." (*Geographie des Plantes*, p. 25.)

The general effect of culture on plants is that of enlarging all their parts; but it often also alters their qualities, forms, and colours: it never, however, alters their primitive structure. "The potatoe," as Humboldt observes, "cultivated in Chili, at nearly twelve thousand feet above the level of the sea, carries the same flower as in Siberia."

The culinary vegetables of our gardens, compared with the same species in their wild state, afford striking proofs of the influence of culture on both the magnitude and qualities of plants. Nothing in regard to magnitude is more remarkable than in the case of the Brassica tribe; and nothing, in respect to quality, exceeds the change effected on the celery and carrot.

The influence of culture on fruits is not less remarkable. The peach, in its wild state in Media, is poisonous, but cultivated in the plains of Ispahan and Egypt, it becomes one of the most delicious of fruits. The effect of culture on the apple, pear, cherry, plum, and other fruits, is nearly as remarkable; for not only the fruit and leaves, but the general habits of the tree is altered in these and other species. The history of the migration of fruit-trees has been commenced by Sickler, in a work (*Geschichte*, &c.) which Humboldt has praised as equally curious and philosophical.

The influence of culture on plants of ornament is great in most species. The parts of all plants are enlarged, some are numerically increased, as in the case of double flowers; and what is most remarkable, even the colours are frequently changed, both in the leaf, flower, and fruit.

The influence of culture, in increasing the botany of a country, is very considerable, and operates directly, by introducing new species for culture in gardens, fields, or timber plantations; and indirectly by the acclimating and final naturalization of many species, by the influence of winds and birds in scattering their seeds. The vine and the fig are not indigenous to France, but are now naturalized there by birds. In like manner the orange is naturalized in the south of Italy. Many herbaceous plants of the Levant are naturalized both in France and Britain; some, as the cabbage, cherry, and apple, were probably naturalized during the subjection of England to the Romans. The narrow-leaved elm was brought from the Holy Land during the crusades. *Phaseolus vulgaris*, and *Impatiens balsamina* were brought originally from India; and *Datura stramonium*, which is now naturalized in Europe was brought originally from India or Abyssinia. Buckwheat and most species of corn and peas came also from the East, and along with them several plants found among corn only; such as *Centaurea cyanus*, *Agrostemma githago*, *Raphanus raphanistrum*, and *Myagrum sativum*. The country from whence the most valuable grasses migrated is not known. Bruce says he found the oat wild in Abyssinia, and wheat has been found in a wild state in hilly situations in the East Indies. Rye and the potatoe were not known to the Romans. The country of the former Humboldt declares to be totally unknown.

In all temperate countries it will generally be found, that the most useful corns, culinary vegetables, and fruits have been brought there by man. But many vegetables, natives of the torrid zone, as the pine-apple, the palm, &c. cannot be acclimated in temperate regions; and the greatest refinement in culture consists in the successful formation of artificial climates for their culture in cold regions. This also contributes materially to the acclimating, and even, occasionally, to the naturalization of intertropical plants. Casting our eyes on man, and the effects of his industry, we see him spread on the plains and the sides of mountains, from the frozen ocean to the equator, and every where he wishes to assemble around him whatever is useful and agreeable of his own or of other countries. The more difficulties to surmount, the more rapidly are developed the moral faculties, and thus the civilization of a people is almost always in an inverse ratio with the fertility of the soil which they inhabit. What is the reason of this Humboldt asks? Habit and the love of the site natal.

Sect. IV. *Characteristic or Picturesque Distribution of Vegetables.*

516. Plants, Humboldt observes, are not only ranged according to zones of elevation; they are yet distinguished, like animals, as living in two classes. The one class grows alone and scattered, as *Solanum dulcamara*, *Lychnis dioica*, *Polygonum bistorta*, *Anthericum liliago*, *&c.* The other class unites in society, like ants or bees, cover immense surfaces, and include other species, such as *Fragaria vesca*, *Vaccinium myrtillus*, *Polygonum aviculare*, *Aira canescens*, *Pinus sylvestris*, *&c.*

Burton states that the *Mitchella repens* is the plant most extensively spread in North

America, occupying all the ground between the 28° and 69° of north latitude. The *arbutus uva ursi*, goes from New Jersey to the 72° of latitude. On the contrary, *Gordonia, Franklinia, and Dionæa muscipula*, are found isolated in small spots. Associated plants are more common in the temperate zones than in the tropics, where vegetation is less uniform and more picturesque. In the temperate zones, the frequency of social plants, and the culture of man, has rendered the aspect of the country comparatively monotonous. Under the tropics on the contrary, all sorts of forms are united; thus cypresses, and pines, are found in the forests of the Andes of Quindiu, and of Mexico; and bananas, palms, and bamboos in the valleys. But green meadows, and the season of spring are wanting in the south, for nature has reserved gifts for every region.

"The valleys of the Andes," Humboldt observes, "are ornamented with bananas and palms; on the mountains are found oaks, firs, berberries, alders, brambles, and a crowd of genera believed to belong only to countries of the north. Thus the inhabitant of the equinoctial regions views all the vegetable forms which nature has bestowed around him on the globe. Earth developes to his eyes a spectacle as varied as the azure vault of heaven, which conceals none of her constellations."

The people of Europe do not enjoy the same advantage. The languishing plants, which the love of science or luxury cultivates in our hot-houses presents only the shadow of the majesty of equinoctial vegetation; but by the richness of our language, we paint these countries to the imagination, and individual man feels a happiness peculiar to civilization.

Independently of systematic arrangements of plants, there are others so obvious and characteristic, as to strike every general observer. A few of these are the scitamineæ, tree-heaths, firs, and pines, mimosæ, climbers, cacti, grasses, lichens, mosses, palms, equisitaceæ, arums, pothos, dracontium, &c. the chaffy leaved plants, malvaceæ, orchideæ, &c. Of these groups, the most beautiful are the palms and scitamineæ, which include the bamboos and plantains, and these tribes are entirely wanting in the temperate zones.

But the vegetables of different countries, though of the same genus or group, display a sort of characteristic feature by which their country may often be discovered, in the same manner as the national distinctions which are observable in the looks and color of mankind, and which are effected chiefly by climate. Asiatic plants are remarkable for their superior beauty; African plants for their thick and succulent leaves, as in the case of the cacti; and American plants for the length and smoothness of their leaves, and for a sort of singularity in the shape of the flower and fruit. The flowers of European plants are but rarely beautiful, a great proportion of them being amentaceous. Plants indigenous to polar and mountainous regions are generally low, with small compressed leaves; but with flowers large in proportion. Plants indigenous to New Holland are distinguishable for small and dry leaves, that have often a shrivelled appearance. In Arabia they are low and dwarfish; in the Archipelago they are generally shrubby and furnished with prickles; while in the Canary Islands many plants, which in other countries are merely herbs, assume the port of shrubs and trees.

The shrubby plants of the Cape of Good Hope and New Holland exhibit a striking similarity, as also the shrubs and trees of the northern parts of Asia and America, which may be exemplified in the platanus orientalis of the former, and in platanus occidentalis of the latter, as well as in fagus sylvatica and fagus latifolia, or acer cappadocicum, and acer saccharinum; and yet the herbs and under-shrubs of the two countries do not in the least correspond.

"A tissue of fibres," Humboldt observes, "more or less loose—vegetable colors more or less vivid, according to the chemical mixture of their elements, and the force of the solar rays, are some of the causes which impress on the vegetables of each zone their particular character."

The influence of the general aspect of vegetation on the taste and imagination of a people; the difference in this respect between the monotonous oak and pine forests of the temperate zones, and the picturesque assemblages of palms, mimosas, plantains, and bamboos of the tropics; the influence of the nourishment, more or less stimulant, peculiar to different zones, on the character and energy of the passions: these, Humboldt observes, unite the history of plants with the moral and political history of man.

Sect. V. *Systematic Distribution of Vegetables.*

517. The three grand systematic divisions of plants are acotyledoneæ, dicotyledoneæ, and monocotyledoneæ. A simplification of this division considers plants as *agamous*, or *phanerogamous*, that is without or with visible sexes. Taking the globe in zones, the temperate contain $\frac{1}{6}$ part of all the phanerogamous plants. The equinoctial countries contain nearly $\frac{1}{20}$, and Lapland only $\frac{1}{30}$ part. Taking the whole surface of the globe, the agamous plants, that is, mosses, fungi, fuci, &c. are to the phanerogamæ or perfect plants, nearly as 1 to 7; in the equinoctial countries as 1 to 5; in the temperate zones

as 2 to 5; in New Holland as 2 to 11; in France as 1 to 2; in Lapland, Greenland, Iceland, and Scotland, they are as 1 to 1, or even more numerous than the phanerogamous plants. Within the tropics, agamous plants grow only on the summits of the highest mountains. In several of the islands of the Gulf of Carpentoria, having a flora of phanerogamous plants, exceeding 200 species, R. Brown did not observe a single moss.

In the whole globe, the monocotyledoneæ, including the grasses, liliaceæ, scitameneæ, &c. are to the whole of the perfect plants as 1 to 6: in the temperate zones (between 36° and 52°,) as 1 to 4, and in the polar regions as 1 to 20. In Germany, the monocotyledoneæ are to the total number of species as 1 to $4\frac{1}{2}$; in France as 1 to $4\frac{2}{5}$; in New Holland the three grand divisions of plants, beginning with the acotyledoneæ, are nearly as 1, $2\frac{1}{4}$, and $7\frac{1}{4}$.

In the whole globe, the monocotyledoneæ are estimated, by R. Brown, from Persoon's Synopsis, (*Gen. Rem. on the Bot. of Terr. Aust.* 1814,) to be to the dicotyledoneæ as 2 to 11; or with the addition of undescribed plants, as 2 to 9. From the equator to 30° of north latitude, they are as 1 to 5. In the higher latitudes a gradual diminution of dicotyledoneæ takes place until in about 60° north latitude, and 50° south latitude, they scarcely equal half their intertropical proportions.

The ferns in the temperate regions are to the whole number of species as 1, 2, and 5; that is, in the polar regions as 1, in the temperate countries as 2, and in the intertropical regions as 5. In France, ferns form $\frac{1}{72}$ part of the phanerogamous plants; in Germany $\frac{1}{48}$; in Lapland $\frac{1}{26}$.

The following table gives a general view of the relative proportions of different natural orders of perfect plants in France, Germany, and Lapland:

	Number of Species in			Ratio of each Family to the whole of the Phanerogamous plants in these Countries.		
	Fran.	Germ.	Lapl.	Fran.	Germ.	Lapl.
Cyperoideæ	134	102	55	$\frac{1}{27}$	$\frac{1}{18}$	$\frac{1}{9}$
Gramineæ	284	143	49	$\frac{1}{13}$	$\frac{1}{13}$	$\frac{1}{10}$
Junceæ	42	20	20	$\frac{1}{86}$	$\frac{1}{94}$	$\frac{1}{25}$
These three Families together	460	265	124	$\frac{1}{8}$	$\frac{1}{7}$	$\frac{1}{4}$
Orchideæ	54	44	11	$\frac{1}{67}$	$\frac{1}{43}$	$\frac{1}{45}$
Labiatæ	149	72	7	$\frac{1}{24}$	$\frac{1}{26}$	$\frac{1}{71}$
Rhinantheæ et Scrophuleæ	147	76	17	$\frac{1}{24}$	$\frac{1}{24}$	$\frac{1}{29}$
Boragineæ	49	26	6	$\frac{1}{74}$	$\frac{1}{72}$	$\frac{1}{83}$
Ericeæ et Rhodod.	29	21	20	$\frac{1}{125}$	$\frac{1}{90}$	$\frac{1}{25}$
Compositæ	490	233	38	$\frac{1}{7}$	$\frac{1}{8}$	$\frac{1}{13}$
Umbelliferæ	170	86	9	$\frac{1}{21}$	$\frac{1}{22}$	$\frac{1}{55}$
Cruciferæ	190	106	22	$\frac{1}{19}$	$\frac{1}{18}$	$\frac{1}{23}$
Malvaceæ	25	8	—	$\frac{1}{145}$	$\frac{1}{235}$	—
Caryophylleæ	165	71	29	$\frac{1}{22}$	$\frac{1}{27}$	$\frac{1}{17}$
Legumenoseæ	230	96	14	$\frac{1}{16}$	$\frac{1}{18}$	$\frac{1}{35}$
Euphorbiæ	51	18	1	$\frac{1}{71}$	$\frac{1}{104}$	$\frac{1}{497}$
Amentaceæ	69	48	23	$\frac{1}{52}$	$\frac{1}{39}$	$\frac{1}{21}$
Conifereæ	19	7	3	$\frac{1}{192}$	$\frac{1}{269}$	$\frac{1}{165}$
Phanerogamous	3645	1884	497			

The germs of cryptogamous plants are the only ones which nature developes spontaneously in all climates. The *polytrichum commune* grows in all latitudes; in Europe and under the equator; on high mountains and on a level with the sea; in short, wherever there is shade and humidity. No phanerogamous plants have organs sufficiently flexible to accommodate themselves in this manner to every zone. The *Alsine media*, *Fragaria vesca*, and *solanum nigrum*, have been said to enjoy this advantage; but all that can be said is, that these plants are very much spread, like the people of the race of Caucasus, in the northern part of the ancient continent. *Humboldt.*

Sect. VI. *Arithmetical Distribution of Vegetables.*

518. The total number of species of plants known, or believed to exist, amounts to about 44,000, of which 38,000 have been described. According to Humboldt and R. Brown, they are thus distributed: in Europe 7000; in temperate Asia 1500; in equinoctial Asia and the adjacent islands 4500; in Africa 3000; in temperate America,

in both hemispheres, 4000; in equinoctial America 13,000; in New Holland and the islands of the Pacific Ocean 5000. In all 38,000. In Spitzbergen there are 30 species of perfect plants; in Lapland 534; in Iceland 533; in Sweden 1299; in Scotland 900; in Britain 1400; in Brandenburg 2000; in Piedmont 2800; in Jamaica, Madagascar, and the coast of Coromandel, from 4000 to 5000.

Sect. VII. *Distribution of the British Flora, Indigenous and Exotic.*

519. There are about 1437 cotyledonous plants natives of Britain, and nearly 1893 of imperfect, or of what are termed, in the Jussieuan system, acotyledoneæ. Of the cotyledonous, or perfect plants, 182 are trees or shrubs; 855 are perennials; 60 are biennials, and 340 annuals. Of the trees and shrubs, 47 are trees; 25 above thirty feet high, and the remainder under thirty, but above ten feet high. Of the perennials, 83 are grasses; the next greatest number belong to the two first orders of the class Pentandria; the next to the Syngenesia; and the third to Monœcia Triandria, or the Cyperaceæ of Jussieu, comprehending chiefly the genus Carex. Most of the biennials belong to the first order of the 19th class, and the two first orders of Pentandria. There are 41 annual grasses; 52 annuals belong to the two first orders of Pentandria; and the next greatest number of annuals to Diadelphia Decandria, which includes the trefoils and vetches.

Of the Cryptogameæ, or imperfect plants, 800 are fungi, 18 algæ, 373 lichens, 85 hepaticæ, 460 musci, and 130 ferns, according to an estimate, (in *Rees's Cyclop.* art. *Plant*,) understood to be made by Sir J. E. Smith.

In regard to the distribution of the perfect plants as to elevation, little or nothing has been yet generalized on the subject. In regard to soils, 276 are found in bogs, and marshy or moist places; 140 on the sea-shores; 128 in cultivated grounds; 121 in meadows and pastures; 78 in sandy grounds; 76 in hedges and on hedge-banks; 70 on chalky and other calcareous soils; 64 on heaths; 60 in woods; 30 on walls; 29 on rocks; and 19 on salt-marshes.

Of the Cryptogameæ, the ferns are found in rocky places and wastes; most of the musci, hepatici, and lichens, on rocks and trees; most of the fuci and algæ in the sea; and of the fungi, on decaying vegetable bodies, especially trunks of trees, manures, &c.

In respect to geographical distribution, the mountainous and hilly districts of England and South Wales are most prolific; the greatest number, according to extent of surface, are found in England, and the smallest number in Ireland.

The genera have been already arranged according to the Linnæan and Jussieuean systems (in 277. & 278.); they enter into 23 classes, and 71 orders of the former; and 8 classes, and 121 orders of the latter method.

520. With respect to the uses or *application* of the native Flora, there are about 18 sorts of wild fruits which *may* be eaten, exclusive of the wild apple and pear; but only the pear, apple, plum, currant, raspberry, strawberry, and cranberry, are gathered wild, or cultivated in gardens.

There are about 20 boiling culinary plants natives, including the cabbage, sea-kale, asparagus, turnip, carrot, and parsnip.

There are about the same number of spinaceous plants, salading, and pot and sweet herbs, which may be used, but of which but a few only enter into the modern diatetics of the cooks.

There are three fungi, in general use, the mushroom, truffle, and morel: and various others, as well as about eight species of sea-weeds, are occasionally eaten.

There are about six native plants cultivated as florists' flowers, including the primula elatior, crocus, narcissus, dianthus, &c.

Nearly 100 grasses, clovers, and leguminous plants are used in agriculture, or serve in their native places of growth as pasturage for cattle. Two native plants, the oat and the big, or wild barley, are cultivated as farinaceous grains. Most of the trees are used in the mechanical arts for fuel, or for tanning: one plant, the flax, affords fibre for the manufacture of linen cloth. Various plants yield coloured juices, which may, and in part are, used in dying; and some hundred species have been, and a few are still used in medicine. About 20 cotyledonous plants, and above 50 cryptogamia, chiefly fungi, are, or are reputed to be, poisonous, both to men and cattle.

521. By the *artificial Flora of Britain*, we understand such of the native plants as admit of preservation or culture in gardens; and such exotics as are grown there, whether in the open ground, or in different descriptions of plant habitations. The total number of species which compose this Flora, or *Hortus Britannicus*, as taken from Sweet's catalogue, already referred to, exceeds 12,500, exclusive of botanists' varieties, and agamous plants, which is nearly a fourth part of the estimated Flora of our globe. This Flora may be considered in regard to the countries from whence the plants were introduced; the periods of their introduction; their obvious divisions; their systematic classification; their garden habitations, their application; and their native habitations.

522. With respect to the native countries of the 12,500 plants, which may be said to form the *Hortus Britannicus*, about 1400 are natives; of 970 the native countries are unknown; and the remaining 11,000 are thus distributed: —

EUROPE.		ASIA.		AFRICA.		AMERICA.			
Continent.		*Continent.*		*Continent.*		*S. Continent.*		*N. Continent.*	
S. of Europe -	659	East Indies	826	Cape of Good Hope -	2280	Mexico -	102	United States -	1222
Spain -	266	Siberia -	364	Barbary -	77	Peru -	77	Carolina	129
Italy -	202	Levant -	213	Egypt -	69	Brazil -	74	Virginia -	49
Hungary -	173	China -	205	Morocco -	13	Guinea -	33	Canada -	28
Austria -	171	Caucasus -	67	Sierra Leone	12	Vera Cruz	22	Missouri -	24
Germany -	134	Persia -	37	Guinea -	11	Caraccas -	21	Louisiana	18
Switzerland	117	Japan -	36	Abyssinia -	8	Chili -	29	Georgia -	16
France -	103	Syria -	19	Algiers -	8	Buenos Ayres -	8	Florida -	9
Various other Parts -	446	Various other Parts -	82	Various other Parts -	51	Various other Places	275	Other Parts of British America and the United States -	111
Islands.		*Islands.*		*Islands.*		*S. Islands.*		*N. Islands.*	
Madeira -	75	New So. Wales	239	Canaries -	82	Cayenne -	9	W. Indies	435
Candia -	66	New Holland -	152	Teneriffe -	21	Falkland Islands	3	Jamaica -	248
Other Islands	352	Ceylon -	31	St. Helena -	6	Terra del Fuego -	1	Bahamas -	9
Total of Exotics	2759	Van Dieman's Land -	21	C. Verde Islands	1			Other Islands	55
Britain -	1400	Other Islands	73						
Total of European cotyledonous Plants	4169	Total -	2365	Total -	2639	Total -	644		2353
						Total -	2997		

523. With respect to the introduction of the exotics from those different countries, the dates of the introduction of none are known before the time of Gerard, in Henry VIII.'s reign. From this author and Trew, it appears that 47 species were introduced on or before 1548, including the apricot, fig, pomegranate, &c. Those previously introduced, of which the dates are unkown, may be considered as brought over from France, Italy, and Spain, by the ecclesiastics, and preserved in the gardens of the religious houses. Henry died in 1547; but we consider the plants introduced in the year after his death as properly belonging to his reign.

1547 to 1553. Edw. VI. During this troublous reign, only seven exotic species were added to the British garden, chiefly by Dr. Turner, director of the Duke of Somerset's (then Lord Protector) garden at Zion House.

1553 to 1558. Mary. No plants introduced.

1558 to 1603. Elizabeth. 533 species were introduced during this reign. Of these, 288 are enumerated in the first edition of Gerard's Herbal, published 1557. Drake's Voyage round the World; Raleigh's discoveries in North America, and the consequent introduction of the tobacco and potatoe, took place during this reign.

1603 to 1625. James I. Only 20 plants introduced during this period.

1625 to 1649. Charles I. 331 plants introduced, which are chiefly mentioned by Parkinson, the first edition of whose work was published in 1629. Parkinson was the king's herbalist, and Tradescant his kitchen-gardener. A taste for plants began to appear among the higher classes during this reign; various private gentlemen had botanic gardens; and several London merchants procured seeds and plants for Lobel, Johnston, and Parkinson, through their foreign correspondents.

1649 to 1658. O. and R. Cromwell. 95 plants introduced by the same means as before. Cromwell encouraged agriculture; but the part he acted left no leisure for any description of elegant or refined enjoyment.

1660 to 1685. Charles II. 152 plants introduced, chiefly mentioned by Ray, Morrison, and different writers in the Transactions of the Royal Society, founded in 1663. The Oxford and Chelsea gardens were founded, or enlarged, during this reign. Sir Hans Sloane and Evelyn flourished. Many native plants were now brought into notice by Ray and Willoughby.

1685 to 1688. James II. 44 plants introduced.

1688 to 1702. William & Mary. 298 species introduced, chiefly from the West Indies, and through Sir Hans Sloane and the Chelsea garden. Plunkenet succeeded Parkinson as royal herbalist during this reign; and botanists were sent from England, for the first time, to explore foreign countries. As in the two former reigns, great additions were now made to the indigenous Flora, by Ray, Sibbald, Johnson, and others. Many of the 50 species annually presented to the Royal Society, (see 119.) were natives.

1702 to 1714. Anne. 230 plants in great part from the East and West Indies, and through the Chelsea garden.

1714 to 1727. George I. 182 plants, chiefly through the Chelsea garden.

1727 to 1760. George II. 1770 plants, almost entirely through the Chelsea garden, now in its zenith of fame under Miller. 375 of these plants are stated as introduced in 1730 and 1731, the latter being the year in which the first folio edition of the Gardeners' and Botanists' Dictionary appeared. 239 in 1739, in which year the 4th edition of the same work appeared. 196 in 1752, and above 400 in 1758 and 1759, when subsequent editions were published. In the last, in 1763, the number of plants cultivated in England is stated to be more than double the number contained in the edition of 1731.

1760 to 1817. George III. 6756 plants introduced, or considerably above half the whole number of exotics now in the gardens of this country. This is to be accounted for from the general progress of civilization, and the great extension of British power and influence in every quarter of the world; especially in the East Indies, at the Cape of Good Hope, and New South Wales. The increasing liberality of intercourse which now obtained among the learned among all countries, must also be taken into account, by which, notwithstanding the existence of political differences, peace reigned and commerce flourished in the world of science.

George III. may also be said to have encouraged botany, aided by the advice, assistance, and unwearied efforts of that distinguished botanist Sir Joseph Banks; and the garden of Kew, and its late curator, Aiton, became the Chelsea garden, and the Miller of this reign. Most of the new plants were sent there, and first described in the Hortus Kewensis. The next greatest number were procured by the activity of the London nurserymen, especially Lee, and Loddiges, and described in the Botanical Magazine; Andrews's Heathery; the Botanical Register; Loddiges' Cabinet, and other works. The greatest number of plants introduced in any one year during this period is 336, in 1800, chiefly heaths and proteas, from the Cape of Good Hope, taken from the Dutch in 1795. The following are the numbers annually introduced since that period:

1801. - -	116	1805. - -	169	1809. - -	48	1813. - -	42
1802. - -	169	1806. - -	224	1810. - -	68	1814. - -	44
1803. - -	267	1807. - -	61	1811. - -	149	1815. - -	192
1804. - -	299	1808. - -	52	1812. - -	316	1816. - -	301

Annual average of the last 17 years, 156 species.

524. With respect to *obvious character*, of the total number of plants composing the British Garden, 350 species are hardy trees or shrubs; of these 270 are trees above 10, and 100 trees above 30 feet high. Of these, the larch, spruce fir, silver fir, and Lombardy poplar, sometimes attain the height of 100 feet. Above 400 species are hardy grasses. Of the tender exotics, the greater number are trees or shrubs, and the next greatest number annuals and bulbs. The colors of the blossoms are generally rich and vivid in proportion to the warmth of the climate, of which the plants are natives.

525. In regard to *Botanical and Horticultural Distribution*, the following table gives a combined view of the whole, arranged according to the Linnæan system, and also according to their habitation in the garden.

Name.	Hardy.				Frame.				Green-house.				Dry-stove.				Stove.				Total.	
	♄	♃	♂	⊙	♄	♃	♂	⊙	♄	♃	♂	⊙	♄	♃	♂	⊙	♄	♃	♂	⊙	*Gen.*	*Sp.*
MONANDRIA.																						
Monogynia	1	2	-	3	-	-	-	-	1	3	1	-	-	-	-	-	3	49	2	-	20	65
Digynia	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	5
DIANDRIA.																						
Monogynia	34	112	7	24	-	-	-	-	42	12	1	-	-	-	-	-	6	-	33	5	36	276
Digynia	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2
Trigynia ...	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	14	1	1	28
TRIANDRIA.																						
Monogynia	-	122	1	20	-	-	-	-	1	169	-	-	-	-	-	-	-	27	4	2	56	346
Digynia	-	153	3	141	-	-	-	-	-	1	-	-	-	-	-	-	6	7	1	2	50	314
Trigynia ...	-	3	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	12

Name.	Hardy.				Frame.				Green-house.				Dry-stove.				Stove.				Total.	
	♄	♃	♂	☉	♄	♃	♂	☉	♄	♃	♂	☉	♄	♃	♂	☉	♄	♃	♂	☉	Ge.	Sp.
Tetrandria.																						
Monogynia	18	88	8	49	-	-	-	-	196	5	4	-	-	-	-	-	-	17	32	3	76	420
Digynia	1	-	1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	5
Tetragynia	5	14	-	6	4	-	-	-	2	-	-	-	-	-	-	-	-	-	3	1	9	35
Pentandria.																						
Monogynia	117	211	31	117	3	-	-	-	202	851	13	1	-	-	-	-	12	25	200	36	209	1080
Digynia	13	227	26	90	-	-	-	-	26	7	2	-	74	-	-	-	-	-	17	5	93	487
Trigynia ...	42	2	1	3	-	-	-	-	23	-	-	1	-	-	-	-	2	-	7	4	15	85
Tetragynia	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3
Pentagynia	3	46	2	4	-	7	-	-	43	10	6	6	-	-	-	-	-	-	3	1	11	131
Polygynia ..	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	8
Hexandria.																						
Monogynia	14	277	3	3	3	9	-	-	34	238	1	-	13	6	-	-	-	84	47	1	106	730
Digynia	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-	-	1	3	4
Trigynia ...	-	45	-	8	-	-	-	-	2	17	-	-	-	-	-	-	-	2	1	-	14	175
Heptandria.																						
Monogynia	7	3	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	3	5	-	8	21
Digynia	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.	-	1	1
Tetragynia	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.	-	-	1	1
Heptagynia	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	1	3
Octandria.																						
Monogynia	25	22	8	7	1	2	1	-	35	2	3	31	-	-	-	-	1	-	25	.	41	163
Digynia	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	2	2
Trigynia ...	2	11	-	17	-	-	-	-	2	-	1	-	-	-	-	-	-	1	14	2	6	50
Tetragynia	-	2	3	-	-	-	-	-	-	1	-	-	4	-	-	-	-	-	-	-	7	10
Enneandria.																						
Monogynia	5	2	-	-	-	-	-	-	7	-	-	-	-	-	-	-	-	-	6	-	3	20
Trigynia ...	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	7
Hexagynia	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Decandria.																						
Monogynia	196	20	-	3	-	-	-	-	91	3	3	1	-	-	-	-	8	3	169	6	92	443
Digynia	4	111	-	9	2	20	-	1	-	-	-	-	-	-	-	-	-	-	-	2	12	160
Trigynia ...	-	67	8	49	1	1	-	-	-	-	6	-	-	-	-	-	-	-	26	-	9	158
Pentagynia	-	63	2	20	-	1	-	-	10	62	-	1	-	-	-	-	-	-	5	-	1	6
Decagynia	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	3	2	-	11	164
Dodecandria.																						
Monogynia	6	11	-	2	1	-	-	-	5	2	1	1	-	-	-	-	4	-	17	4	22	54
Digynia	-	6	-	-	-	-	-	-	1	-	-	..	-	-	-	-	-	-	1	-	3	8
Trigynia ...	2	30	3	24	6	3	-	-	26	3	2	-	23	-	-	-	1	3	7	6	3	139
Tetragynia	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	1
Pentagynia	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	1
Dodecag. ..	-	6	-	1	-	-	-	.	6	2	-	2	-	-	-	-	-	-	-	-	1	17
Icosandria.																						
Monogynia	33	-	-	-	1	-	-	-	53	-	2	-	55	-	-	-	-	-	34	-	18	173
Di-Pentag.	67	7	-	-	-	-	-	-	15	49	3	315	-	-	-	-	-	3	-	2	9	309
Polygynia ..	162	67	1	-	3	-	-	-	6	-	-	-	-	-	-	-	-	.	1	-	10	340
Polyandria.																						
Monogynia	28	19	3	17	33	5	-	-	6	-	-	-	-	-	-	-	-	6	37	5	32	161
Digynia	5	13	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	4	21
Trigynia ...	-	27	2	5	-	-	-	-	2	-	-	-	-	-	-	-	-	1	-	-	3	36
Pentagynia	-	11	-	6	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	18
Polygynia ..	30	107	1	10	5	2	-	-	8	2	-	-	-	-	-	-	-	2	18	-	28	135
Didynamia.																						
Gymnos. ..	22	198	4	38	24	7	2	-	48	5	6	-	-	-	-	-	-	5	5	15	48	279
Angios.	-	87	8	42	3	25	4	-	38	-	3	10	-	-	-	-	-	15	9	511	81	346
Tetradyn.																						
Siliculosa ...	6	35	11	56	4	1	1	-	6	-	-	-	-	-	-	-	-	-	-	-	30	120
Siliquosa ...	-	48	22	66	-	-	-	-	15	-	2	2	-	-	-	-	2	-	1	6	20	164
Monadelphia.																						
Triandria ...	-	1	-	-	-		-	-	-	9	-	-	-	-	-	-	-		1	-	5	11
Pentandria	1	3	-	8	-	2	-	-	34	3	1	.	-	-	-	-	1	.	38	1	7	92
Heptandria	-	-	-	-	-	-	-	-	107	59	2	2	-	-	-	-	-	2	5	-	1	175
Octandria ..	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	1

Name.	Hardy.				Frame.				Green house.				Dry-stove.				Stove.				Total.	
MONAD.—*cont.*	♄	♃	♂	⊙	♄	♃	♂	⊙	♄	♃	♂	⊙	♄	♃	♂	⊙	♄	♃	♂	⊙	*Gen.*	*Sp.*
Decandria	-	23	-	12	-	1	-	-	2	2	-	-	-	-	-	-	-	-	1	-	2	41
Dodecand.	-	-	-	-	-	-	-	-	1	3	1	-	-	-	-	-	1	-	7	-	5	13
Polyandria	3	14	4	24	1	-	-	-	53	3	2	3	-	-	-	-	23	3	55	22	27	210
DIADELPHIA.																						
Pentandria	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	5
Hexandria	-	9	3	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	19
Octandria...	2	5	-	6	-	-	-	-	15	-	-	-	-	-	-	-	-	-	1	-	2	29
Decandria	70	138	9	189	8	6	-	-	159	12	4	-	-	-	-	-	18	8	7	76	88	800
POLYADELPHIA																						
Decandria..	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1	2
Dodecand.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	2	3
Icosandria	-	-	-	-	-	-	-	-	31	-	-	-	-	-	-	-	-	-	1	-	4	32
Polyandria	10	17	-	-	5	8	-	-	322	2	-	-	-	-	-	-	1	-	-	-	5	65
SYNGENESIA.																						
Polyg. æqu.	-	253	48	11	52	3	6	-	-	12	4	-	..	-	-	-	7	3	3	10	74	274
superflua	8	389	8	98	4	5	1	-	101	22	12	-	-	-	-	-	5	5	1	13	60	673
frustanæa	-	92	6	36	2	7	-	-	20	6	1	3	-	-	-	-	-	2	1	1	19	177
necessaria	1	14	-	14	1	-	-	4	39	13	3	2	-	-	-	-	1	-	2	6	20	100
segregata	-	6	-	2	-	-	-	-	3	3	-	-	-	-	-	-	1	2	-	-	10	17
GYNANDRIA.																						
Monandria	-	46	-	-	-	1	-	-	-	23	-	-	-	-	-	-	2	50	-	-	48	122
Diandria ...	-	6	-	-	-	-	-	-	1	3	-	-	-	-	-	-	-	-	-	-	3	10
Hexandria	2	6	-	-	-	-	-	-	3	2	-	-	-	-	-	-	4	2	-	-	1	19
MONŒCIA.																						
Monandria	-	-	-	9	-	-	-	-	5	-	-	-	-	-	-	-	2	-	-	-	5	16
Diandria ...	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	2	5
Triandria...	1	85	-	5	-	-	-	-	-	1	-	-	-	-	-	-	2	4	-	3	11	101
Tetrandria	14	7	-	4	2	1	-	-	-	1	-	-	-	-	-	-	10	-	2	-	12	41
Pentandria	-	-	-	42	-	-	-	1	3	-	-	-	-	-	-	-	1	-	-	1	7	48
Hexandria	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	16	1	-	-	7	11
Polyandria	82	17	-	1	-	3	-	-	2	2	-	-	-	-	-	-	14	16	2	-	22	189
Monadelp.	36	3	-	14	2	-	-	17	13	9	-	-	-	-	-	-	46	5	4	9	26	158
Gynandria	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
DIŒCIA.																						
Monandria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	1	4
Diandria ...	84	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	3	87
Triandria...	1	-	-	-	-	-	-	-	4	4	-	-	-	-	-	-	3	-	-	-	7	12
Tetrandria	9	-	-	-	-	-	-	-	33	-	-	-	-	-	-	-	4	-	-	-	13	46
Pentandria	5	1	-	3	-	1	-	-	3	-	-	-	-	-	-	-	5	-	-	-	8	18
Hexandria	11	7	-	-	1	-	-	-	6		-	-	-	-	-	-	5	6	-	-	8	36
Octandria...	14	1	-	2	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	2	15
Enneandria	2	1	-	2	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	2	6
Decandria	3	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	3	-	-	-	5	9
Dodecand.	2	2	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	-	-	-	6	12
Icosandria	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-	3	6
Polyandria	-	-	-	-	-	-	-	-	16	-	-	-	-	-	-	-	10	-	-	-	5	26
Monadelp.	21	-	-	-	2	-	-	-	7	3	-	-	-	-	-	-	7	-	-	-	12	40
Gynandria	-	-	-	-	-	-	-	-	7	-	-	-	-	-	-	-	1	-	-	-	1	8
POLYGAMIA.																						
Monœcia ...	24	21	-	29	-	-	-	-	36	5	-	-	-	-	-	-	70	9	2	-	31	204
Diœcia	25	2	-	-	1	-	-	-	20	1	-	-	-	-	-	-	27	-	-	-	14	76
CRYPTOGAMIA.																						
Gonopter.	1	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	7
Stachyopter.	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	4	18
Poropterid.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	1
Schismatopt.	-	5	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	3	-	-	3	9
Filices	-	5	-	-	-	-	-	-	1	-	-	-	-	-	-	-	2	44	-	-	26	130
Hydropter.	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	1152	3130	234	1232	177	21	15	23	2014	1535	90	382	169	6	0	0	353	438	855	764	1850	12700

526. The following table exhibits a similar combination of the *Jussieuean classification*, with the garden habitations.

Name.	Hardy.				Frame.				Green-house.				Dry-stove.				Stove.				Total.	
	♄	♃	♂	⊙	♄	♃	♂	⊙	♄	♃	♂	⊙	♄	♃	♂	⊙	♄	♃	♂	⊙	*Gen.*	*Sp.*
THALAMIF. §1.																						
Ranuncula.	16	43	-	4	-	2	-	-	1	2	-	-	-	-	-	-	1	-	-	-	23	69
Magnoliace.	13	-	-	-	5	-	-	-	3	-	-	-	-	-	-	-	3	-	-	-	5	24
Annonæ, …	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-	-	-	4	16
Menisperm.	3	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	4	2	-	-	5	12
Berberides,	7	4	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	7	13
THALAMIF. §2.																						
Papaverace.	-	18	8	20	-	4	-	-	-	-	-	-	-	-	-	-	1	-	-	-	13	51
Cruciferæ ..	46	83	33	124	5	1	-	-	30	1	3	2	-	-	-	-	1	-	-	-	53	330
Capparides,	-	11	1	9	-	-	-	-	5	1	1	-	-	-	-	-	16	1	2	6	7	58
Passifloræ,..	1	3	-	7	-	2	-	-	4	3	1	-	-	-	-	-	34	-	-	-	1	55
Violeæ ……	4	36	-	2	-	-	-	-	5	1	-	-	-	-	-	-	5	-	-	-	3	53
Pediculareæ	2	5	-	6	-	-	-	-	15	1	-	-	-	-	-	-	-	-	-	-	2	29
Cisti, ……..	11	1	-	6	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	47
THALAMIF. §3.																						
Caryophyll.	5	154	12	85	1	4	-	-	8	5	5	1	-	-	-	-	1	-	-	-	30	281
Malvaceæ, .	5	16	4	24	1	-	-	-	34	6	1	3	-	-	-	-	71	2	24	22	35	216
Sterculiace.	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	5	-	-	-	2	6
Tiliaceæ, …	21	-	-	-	1	-	-	-	43	-	-	-	-	-	-	-	65	-	1	5	20	88
Sapindi,…..	1	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	15	-	-	2	10	20
Acereæ, ….	22	20	-	1	-	3	-	-	3	1	-	-	-	-	-	-	8	30	-	-	17	51
Malpighace.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27	-	-	-	3	27
Pittosporæ,	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	1	-	-	-	3	10
Hypericinæ	10	17	-	-	8	8	-	-	10	-	-	-	-	-	-	-	-	-	1	-	2	54
Guttiferæ,..	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	13	-	-	-	8	15
Vites, …….	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	8
Geraniæ, …	-	30	-	26	-	3	-	-	175	67	5	-	-	-	-	-	2	-	-	-	7	309
Meliaceæ, ..	-	1	-	-	-	-	-	-	5	1	-	-	-	-	-	-	13	1	-	-	14	21
Aurantiæ, .	-	-	-	-	-	-	-	-	28	-	-	-	-	-	-	-	10	-	-	-	8	38
Rutaceæ, …	2	6	-	1	-	-	-	-	11	1	2	-	1	-	-	-	1	1	-	1	10	27
Diosmeæ, ..	-	-	-	-	-	-	-	-	34	-	-	-	-	-	-	-	-	-	-	-	7	34
THALAMIF. §4.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CALYCIFLORÆ.																						
Terebintac.	20	-	-	-	-	-	-	-	21	-	-	-	-	-	-	-	20	-	-	-	17	70
Leguminos.	52	184	9	292	9	6	-	-	189	15	5	3	-	-	-	-	89	10	19	62	144	1054
Rosaceæ, …	157	195	1	-	6	-	-	-	27	-	-	-	-	-	-	-	4	-	-	-	26	391
Salicariæ,…	-	6	-	5	-	-	-	-	3	1	1	-	-	-	-	-	7	1	1	1	12	27
Melastomeæ	-	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	20	-	1	-	4	24
Myrtæ,……	9	-	-	-	-	-	-	-	79	-	-	-	-	-	-	-	33	1	-	1	22	123
Combretac.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	4	9
Cucurbitac.	-	1	-	8	-	-	-	13	-	8	-	-	-	-	-	-	3	7	-	1	10	4
Looseæ, ….	-	11	-	-	-	-	-	-	1	2	-	-	-	-	-	-	2	1	-	1	2	12
Onograriæ,	-	24	8	7	-	1	1	-	3	2	2	-	-	-	-	-	-	2	4	-	10	72
Ficoideæ,…	1	-	-	-	1	-	-	-	152	53	5	15	-	-	-	-	-	3	-	4	7	232
Semperviveæ	-	41	-	6	-	1	-	-	42	11	5	4	4	-	-	-	-	-	-	-	13	97
Portulaceæ,	3	6	-	9	-	-	-	-	5	2	-	-	-	-	-	-	5	-	3	8	14	37
Cacti, …….	22	-	-	-	-	-	-	-	-	2	-	-	55	-	-	-	3	-	-	-	3	82
Saxifrageæ,	4	69	-	2	2	18	-	-	1	-	-	-	-	-	-	-	-	-	-	-	9	95
Cunoniaceæ	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	2	2
Araliæ,. ….	4	4	-	-	-	-	-	-	2	-	-	-	-	-	-	-	4	-	-	-	3	32
Caprifoliæ, .	53	6	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	11	65
Umbellifer.	1	172	33	51	-	-	-	-	10	8	3	1	-	-	-	-	-	1	1	-	53	285
Corymbifer.	21	494	8	148	6	12	1	1	169	54	14	6	-	-	-	-	14	12	9	30	133	945
Rubiaceæ, .	41	36	-	11	-	-	-	-	19	1	-	-	-	-	-	-	62	2	2	3	51	153
Cyonrocep.	1	127	28	43	2	4	3	-	12	4	-	1	-	-	-	-	1	1	-	-	23	227
Dipsaceæ, ..	-	33	4	26	-	-	-	-	4	1	-	-	-	-	-	-	-	-	-	-	5	68
Gentianeæ,	-	24	6	9	-	-	-	-	-	5	1	-	-	-	-	-	13	2	-	1	15	48
Cichoraceæ,	-	118	25	59	-	-	1	-	1	3	2	-	-	-	-	-	-	-	-	-	10	73
Campanula.	-	84	14	9	-	3	-	-	8	25	5	9	-	-	-	-	2	-	-	-	10	128

Name.	Hardy.				Frame.				Green-house.				Dry-stove.				Stove.				Total.	
	♄	♃	♂	☉	♄	♃	♂	☉	♄	♃	♂	☉	♄	♃	♂	☉	♄	♄	♂	☉	*Gen.*	*Sp.*
Stylideæ, ...	-	-	-	-	-	-	-	-	3	2	-	.	-	-	-	-	-	-	-	-	1	3
Goodenoviæ	-	4	-	-	-	-	-	-	3	-	-	-	-	-	-	-	1	-	-	-	4	8
Ericeæ, ...	67	10	-	-	2	-	-	-	42	-	-	-	-	-	-	-	10	-	-	-	20	421
Epacrideæ,	1	-	-	-	-	-	-	-	19	-	-	-	-	-	-	-	-	-	-	-	9	20
CORolliflor.																						
Myrsineæ. .	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	6	-	-	-	2	11
Sapoteæ, ...	5	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	16	-	-	-	9	23
Ebenaceæ, .	9	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-	7	-	-	-	8	23
Oleineæ, ...	34	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	3	-	-	-	9	49
Jasmineæ, ..	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	1
Apocineæ, .	2	8	-	-	-	-	-	-	5	-	-	-	-	-	-	-	34	-	3	-	19	56
Bignoniac. .	3	11	-	-	1	-	-	-	4	a	-	2	-	-	-	-	19	2	-	5	10	47
Pedalineæ, ..	-	-	-	-	-	-	-	-	4	3	1	-	-	-	-	-	-	-	-	1	1	1
Polemonia ..	-	27	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	5	24
Convolvul.	6	5	-	18	-	-	-	-	12	9	-	-	-	-	-	-	9	7	1	22	9	92
Boragineæ,	1	44	17	33	-	-	-	-	28	5	2	-	-	-	-	-	21	1	-	-	25	152
Solaneæ, ...	9	12	15	49	-	-	3	-	28	8	2	-	-	-	-	-	42	2	2	2	20	174
Scrofularin.	-	102	6	38	2	25	-	1	17	4	3	5	-	-	-	-	11	3	1	2	41	222
Orobancheæ	-	7	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	2	7
Labiateæ, ...	32	227	11	55	28	7	2	-	61	13	3	-	-	-	-	-	7	3	5	15	55	590
Myoporin ...	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	6	-	-	-	4	11
Acanthaceæ	-	-	-	-	-	-	-	-	3	3	-	-	-	-	-	-	35	5	1	5	10	61
Lentibular..	-	7	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	9
Primulaceæ	-	57	2	7	-	-	-	-	-	3	4	-	-	-	-	-	-	-	-	-	14	64
Globulareæ,	-	3	1	3	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	7
MONOCHLAMY.																						
Plumbagin.	2	24	-	-	-	9	-	-	4	4	1	-	-	-	-	-	3	-	-	-	3	44
Plantagin ...	1	19	2	14	-	-	-	-	1	-	1	1	-	-	-	-	-	-	-	-	2	39
Nyctagineæ	-	2	-	-	-	-	-	-	2	1	1	-	-	-	-	-	6	4	-	1	7	17
Amarantha.	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-	-	6	4	3	9	61	23
Chenopod..	5	5	3	60	-	-	-	-	3	1	1	-	-	-	-	-	10	3	2	2	24	136
Polygoneæ,	2	36	-	26	-	-	-	-	4	2	1	-	-	-	-	-	6	1	-	-	8	79
Laurineæ, .	5	-	-	-	-	-	-	-	7	-	-	-	-	-	-	-	9	-	-	-	2	18
Myristiaceæ	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	2	1	-	-	2	3
Proteaceæ,	-	-	-	-	-	-	-	-	61	-	-	-	-	-	-	-	-	-	-	-	23	200
Thymeleæ, .	14	-	-	-	-	-	-	-	32	-	-	-	-	-	-	-	2	-	-	-	11	48
Santalaceæ,	4	4	-	-	-	-	-	-	5	-	-	-	-	-	-	-	7	-	-	-	10	20
Elæagni, ...	4	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	2	6
Aristolochi.	2	8	-	-	-	-	-	-	6	5	-	-	-	-	-	-	4	1	-	-	2	41
Euphorbiac.	4	-	1	20	-	-	-	-	25	1	-	-	-	-	-	-	50	2	4	9	30	196
Urticeæ, ...	8	6	-	10	-	1	-	-	3	2	-	-	-	-	-	-	46	17	2	2	15	102
Amentaceæ	190	3	-	-	-	-	-	-	2	-	-	-	-	-	-	-	4	-	-	-	18	206
Coniferæ, ..	16	-	-	-	-	2	-	-	8	-	-	-	-	-	-	-	-	-	-	-	5	26
PHANEROGAM.																						
Cycadeæ, ..	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	8	-	-	-	2	13
Hydrochari.	-	13	-	1	-	-	-	-	11	-	-	-	-	-	-	-	7	14	2	-	17	58
Alismaceæ,	-	23	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	6	30
Orchideæ, ..	-	27	-	-	-	1	-	-	28	-	-	-	-	-	-	2	2	48	-	-	49	128
Musaceæ, ..	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	9	-	-	4	15
Irideæ, ...	-	73	-	-	-	1	-	-	166	2	-	-	-	-	-	-	7	5	-	-	25	00
Hæmodora.	-	1	-	-	-	-	-	-	1	2	-	-	7	4	-	-	-	-	-	-	4	4
Amaryllide.	-	64	-	-	-	-	-	-	2	61	-	-	-	-	-	-	-	48	-	-	13	102
Hemerocali.	-	10	-	-	-	3	-	-	29	39	-	-	-	-	-	-	2	9	-	-	13	102
Dioscoreæ, .	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	6	-	-	2	9
Smilaceæ, ..	16	29	-	1	1	1	-	-	7	1	-	-	-	-	-	-	1	-	-	-	11	59
Liliæ, ...	4	37	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	2	-	-	6	47
Melanthace.	-	24	-	-	-	-	-	-	-	11	-	-	-	-	-	-	-	-	-	-	7	35
Junceæ, ...	-	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	5	32
Restiaceæ, .	-	1	-	-	-	1	-	-	-	4	-	-	-	-	-	-	-	-	-	-	5	7
Commelin..	-	7	..		-	-	-	-	-	1	-	-	-	-	-	-	1	9	-	2	5	22
Palmæ, ...	-	7	..	-	-	-	-	-	7	-	-	-	-	-	-	-	22	1	-	-	19	37

Name.	Hardy.				Frame.				Green-house.				Dry-stove.				Stove.				Total.	
	♄	♃	♂	☉	♄	♃	♂	☉	♄	♃	♂	☉	♄	♃	♂	☉	♄	♃	♂	☉	*Gen.*	*Sp.*
Pandaneæ, .	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	1	4
Scitamineæ,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	38	-	-	-	1	2
Cyperaceæ,	-	33	78	5	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	12	136
Gramineæ, .	-	174	5	155	-	-	-	-	-	3	-	-	-	-	-	-	1	8	5	3	75	393
CRYPTOGAMIÆ																						
Naiadies, ...	-	5	-	13	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	9	21
Equisetaceæ	1	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	6
Marciliaceæ	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
Lycopodin.	-	11	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	2	12
Felices, ...	-	76	-	-	-	-	-	-	1	9	-	-	-	-	-	-	1	49	-	-	31	144
App.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	54	76
Total	1132	3130	234	1232	177	21	15	23	2014	1536	90	382	169	6	0	0	853	438	855	764	1850	12700

The above table, and that preceding, though neither are perfectly accurate, afford a very full view of the riches of the British garden; and from them, in connection with the genera already given (276. & 277.), the cultivator may form arrangements in any of the garden departments with ease and effect. Thus, supposing he is desirous of arranging his green-house plants according to the method of Jussieu; then, beginning, say with Ranunculaceæ, he finds that order contains only one tree and two perennials which are green-house plants; on turning to the Jussieuean classification of the genera, he finds Atragene and Knowltonia furnish these. If these genera are in his collection, he begins by placing them together. Next, he proceeds to Magnoliaceæ, in which there are three green-house trees, and so on;—proceeding thus, whether in arranging hardy, green-house, or hot-house plants in the natural method, and similarly, if arranging them according to that of Linnæus.

527. But the whole of the plants enumerated as forming the British Flora, are probably not at any one time all in existence in Britain. Many of them, especially the exotic species, are lost through accidents or diseases, and are wanting for a time till new seeds or plants are obtained from abroad. Similar casualties happen even to hardy plants, and a species which at one time is to be found in moderate quantities in the nurseries is at another period so scarce as not to be met with. Thus, if we reduce the actual number of species to be found in cultivation at one time to from 9000 to 10,000, it will be found nearer the truth. In the public nurseries, varieties are very much cultivated, in order as it were to place the beauties of esteemed species in different points of view; or to produce in vegetables something analogous to what are called variations in musical compositions. The following may be considered as a popular or horticultural distribution of the species and varieties obtainable from British nurseries. It is taken from a catalogue entitled *Prodromus*, &c.; or Forerunner of the collection in Page's Southampton nursery garden, drawn up by L. Kennedy, (late of the Hammersmith nursery,) and published in 1818. It is a work of great practical utility, and with Sweet's *Hortus*, should be in the hands of every gardener who has a collection of plants under his care.

528. *Hardy Plants.*

	Sp. & Var.
Trees above 30 feet high -	100
Trees under 30 and above 10 feet high -	200
Deciduous shrubs	500
Roses double and single -	330
Evergreen shrubs	400
Hardy climbing shrubs -	130
Herbaceous plants	2800
Grasses introduced in botanic collections -	150
Bulbous rooted plants -	250
Aquatics - -	50
Marsh plants -	70
Biennials - -	300
Total	4580

529. *Greenhouse and Drystove Plants.*

	Sp. & Var.
Trees and shrubs	1450
Heaths - -	400
Geraniums -	150
Proteas - -	120
Climbers - -	90
Succulents - -	170
Mesymbryanthemums -	160
Bulbous rooted plants -	300
Herbaceous and stemless plants	340
Total	3180

530. *Hothouse Plants,*

	Sp.& Var.		Sp.& Var.
Trees and shrubs	850	Aquatics	28
Climbers	150	Reedy or scitaminous	55
Succulent plants	130		
Bulbous rooted plants	80	Total	1463
Herbaceous	170		

531. *Annuals, native and exotic.*

	Sp.& Var.		Sp.& Var.
Hardy	300	Used in agriculture exclusive of grasses	80
Half hardy	140		
Tender	100		
Esculent	200	Total	820

Hardy, 4580; greenhouse and drystove, 3180; hothouse, 1463; annuals, 820; total, 10,043; of these, above 3000 may be considered as varieties, so that the actual hortus procurable in British nurseries, may be estimated as to the British hortus of books, as 7 to 12, or including the cryptogamous plants, as 8 to 12.

532. With respect to the *artificial application* of the actual Flora of Britain, including species and varieties, we submit the following as only a rude outline, the subject not admitting of perfect accuracy from the ever-varying number of varieties.

Varieties of Fruit Trees, and Fruit-bearing Plants for Sale in British Nurseries.

	Sp.& Var.		Sp.& Var.		Sp.& Var.
Apples	300	Apricots	30	Cranberry	1
Pears	300	Plums	150	Mulberries	2
Medlars	2	Cherries	100	Filberts	6
Quinces	2	Grapes	50	Walnuts	3
Services	3	Figs	30	Chestnuts	3
Oranges and Lemons	60	Gooseberries	200	Melons	15
Peaches	100	Currants	4	Pine Apples	20
Nectarines	50	Raspberries	10		
Almonds	6	Strawberries	20	Total	1417

533. *Herbaceous Plants, annuals and perennials, used in Horticulture.*

	Sp.& Var.			Sp.& Var.			Sp.& Var.	
Cabbage tribe	1	35	Potherbs and garnishings	11	16	Edible wild plants which may be used	31	31
Leguminous plants	3	59	Sweet herbs	12	20	Edible fungi	3	3
Esculent roots	10	45	Plants used in confectionary and domestic medicine	14	18	Edible fuci	8	8
Spinaceous plants	6	10	Plants used as preserves and pickles	12	26	Total	154	337
Alliacious pla	7	18						
Asparaginous plants	11	18						
Acetaceous plants	25	40						

534. *Florists' Flowers used in Ornamental Gardening.*

By this term is to be understood varieties and sub-varieties of certain species with showy flowers, and which species are peculiarly liable to sport or vary in color, form, &c. by culture. Like all plants whose habits are materially changed by culture, they are more or less monstrous productions, and their beauties not being to be judged of by analogy with the ordinary productions of nature, florists accordingly, about the beginning of last century (44.) fixed on certain artificial canons or laws of beauty by which the new productions continually originated from seed are to be tried. These canons will be found laid down in Part III. Book II.

	Sp.&Var.		Sp.&Var.		Sp.&Var.
Bulbous rooted Plants.		Colchicums	10	*Tuberous rooted Plants.*	
Hyacinths	200	Other sorts	100	Dahlias	400
Tulips	300	*Fibrous rooted Plants.*		Pœonys	20
Crocuses	100	Auriculas	200	Ranunculuses	300
Narcissus	200	Polyanthi	100	Anemonies	200
Iris	60	Primroses	20		
Fritillaries	20	Cowslips	10	Total	2666
Crown imperials	20	Pinks	200		
Dens canis	6	Carnations	300		

535. *Hardy Barren Trees and Shrubs used in Useful and Ornamental Planting.*

	Sp.&Var.		Sp.&Var.
Trees planted for timber	100	Shrubs planted for various uses, as fuel, charcoal, bark, fire-wood, &c.	20
——— other useful purposes	20		
Trees planted for ornament	180	Total	330
Hedge plants	10		

536. *Herbaceous Plants cultivated in Agriculture for Food and the Arts.*

	Sp.&Var.			Sp.&Var.	
Grains for human food	4	20	Plants used for the cloathing arts	2	2
Leguminous seeds	4	10	Sea plants used	6	6
Roots	6	20	Mosses used in dyeing	1	1
Herbage plants, not grasses	9	15	——— various purposes in the arts	6	6
——— grasses, and grasses for grains for the inferior animals	20	25			
Plants used for furnishing oils and essences	5	5	Total	65.	112
lants used for dyeing	2	2			

537. *Miscellaneous applications of Hardy perennials, native and exotic.*

	Sp.&Var.		Sp.&Var.
Border flowers, or such as are used in flower gardens and shrubberies, in ordinary cases about	300	Sold by herbalists, and used by quacks and irregular practitioners	500
Used in the modern pharmacopœias	50	Used for distillation and perfumery	20
		Total	870

The remainder of the hardy herbaceous plants in the actual British Flora are chiefly to be found in a wild state, or in public or private botanic gardens.

538. *Application of Curious or Ornamental Exotics which require the protection of Glass.*

Of these there are in ordinary greenhouses, seldom more than 100 species and varieties, and not more than half that number in the greater number of stoves. The remainder of this class are confined to the public and private botanic gardens, and to eminent public nurseries. Many of this division are of great importance in their native countries, as the indigo, sugar cane, tea tree, cinnamon, &c. The mango, durion, and other excellent fruits, the palms, bamboos, &c. Even some here treated as entirely ornamental, afford useful products in their own countries, as the camelia, sun-flower, &c. from the seeds of which oils are expressed in China and America. The cultivation or preservation of living specimens of these plants, therefore, in our greenhouses and stoves, is a rational entertainment, and also useful, as many species become in time acclimated, and some even naturalized; and uses may in time also be discovered for such as are now merely looked on as objects of curiosity. But it is quite enough to justify much more than all the care that is taken to obtain and preserve them that they contribute to elegant enjoyment; for what is life when it does not exceed mere obedience to the animal instincts?

539. With respect to the *native habitations* of the exotic part of the British Flora, little can be advanced with certainty. In general it seems to appear that moist and moderately warm climates, and irregular surfaces, are most prolific in species; and judging of the whole world from Europe, we should venture to consider half the species of plants in existence as growing in soft and rather moist grounds, whether low or elevated. The soil of surfaces constantly moist, or inclining to be moist, whether watered from the atmosphere or from subterraneous sources, is almost always found to be minutely divided, and generally of a black vegetable or peaty nature. Immense tracts in Russia and America are of this description, and even when dry, resist evaporation better than any other. In such soils, the roots of plants are generally small and finely divided, as in the heaths, most bog plants, and nearly all the American shrubs. The next sort of habitation most prolific in species, appears to us to be arenarious soils in temperate climates, and in proportion to their moisture. Here the roots of plants are also small, but less so than in soils of the former description. On rocky and calcareous soils the roots of plants are generally strong and woody, or at least long and penetrating. In clayey habitations exclusive of the alluvial depositions of rivers, few plants are found, and these generally grasses or strong fibrous-rooted herbaceous plants or tap-rooted trees. Such at least is the amount of our generalizations; but as our observation has been limited to Europe, and does not even extend to the whole of it, those who have visited Africa and Asia, are much more capable of illustrating the subject. One conclusion we think the cultivator is fully entitled to draw, that the greater number of plants, native or foreign, will thrive best in light soil, such as a mixture of soft black vegetable mould or peat and fine sand kept moderately moist; and that on receiving unknown plants or seeds, of the native sites of which he is ignorant, he will err on the safe side by placing them in such soils rather than in any other; avoiding most of all clayey and highly manured soils, as only fit for certain kinds of plants constitutionally suited to become monstrous by culture.

Chap. XI.

Origin of Culture as derived from the Study of Vegetables.

540. The final object of all the sciences is their application to purposes subservient to the wants and desires of man. Phytology in this respect is one of the most important studies, as directly introductory to the arts, which supply food, clothing, and medicine; and indirectly to those which supply houses, machines for conveying us by land or by water, and in short almost every comfort and luxury; for, without the vegetable kingdom, few mineral bodies could be employed in the arts, and the great majority of animals could not live.

Agriculture and gardening are the two arts which embrace the whole business of cultivating vegetables for whatever purpose they are applied by civilized man, and in this respect their fundamental principles are the same; they are all indicated by nature, and explained by vegetable chemistry and physiology, and most of them have been long practised by man without much reference to either.

The object of vegetable culture is either, 1. to increase the number of plants; 2. to increase their number and retain their native qualities; 3. to increase their number and improve their qualities; 4. to increase their magnitude; 5. to increase the number, improve the quality, and increase the magnitude of particular parts of the vegetable; 6. to form new varieties for the furtherance of all or any of the above purposes; and 7. to preserve vegetables for future use.

For all these objects in common, the first step is to procure the desired plant, either by removing it in an entire state from its native scite, and planting it in an appropriate situation; or by gathering and sowing its seeds; or by propagating from a part of the plant. Hence the general origin both of agriculture and gardening, and of all the different modes of propagation, transplanting, and collecting seeds.

The next step is to secure the plants to be cultivated from the depredations of animals, or unsuitable weather, either by surrounding them with an adequate barrier where they are growing fortuitously, or by removing them to a spot already protected. Hence the origin of fences and enclosures, and plant habitations.

A third step common to all the above objects of culture is to remove from the vicinity of the plant to be cultivated, or from the plant itself, all other plants, or animals, or objects likely to impede its progress. Hence the origin of weeding, thinning, destroying insects, and curing diseases.

541. *To increase the Number and retain the Native Qualities of Vegetables*, it is necessary to imitate, as exactly as circumstances will admit, their native habitation, in respect to soil, climate, mode of watering, light, &c. If the habitation is in any way ameliorated,

the qualities of the plant will be altered, and its parts enlarged, which is not desired. All that is necessary, therefore, for effecting this branch of culture, is to imitate the habitation and propagate. This is, or ought to be the case, wherever plants are grown for medicine or botanical purposes, as in physic and botanic gardens. Nature is here imitated as exactly as possible, and the result is productions resembling, as near as possible, those of nature.

542. *To increase the Number and improve the Qualities of Plants,* it is necessary, 1. To facilitate their mode of nutrition by removing all obstacles to the progress of the plant, whether those obstacles exist under or above the surface; and hence the origin of draining, clearing from surface incumbrances, and the various operations, as digging, ploughing, &c. for pulverizing the soil. Nature suggests this in accidental ruptures of the surface, broken banks, the alluvial depositions from overflowing rivers, and the earth thrown up by underground animals. Many of the vegetables within the influence of such accidents are destroyed, but such as remain are ameliorated in quality, and the reason is, their food is increased, because their roots, being enabled to take a more extensive range, more is brought within their reach.

It is necessary, or at least advantageous, to supply food artificially; and hence the origin of manuring. All organized matters are capable of being converted into the food of plants; but the best manure for ameliorating the quality, and yet retaining the peculiar chemical properties of plants, must necessarily be decayed plants of their own species. It is true that plants do not differ greatly in their primary principles, and that a supply of any description of putrescent manure will cause all plants to thrive better; but some plants, as wheat, contain peculiar substances, (as gluten and phosphate of lime,) and some manures, as those of animals, or decayed wheat, containing the same substances, must necessarily be a better food or manure for such plants. Manuring is an obvious imitation of nature, every where observable by the decaying herbage of herbaceous plants, or the fallen leaves of trees, rotting into dust or vegetable mould about their roots; and by the effect of manure left by pasturing or other animals.

It is farther advantageous, in improving the qualities of vegetables, to ameliorate their climate, by increasing or diminishing its temperature according to the nature of the plant; unless, indeed, it be situated in a climate which experience and observation show to be exactly suited to its nature. Hence the origin of shelter and shade, by means of walls, hedges, or strips of plantation; of sloping surfaces or banks, to receive more directly or indirectly the rays of the sun; of soils better calculated to absorb and retain heat; walls fully exposed to the south; or to the north, of training or spreading out the branches of trees on these walls; of hot-walls; of hot-beds; and finally of all the variety of hot-houses. Nature suggests this part of culture, by presenting, in every country, different degrees of shelter, shade, and surface, and in every zone different climates.

The next point demanding attention is moisture, for when the soil is pulverized, it is more easily dried by the penetration of the air; when an increase of food is supplied, the medium through which that food is taken up by the plant should be increased; and when the temperature is increased, evaporation becomes greater. Hence the origin of watering by surface or subterraneous irrigation, manual supplies to the root, showering over the leaves, steaming the surrounding atmosphere, &c. This is only to imitate the dews and showers, streams and floods, of nature; and it is to be regretted that the imitation is in most countries attended with so much labor, and requires so much nicety in the arrangement of the means, and judgment in the application of the water, that it is but very partially applied by man in every part of the world excepting perhaps a small district of Italy. But moisture may be excessive, and on certain soils at certain seasons, and on certain productions at particular periods of their progress, it may be necessary to carry off a great part of the natural moisture, rather than let it sink into the earth, or draw it off where it has sunk in and injuriously accumulated, or prevent its falling on the crop at all; and hence the origin of surface-drainage by ridges, and of under-draining by covered conduits, or gutters; and of awnings and other covers to keep off the rain or dews from ripe fruits, seeds, or rare flowers.

The remaining article is light, which sometimes requires to be excluded or increased, in order to improve the qualities of vegetables; and hence another origin of shading, and the practice of blanching. This practice is derived from accidents observable among vegetables in a wild state, and its influence on their quality is physiologically accounted for by the obstruction of perspiration, and the prevention of the chemical changes effected by light on the epidermis.

543. *Increasing the Magnitude of Vegetables,* without reference to their quality, is to be obtained by an increased supply of all the ingredients of food, distributed in such a body of well pulverized soil as the roots can reach to; of heat and moisture; of a partial exclusion of the direct rays of the sun, so as to moderate perspiration; and of wind, so as to prevent sudden desiccation. But experience alone can determine what plants are

best suited for this, and to what extent the practice can be carried. Nature gives the hint in the occasional luxuriance of plants accidentally placed in favorable circumstances, and man adopts it, and improving on it, produces cabbages and turnips of half a cwt.; apples of one pound and a half; and cabbage roses four inches in diameter; productions which may in some respects be considered as diseased.

544. *To increase the Number, improve the Quality, and increase the Magnitude of particular parts of Vegetables.* It is necessary, in this case, to remove such parts of the vegetable as are not wanted, as the blossoms of bulbous or tuberous-rooted plants, when the bulbs are to be increased, and the contrary; the water-shoots and leaf-buds of fruit-trees; the flower-stems of tobacco; the male-flowers and barren runners of the cucumis tribe, &c. Hence the important operations of pruning, ringing, cutting off large roots, &c.; and other practices for improving fruits, and throwing trees into a bearing state. At first sight these practices do not appear to be copied from nature; but, independently of accidents by fire, already mentioned, (11) which both prune and manure, and of fruit-bearing trees, say thorns or oaks, partially blown out by the roots, or washed out of the soil by torrents, which always bear better afterwards, why may not the necessity that man was under, in a primitive state of society, of cutting or breaking off branches of trees, to form huts, fences, or fires, and the consequent vigorous shoots produced from the parts where the amputation took place, or the larger fruit on that part of the tree which remained, have given the first idea of pruning, cutting off roots, &c. It may be said that this is not nature but art; but man, though an improving animal, is still in a state of nature, and all his practices, in every stage of civilization, are as natural to him as those of the other animals are to them. Cottages and palaces are as much natural objects as the nests of birds, or the burrows of quadrupeds; and all the laws and institutions by which social man is guided in his morals and politics, are no more artificial than the instinct which congregates sheep and cattle in flocks and herds, and guides them in their choice of pasturage and shelter.

545. *To form new Varieties of Vegetables,* it is necessary to take advantage of their sexual differences, and to operate (as already observed) in a manner analogous to crossing the breed in animals. Hence the origin of what is called obtaining new sorts of fruits, as well as by an inverse practice of preserving distinct sorts of annual or biennial plants already obtained. Even this practice is but an imitation of what takes place in nature by the agency of bees and other insects, and the wind; all the difference is, that man operates with a particular end in view, and selects individuals possessing the particular properties which he wishes to perpetuate or improve.

546. *The Preservation of Vegetables for future Use* is effected by destroying or rendering dormant the principle of life, and by warding off, as far as practicable, the progress of chemical decomposition. Hence some vegetables are dried, and either their herbs, or roots, or fruits; others are placed beyond the reach of the active principles of vegetation, heat, and moisture, as seeds, roots, and fruits; and some are, in addition, even excluded from air, or placed in very low temperatures. The origin of these practices are all obvious imitations of what accidentally takes place in nature, from the withered grassy tressock to the hedge-hog's winter store; and hence the origin of herb, seed, fruit, and root-rooms, and cellars.

The whole of gardening, as an art of culture, is but a varied developement of the above fundamental practices, all founded in nature, and for the most part rationally and satisfactorily explained on chemical and physiological principles. Hence the great necessity of the study of botany to the cultivator, not in the limited sense in which the term is often taken as including mere nomenclature and classification, but in that extended signification in which we have here endeavoured, proportionately to our limited space, to present the study of the vegetable kingdom. Those who would enter more minutely into the subject will have recourse to the excellent work of Keith, from whom we have quoted at such length; to Smith's introduction, and to the elementary works of Wildenow, and Decandolle.

BOOK II.

OF THE NATURAL AGENTS OF VEGETABLE GROWTH AND CULTURE.

547. The phenomena of vegetation being examined, and the fact ascertained that plants derive their nourishment from the external elements of matter: the next step in the study of the science of gardening is to inquire into the composition and nature of material bodies, and the laws of their changes. The earthy matters which compose the surface of the earth, the air and light of the atmosphere, the water precipitated from it, the heat or cold produced by the alternation of day and night, and by chemical composition and resolution, must include all the elements concerned in vegetation.

526. The following table exhibits a similar combination of the *Jussieuan classification*, with the garden habitations.

Name.	Hardy.				Frame.				Green-house.				Dry-stove.				Stove.				Total.	
	♄	♃	♂	⊙	♄	♃	♂	⊙	♄	♃	♂	⊙	♄	♃	♂	⊙	♄	♃	♂	⊙	*Gen.*	*Sp.*
Thalamif. §1.																						
Ranuncula.	16	43	-	4	-	2	-	-	1	2	-	-	-	-	-	-	1	-	-	-	23	69
Magnoliace.	13	-	-	-	5	-	-	-	3	-	-	-	-	-	-	-	3	-	-	-	5	24
Annonæ,…	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-	-	-	4	16
Menisperm.	3	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	4	2	-	-	5	12
Berberides,	7	4	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	7	13
Thalamif. §2.																						
Papaverace.	-	18	8	20	-	4	-	-	-	-	-	-	-	-	-	-	1	-	-	-	13	51
Cruciferæ ..	46	83	33	124	5	1	-	-	30	1	3	2	-	-	-	-	1	-	-	-	53	330
Capparides,	-	11	1	9	-	-	-	-	5	1	1	-	-	-	-	-	16	1	2	6	7	53
Passifloræ,..	1	3	-	7	-	2	-	-	4	3	1	-	-	-	-	-	34	-	-	-	1	55
Violeæ ……	4	36	-	2	-	-	-	-	5	1	-	-	-	-	-	-	5	-	-	-	3	53
Pediculareæ	2	5	-	6	-	-	-	-	15	1	-	-	-	-	-	-	-	-	-	-	2	29
Cisti,……..	11	1	-	6	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	47
Thalamif. §3.																						
Caryophyll.	5	154	12	85	1	4	-	-	8	5	5	1	-	-	-	-	1	-	-	-	30	281
Malvaceæ, .	5	16	4	24	1	-	-	-	34	6	1	3	-	-	-	-	71	2	24	22	35	216
Sterculiace.	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	5	-	-	-	2	6
Tiliaceæ, …	21	-	-	-	1	-	-	-	43	-	-	-	-	-	-	-	65	-	1	5	20	88
Sapindi,……	1	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	15	-	-	2	10	20
Acereæ, ….	22	20	-	1	-	3	-	-	3	1	-	-	-	-	-	-	8	30	-	-	17	51
Malpighace.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27	-	-	-	3	27
Pittosporæ,	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	1	-	-	-	3	10
Hypericinæ	10	17	-	-	8	8	-	-	10	-	-	-	-	-	-	-	-	-	1	-	2	54
Guttiferæ,..	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	13	-	-	-	8	15
Vites, …….	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	8
Geraniæ,…	-	30	-	26	-	3	-	-	175	67	5	-	-	-	-	-	2	-	-	-	7	309
Meliaceæ,..	-	1	-	-	-	-	-	-	5	1	-	-	-	-	-	-	13	1	-	-	14	21
Aurantiæ, .	-	-	-	-	-	-	-	-	28	-	-	-	-	-	-	-	10	-	-	-	8	38
Rutaceæ,…	2	6	-	1	-	-	-	-	11	1	2	-	1	-	-	-	1	1	-	1	10	27
Diosmeæ,..	-	-	-	-	-	-	-	-	34	-	-	-	-	-	-	-	-	-	-	-	7	34
Thalamif. §4.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calyciflore.																						
Terebintac.	20	-	-	-	-	-	-	-	21	-	-	-	-	-	-	-	20	-	-	-	17	70
Leguminos.	52	184	9	292	9	6	-	-	189	15	5	3	-	-	-	-	89	10	19	62	144	1054
Rosaceæ,…	157	195	1	-	6	-	-	-	27	-	-	-	-	-	-	-	4	-	-	-	26	391
Salicariæ,…	-	6	-	5	-	-	-	-	3	1	1	-	-	-	-	-	7	1	1	1	12	27
Melastomeæ	-	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	20	-	1	-	4	24
Myrtæ,……	9	-	-	-	-	-	-	-	79	-	-	-	-	-	-	-	33	1	-	1	22	123
Combretac.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	4	9
Cucurbitac.	-	1	-	8	-	-	-	13	-	8	-	-	-	-	-	-	3	7	-	1	10	4
Looseæ, ….	-	11	-	-	-	-	-	-	1	2	-	-	-	-	-	-	2	1	-	1	2	12
Onograriæ,	-	24	8	7	-	1	1	-	3	2	2	-	-	-	-	-	-	2	4	-	10	72
Ficoideæ,…	1	-	-	-	1	-	-	-	152	53	5	15	-	-	-	-	-	3	-	4	7	232
Semperviveæ	-	41	-	6	-	1	-	-	42	11	5	4	4	-	-	-	-	-	-	-	13	97
Portulaceæ,	3	6	-	9	-	-	-	-	5	2	-	-	-	-	-	-	5	-	3	8	14	37
Cacti, …….	22	-	-	-	-	-	-	-	-	2	-	-	55	-	-	-	3	-	-	-	3	82
Saxifrageæ,	4	69	-	2	2	18	-	-	1	-	-	-	-	-	-	-	-	-	-	-	9	95
Cunoniaceæ	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	2	2
Araliæ,. ….	4	4	-	-	-	-	-	-	2	-	-	-	-	-	-	-	4	-	-	-	3	32
Caprifoliæ, .	53	6	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	11	65
Umbellifer.	1	172	33	51	-	-	-	-	10	8	3	1	-	-	-	-	-	1	1	-	53	285
Corymbifer.	21	494	8	148	6	12	1	1	169	54	14	6	-	-	-	-	14	12	9	30	133	945
Rubiaceæ, .	41	36	-	11	-	-	-	-	19	1	-	-	-	-	-	-	62	2	2	3	51	153
Cyonrocep.	1	127	28	43	2	4	3	-	12	4	-	1	-	-	-	-	1	1	-	-	23	227
Dipsaceæ,..	-	33	4	26	-	-	-	-	4	1	-	-	-	-	-	-	-	-	-	-	5	68
Gentianeæ,	-	24	6	9	-	-	-	-	-	5	1	-	-	-	-	-	13	2	-	1	15	48
Cichoraceæ,	-	118	25	59	-	-	1	-	1	3	2	-	-	-	-	-	-	-	-	-	10	73
Campanula.	-	84	14	9	-	3	-	-	8	25	5	9	-	-	-	-	2	-	-	-	10	128

Name.	Hardy.				Frame.				Green-house.				Dry-stove.				Stove.				Total.	
	♄	♃	♂	⊙	♄	♃	♂	⊙	♄	♃	♂	⊙	♄	♃	♂	⊙	♄	♄	♂	⊙	*Gen.*	*Sp.*
Stylideæ, ...	-	-	-	-	-	-	-	-	3	2	-	-	-	-	-	-	-	-	-	-	1	3
Goodenoviæ	-	4	-	-	-	-	-	-	3	-	-	-	-	-	-	-	1	-	-	-	4	8
Ericeæ, ...	67	10	-	-	2	-	-	-	42	-	-	-	-	-	-	-	10	-	-	-	20	421
Epacrideæ,	1	-	-	-	-	-	-	-	19	-	-	-	-	-	-	-	-	-	-	-	9	20
COROLIFLOR.																						
Myrsineæ. .	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	6	-	-	-	2	11
Sapoteæ, ...	5	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	16	-	-	-	9	23
Ebenaceæ, .	9	-	-	-	-	-	-	-	12	-	-	-	-	-	-	-	7	-	-	-	8	23
Oleineæ, ...	34	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	3	-	-	-	9	49
Jasmineæ, ..	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	1
Apocineæ, .	2	8	-	-	-	-	-	-	5	-	-	-	-	-	-	-	34	-	3	-	19	56
Bignoniac. .	3	11	-	-	1	-	-	-	4	-	-	2	-	-	-	-	19	2	-	5	10	47
Pedalineæ, ..	-	-	-	-	-	-	-	-	4	3	1	-	-	-	-	-	-	-	-	1	1	1
Polemonia ..	-	27	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	5	24
Convolvul.	6	5	-	18	-	-	-	-	12	9	-	-	-	-	-	-	9	7	1	22	9	92
Boragineæ,	1	44	17	33	-	-	-	-	28	5	2	-	-	-	-	-	21	1	-	-	25	152
Solaneæ, ...	9	12	15	49	-	-	3	-	28	8	2	-	-	-	-	-	42	2	2	2	20	174
Scrofularin.	-	102	6	38	2	25	-	1	17	4	3	5	-	-	-	-	11	3	1	2	41	222
Orobancheæ	-	7	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	2	7
Labiateæ, ...	32	227	11	55	23	7	2	-	61	13	3	-	-	-	-	-	7	3	5	15	55	590
Myoporin...	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	6	-	-	-	4	11
Acanthaceæ	-	-	-	-	-	-	-	-	3	3	-	-	-	-	-	-	35	5	1	5	10	61
Lentibular..	-	7	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	9
Primulaceæ	-	57	2	7	-	-	-	-	-	3	4	-	-	-	-	-	-	-	-	-	14	64
Globulareæ,	-	3	1	3	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	7
MONOCHLAMY.																						
Plumbagin.	2	24	-	-	-	9	-	-	4	4	1	-	-	-	-	-	3	-	-	-	3	44
Plantagin...	1	19	2	14	-	-	-	-	1	-	1	1	-	-	-	-	-	-	-	-	2	39
Nyctagineæ	-	2	-	-	-	-	-	-	2	1	1	-	-	-	-	-	6	4	-	1	7	17
Amarantha.	-	-	-	-	-	-	-	-	1	3	-	1	-	-	-	-	6	4	3	9	61	23
Chenopod..	5	5	3	60	-	-	-	-	3	1	1	-	-	-	-	-	10	3	2	2	24	136
Polygoneæ,	2	36	-	26	-	-	-	-	4	2	1	-	-	-	-	-	6	1	-	-	8	79
Laurineæ, .	5	-	-	-	-	-	-	-	7	-	-	-	-	-	-	-	9	-	-	-	2	18
Myristiaceæ	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	2	1	-	-	2	3
Proteaceæ,	-	-	-	-	-	-	-	-	61	-	-	-	-	-	-	-	-	-	-	-	23	200
Thymeleæ, .	14	-	-	-	-	-	-	-	32	-	-	-	-	-	-	-	2	-	-	-	11	48
Santalaceæ,	4	4	-	-	-	-	-	-	5	-	-	-	-	-	-	-	7	-	-	-	10	20
Elæagni, ...	4	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	2	6
Aristolochi.	2	8	-	-	-	-	-	-	6	5	-	-	-	-	-	-	4	1	-	-	2	41
Euphorbiac.	4	-	1	20	-	-	-	-	25	1	-	-	-	-	-	-	50	2	4	9	30	196
Urticeæ, ...	8	6	-	10	-	1	-	-	3	2	-	-	-	-	-	-	46	17	2	2	15	102
Amentaceæ	190	3	-	-	-	-	-	-	2	-	-	-	-	-	-	-	4	-	-	-	18	206
Coniferæ, ..	16	-	-	-	-	2	-	-	8	-	-	-	-	-	-	-	-	-	-	-	5	26
PHANEROGAM.																						
Cycadeæ, ..	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	8	-	-	-	2	13
Hydrochari.	-	13	-	1	-	-	-	-	11	-	-	-	-	-	-	-	7	14	2	-	17	58
Alismaceæ,	-	23	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-	-	-	-	6	30
Orchideæ, ..	-	27	-	-	-	1	-	-	23	-	-	-	-	-	-	2	2	48	-	-	49	128
Musaceæ, ..	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	9	-	-	4	15
Irideæ, ...	-	73	-	-	-	1	-	-	166	2	-	-	-	-	-	-	7	5	-	-	25	00
Hæmodora.	-	1	-	-	-	-	-	-	1	2	-	-	7	4	-	-	-	-	-	-	4	4
Amaryllide.	-	64	-	-	-	-	-	-	2	61	-	-	-	-	-	-	-	48	-	-	13	102
Hemerocali.	-	10	-	-	-	3	-	-	29	39	-	-	-	-	-	-	2	9	-	-	13	102
Dioscoreæ, .	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	6	-	-	2	9
Smilaceæ, ..	16	29	-	1	1	1	-	-	7	1	-	-	-	-	-	-	1	-	-	-	11	59
Liliæ, ...	4	37	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	2	-	-	6	47
Melanthace.	-	24	-	-	-	-	-	-	-	11	-	-	-	-	-	-	-	-	-	-	7	35
Junceæ, ...	-	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	5	32
Restiaceæ, .	-	1	-	-	-	1	-	-	-	4	-	-	-	-	-	-	-	-	-	-	5	7
Commelin..	-	7	..		-	-	-	-	-	1	-	-	-	-	-	-	1	9	-	2	5	22
Palmæ, ...	-	7	..	-	-	-	-	-	7	-	-	-	-	-	-	-	22	1	-	-	19	37

least seven-eighths of sand; sandy soils that effervesce with acids should be distinguished by the name of calcareous sandy soil, to distinguish them from those that are siliceous. The term clayey soil should not be applied to any land which contains less than one-sixth of impalpable earthy matter, not considerably effervescing with acids; the word loam should be limited to soils, containing at least one-third of impalpable earthy matter, copiously effervescing with acids. A soil to be considered as peaty, ought to contain at least one half of vegetable matter.

"In cases where the earthy part of a soil evidently consists of the decomposed matter of one particular rock, a name derived from the rock may with propriety be applied to it. Thus, if a fine red earth be found immediately above decomposing basalt, it may be denominated basaltic soil. If fragments of quartz and mica be found abundant in the materials of the soil, which is often the case, it may be denominated granitic soil; and the same principles may be applied to other like instances. In general, the soils, the materials of which are the most various and heterogeneous, are those called alluvial, or which have been formed from the depositions of rivers; and these deposits may be designated as siliceous, calcareous, or argillaceous; and in some cases the term saline may be added, as at the embouchure of rivers, where their alluvial remains are overflown by the sea."

Oxyde of iron is to be found in almost all soils, and is the general cause of their reddish-brown color. Where this substance is in evident superabundance, the term ferruginous clay, sand, or peat, is very properly applied.

To describe the different soils as known by sight, smell, or touch, would be, as we conceive, useless waste of time; for a very little experience in the field or the garden will give more correct notions than a volume of descriptions.

The leading classes of soils as far as cultivation is concerned, are calcareous, argillaceous, siliceous, ferruginous, aquatic, peaty, and saline. These, when in an uncultivated state, may be known with a considerable degree of certainty by the plants which are found growing on them.

In the agricultural establishments of Fellenberg at Hofwyl in Switzerland, and of Professor Thaer at Mœgelin in Prussia, the predominant earth constitutes the genus; the color produced by its mixture with other earths, salts, or metallic oxydes, the species; and the degree of comminution, or of color, the varieties.

550. The following are a few of the leading plants found in such soils in Britain; and their number may be greatly increased by reference to the *Flora Britannica* of Smith or Galpine. It is proper to add, however, that these plants are not absolutely to be depended on, even in Britain; and in other countries they are found in soils directly opposite. The Saintfoin, however, is almost always an indication of a calcareous soil; the *tussilago farfara*, or common colts-foot, of blue clay; the *arenaria rubra*, of poor sand, the small wood sorrel of the presence of iron; the aquatic, peaty, and saline soils are almost every where indicated by the same plants; a proof, as we have before stated, (509.) that the climate, and natural irrigation of plants have much more influence on their habits than mere soil. See the *Stationes Plantarum* of Lin. and the *Flora Française* of De Candolle; *Kent's Hints*, &c. and *Farmers' Mag.* Feb. 1819.

Calcareous. Veronica spicata, Gallium pusillum, Lithospermum officinale, and purpuro cæruleum. Campanula glomerata, and hybrida. Phyteuma orbiculare, Verbascum lychnitis, Viburnum lantana, Berberis vulgaris, Cistus helianthemum, Anemone pulsatilla, Clematis vita alba, Hedysarum onobrychis.

Argillaceous. Tussilago farfara, Potentilla anserina, argentea, and reptans. Thalictrum flavum, Carex, many species. Juncus, various species. Orobus tuberosus, Lotus major, and corniculatus. Saponaria officinalis, but the Tussilago farfara is the only certain and universal sign of an argillaceous soil, and is the chief plant found on the alum grounds of Britain, France, and Italy.

Siliceous. Veronica triphyllus, and verna. Echium italicum, Herniaria glabra and hirsuta. Silene anglica and other species. Arenaria rubra, &c. Spergula arvensis, Papaver, hybridum agremone, &c.

Ferrugineous. Rumex acetosa, and acetosella.

Aquatic. Caltha palustris, Hippuris vulgaris. Pinguicula vulgaris, Lycopus europeus Valeriana dioica, Viola palustris, Samolus valerandi, Silenum palustre, Epilobium tetragonum, Lythrum salicaria, Ranunculus lingula and flamula.

Peaty. Vaccinium, myrtillus ulignosum, and oxycoccus. Erica 4 sp. Spergula subulata. Tormentilla officinalis.

Saline. Salicornea 4. species. Zostera marina, Ruppia maritima, Pulmonaria maritima, Convolvulus saldanella, Illecebrum verticillatum, Chenopodium maritimum, Salsola kali, and fruticosa. Sium verticillatum. Arenaria maritima, &c. Atriplex laciniata.

Sect. II. *Of the Analysis and constituent Parts of Soils.*

551. Chemical analysis is much too nice an operation for the great majority both of sceintific and practical cultivators, either to perform, or to depend on, when performed by themselves. Such a knowledge of chemistry as shall enable the cultivator to understand the nature of the process and its results, when made and presented to him by others, is calculated to be highly useful, and ought to be acquired by every man whose object is to join theoretical to practical knowledge. If it so happens that he can perform the operations of analysis himself, so much the better, as far as that point is concerned; but on the whole, such knowledge and adroitness is not to be expected from men who have so many other points demanding their attention, and who will, therefore, effect their purpose much better by collecting proper specimens of the soils to be studied, and sending them for analysis to a respectable operative chemist.

In cases where the general nature of the soil of a field is to be ascertained, specimens of it should be taken from different places, two or three inches below the surface, and examined as to the similarity of their properties. It sometimes happens, that upon plains, the whole of the upper stratum of the land is of the same kind, and in this case, one analysis will be sufficient; but in valleys, and near the beds of rivers, there are very great differences, and it now and then occurs that one part of a field is calcareous, and another part siliceous; and in this case, and in analogous cases, the portions different from each other should be separately submitted to experiment.

Soils, when collected, if they cannot be immediately examined, should be preserved in phials quite filled with them, and closed with ground glass stoppers.

The quantity of soil most convenient for a perfect analysis is from two to four hundred grains. It should be collected in dry weather, and exposed to the atmosphere till it becomes dry to the touch.

The specific gravity of a soil, or the relation of its weight to that of water, may be ascertained by introducing into a phial, which will contain a known quantity of water, equal volumes of water and of soil, and this may be easily done by pouring in water till it is half full, and then adding the soil till the fluid rises to the mouth; the difference between the weight of the soil and that of the water, will give the result. Thus if the bottle contains four hundred grains of water, and gains two hundred grains when half filled with water and half with soil, the specific gravity of the soil will be 2, that is, it will be twice as heavy as water, and if it gained one hundred and sixty-five grains, its specific gravity would be 1825, water being 1000.

It is of importance, that the specific gravity of a soil should be known, as it affords an indication of the quantity of animal and vegetable matter it contains; these substances being always most abundant in the lighter soils.

The other physical properties of soils should likewise be examined before the analysis is made, as they denote, to a certain extent, their composition, and serve as guides in directing the experiments. Thus siliceous soils are generally rough to the touch, and scratch glass when rubbed upon it; ferruginous soils are of a red or yellow colour; and calcareous soils are soft.

552. Grisenthwaite describes a simple mode of ascertaining experimentally the properties of soils independently of analysis, but it is here to be considered, that by the word soil, contrary to the common usage of language, he understands earthy substances only, independently of every thing capable of furnishing nourishment, or any constituent part of vegetables. The mode, however, may be very usefully applied to soils in the general sense of the word. "We have seen," he says, "the vast importance connected with the free circulation of water in a soil. We have proved that on that free circulation depend its temperature, its capability of conducting nourishment to the roots of vegetables, and its adaptation to those spontaneous changes which are required to take place in manure in order to furnish this nourishment; if, therefore, the relative excellence of this property be determined, we shall also arrive at the determination of those others which depend on it. To effect this, an equal portion of two soils, perfectly dry, may be introduced into two tall glass cylindrical vessels, in the middle of each of which a glass tube is previously placed. The soils should be put into each in the same manner, not compressed very hard, but so as to receive a solidity approaching to that which they possessed when first obtained for trial. If, after this preparation, a quantity of water be poured into the glass tubes, it will subside; and the capillary attraction of the soils will conduct it up the cylinders towards the tops of the vessels. That which conducts it most rapidly, provided it do not rise from the weight of the incumbent column of water in the tube, may be pronounced to be the better soil."

553. "The substances which constitute soils," Sir H. Davy observes, "are certain compounds of the earths, silica, lime, alumina, magnesia, and of the oxides of iron and manganesum; and animal and vegetable matters in a decomposing state, and saline, acid, or alkaline combinations.

"In all chemical experiments on the composition of soils connected with culture, the constituent parts obtained are compounds; and they act as compounds in nature: it is in this state, therefore, their characteristic properties shall be described.

"1. Silica, or the earth of flints, in its pure and crystallized form, is the substance known by the name of rock crystal, or Cornish diamond. As it is procured by chemists, it appears in the form of a white impalpable powder. It is not soluble in the common acids, but dissolves by heat in fixed alkaline lixivia. It is an incombustible substance, for it is saturated with oxygen.

"2. The sensible properties of lime are well known. It exists in soils usually united to carbonic acid; which is easily disengaged from it by the attraction of the common acids. It is sometimes found combined with the phosphoric and sulphuric acids. Its chemical properties and agencies in its pure state will be afterwards described. It is soluble in nitric and muriatic acids, and forms a substance with sulphuric acid, difficult of solution, called gypsum. It is not soluble in alkaline solutions.

"3. Alumina exists in a pure and crystallized state in the white sapphire, and united to a little oxide of iron and silica in the other oriental gems. In the state in which it is procured by chemists, it appears as a white powder, soluble in acids and fixed alkaline liquors.

"4. Magnesia exists in a pure crystallized state, constituting a mineral like talc found in North America. In its common form it is the *magnesia usta*, or calcined magnesia of druggists. It generally exists in soils combined with carbonic acid. It is soluble in all the mineral acids; but not in alkaline lixivia. It is distinguished from the other earths found in soils by its ready solubility in solutions of alkaline carbonates, saturated with carbonic acid.

"5. There are two well known oxides of iron, the black and the brown. The black is the substance that flies off when red hot iron is hammered. The brown oxide may be formed by keeping the black oxide red hot, for a long time in contact with air. The oxides of iron sometimes exist in soils combined with carbonic acid. They are easily distinguished from other substances by their giving, when dissolved in acids, a black color to solution of galls, and a bright blue precipitate to solution of prussiate of potassa and iron.

"6. The oxide of manganesum is the substance commonly called manganese, and used in bleaching. It is distinguished from the other substances found in soils, by its property of decomposing muriatic acid, and converting it into chlorine.

"Vegetable and animal matters are known by their sensible qualities, and by their property of being decomposed by heat.

"8. The saline compounds found in soils, are common salt, sulphate of magnesia, sometimes sulphate of iron, nitrates of lime and of magnesia, sulphate of potassa, and carbonates of potassa and soda.

"The silica in soils is usually combined with alumina and oxide of iron, or with alumina, lime, magnesia and oxide of iron, forming gravel and sand of different degrees of fineness. The carbonate of lime is usually in an impalpable form; but sometimes in the state of calcareous sand. The magnesia, if not combined in the gravel and sand of soil, is in a fine powder united to carbonic acid. The impalpable part of the soil, which is usually called clay or loam, consists of silica, alumina, lime, and magnesia; and is, in fact, usually of the same composition as the hard sand, but more finely divided. The vegetable, or animal matters, (and the first is by far the most common in soils) exists in different states of decomposition. They are sometimes fibrous, sometimes entirely broken down and mixed with the soil.

554. "To form a just idea of soils, it is necessary to conceive different rocks decomposed, or ground into parts and powder of different degrees of fineness; some of their soluble parts dissolved by water, and that water adhering to the mass, and the whole mixed with larger or smaller quantities of the remains of vegetables and animals, in different stages of decay.

"Poor and hungry soils, such as are produced from the decomposition of granitic and sandstone rocks, remain very often for ages with only a thin covering of vegetation. Soils from the decomposition of limestone, chalks, and basalts, are often clothed by nature with the perennial grasses; and afford, when ploughed up, a rich bed of vegetation for every species of cultivated plant."

555. Peaty soils, though equally sterile as poor and hungry soils, are produced from very opposite causes, and it is interesting to contemplate how the same effect may be produced by different means, and the earth which supplies almost all our wants may become barren alike from the excessive application of art, or the utter neglect of it. Continual pulverization and cropping, without manuring, will certainly produce a hungry barren soil; and the total neglect of fertile tracts will, from their accumulated vegetable products, produce peat soils, and bogs. Where successive generations of vegetables have grown upon a soil," Sir H. Davy observes, "unless part of their produce has been carried off by man, or consumed by animals, the vegetable matter increases in such a

proportion, that the soil approaches to a peat in its nature; and if in a situation where it can receive water from a higher district, it becomes spongy, and permeated with that fluid, and is gradually rendered incapable of supporting the nobler classes of vegetables.

"Many peat-mosses seem to have been formed by the destruction of forests, in consequence of the imprudent use of the hatchet by the early cultivators of the country in which they exist: when the trees are felled in the out-skirts of a wood, those in the interior are exposed to the influence of the winds; having been accustomed to shelter, they become unhealthy, and die in their new situation; and their leaves and branches gradually decomposing, produce a stratum of vegetable matter. In many of the great bogs in Ireland and Scotland, the larger trees that are found in the out-skirts of them, bear the marks of having been felled. In the interior few entire trees are found; and the cause is, probably, that they fell by gradual decay; and that the fermentation and decomposition of the vegetable matter was most rapid where it was in the greatest quantity.

"Lakes and pools of water are sometimes filled up by the accumulation of the remains of aquatic plants; and in this case a sort of spurious peat is formed. The fermentation in these cases, however, seems to be of a different kind. Much more gaseous matter is evolved; and the neighbourhood of morasses, in which aquatic vegetables decompose, is usually aguish and unhealthy; whilst that of the true peat, or peat formed on soils originally dry, is always salubrious.

"The earthy matter of peats is uniformly analogous to that of the stratum on which they repose; the plants which have formed them must have derived the earths that they contained from this stratum. Thus in Wiltshire and Berkshire, where the stratum below the peat is chalk, calcareous earth abounds in the ashes, and very little alumina and silica. They likewise contain much oxide of iron and gypsum, both of which may be derived from the decomposition of the pyrites, so abundant in chalk.

"Different specimens of peat burnt from the granitic and schistose soils of different parts of these islands, have always given ashes principally siliceous and aluminous; and a specimen of peat from the county of Antrim, gave ashes which afforded very nearly the same constituents as the great basaltic stratum of the county."

Any of the above soils in a constant state of saturation by water, is called an aquatic soil; and in saline soils, this water, or the earth itself, is impregnated with salt, generally that of the sea, or of salt rocks, springs, or lakes.

Sect. III. *Of the Uses of the Soil to Vegetables.*

556. Earths, exclusively of vegetable matter and water, are allowed by most physiologists, to be of no other use to plants than that of supporting them, or furnishing a medium by which they may fix themselves to the globe. "Plants," Sir H. Davy observes, "being possessed of no locomotive powers, can grow only in places where they are supplied with food; and hence the soil is necessary to their existence, both as affording them nourishment, and enabling them to fix themselves in such a manner as to obey those laws by which their radicles are kept below the surface, and their leaves exposed to the free atmosphere. As the systems of roots, branches, and leaves, are very different in different vegetables, so they flourish most in different soils; the plants that have bulbous roots require a looser and a lighter soil than such as have fibrous roots; and the plants possessing only short fibrous radicles demand a firmer soil than such as have tap roots or extensive lateral roots.

"In all cases, the constituent parts of the soil which give tenacity and coherence are the finely divided matters; and they possess the power of giving those qualities in the highest degree when they contain much alumina. A small quantity of finely divided matter is sufficient to fit a soil for the production of turnips and barley; and a tolerable crop of turnips has been produced on a soil containing 11 parts out of 12 sand. A much greater proportion of sand, however, always produces absolute sterility. The soil of Bagshot heath, which is entirely devoid of vegetable covering, contains less than one-twentieth of finely divided matter: 400 parts of it, which had been heated red, afforded 380 parts of coarse siliceous sand; 9 parts of fine siliceous sand, and 11 parts of impalpable matter, which was a mixture of ferruginous clay with carbonate of lime. Vegetable or animal matters, when finely divided, not only give coherence, but likewise softness and penetrability; but neither they nor any other part of the soil must be in too great proportion; and a soil is unproductive if it consist entirely of impalpable matters.

"Pure alumina or silica, pure carbonate of lime, or carbonate of magnesia, are incapable of supporting healthy vegetation; and no soil is fertile that contains as much as 19 parts out of 20 of any of these constituents.

"It will be asked, are the pure earths in the soil merely active as mechanical or indirect chemical agents, or do they actually afford food to the plant? This is an important question, and not difficult of solution.

"The earths consist of metals united to oxygen, and these metals have not been decomposed; there is consequently no reason to suppose that the earths are convertible into the elements of organised compounds, into carbon, hydrogen, and azote.

"Plants have been made to grow in given quantities of earth. They consume very small portions only; and what is lost may be accounted for by the quantities found in their ashes; that is to say, it has not been converted into any new products.

"The carbonic acid united to lime or magnesia, if any stronger acid happens to be formed in the soil during the fermentation of vegetable matter, which will disengage it from the earths, may be decomposed; but the earths themselves cannot be supposed convertible into other substances, by any process taking place in the soil.

"In all cases the ashes of plants contain some of the earths of the soil in which they grow; but these earths, as has been ascertained, from the ashes afforded by different plants, never equal more than one-fiftieth of the weight of the plant consumed. If they be considered as necessary to the vegetable, it is as giving hardness and firmness to its organisation. Thus, it has been mentioned that wheat, oats, and many of the hollow grasses, have an epidermis principally of siliceous earth; the use of which seems to be to strengthen them, and defend them from the attacks of insects and parasitical plants."

557. "When I state that a soil furnishes nothing to a plant," says Grisenthwaite, "I wish to be understood to mean, that, in performing all the purposes and functions of a soil, it furnishes nothing. If chalk (carbonate of lime) form part of a soil, and also a part of the vegetables growing in it, then I consider the chalk in such soil to perform two distinct and independent offices; the one as a part of the soil, modifying its texture, the other as a manure, and contributing a necessary substance to the plants that grow in it.

"As a proof that soils, strictly speaking, furnish nothing to plants, it may be stated, that seeds have been made to germinate, and pass through all the stages of vegetation, in oxides of lead, in sulphur, and even in small shot, where it is evident they could derive no nourishment. These are facts very important to be understood, as they suggest the propriety of ascertaining what substances are really beneficial to vegetation, by contributing to the formation of the crop; and what only serve the purpose of a medium through which those substances are transmitted to it. The latter suffers no change from any species of cropping whatever, whereas the former is, in part, exhausted by every kind, and consequently will demand a perpetual renovation.

"A soil being designed to furnish support to plants should be possessed of a certain degree of adhesiveness or tenacity; this is almost always supplied by the presence of clay (alumina); but adhesiveness alone is not sufficient. There is also required an opposite property, namely, friability or looseness of texture, by which the operations of culture may be easily conducted; that moisture may have free access to the fibres of the roots, that heat may be readily conveyed to them, and that evaporation may proceed without obstruction. These are commonly attained by the presence of sand (silex). As alumina possesses all the properties of adhesiveness in an eminent degree, and silex those of friability, it is obvious that a mixture of those two earths, in suitable proportions, would furnish every thing wanted to form the most perfect soil. In a soil so compounded, water will be presented to the roots by capillary attraction. It will be suspended in it, in the same manner as it is suspended in a sponge, not in a state of aggregation, but minute division, so that every part may be said to be moist, but not wet."

558. "There are two states," Sir H. Davy observes, "in which water seems to exist in the earths, and in animal and vegetable substances; in the first state it is united by chemical, in the other by cohesive, attraction.

"If pure solution of ammonia or potassa be poured into a solution of alum, alumina falls down combined with water; and the powder dried by exposure to air will afford more than half its weight of water by distillation; in this instance the water is united by chemical attraction. The moisture which wood, or muscular fibre, or gum, that have been heated to 212°, afford by distillation at a red heat, is likewise water, the elements of which were united in the substance by chemical combination.

"When pipe-clay, dried at the temperature of the atmosphere, is brought in contact with water, the fluid is rapidly absorbed; this is owing to cohesive attraction. Soils, in general, vegetable and animal substances, that have been dried at a heat below that of boiling water, increase in weight by exposure to air, owing to their absorbing water existing in the state of vapor in the air, in consequence of cohesive attraction.

"The water chemically combined amongst the elements of soils, unless in the case of the decomposition of animal or vegetable substances, cannot be absorbed by the roots of plants; but that adhering to the parts of the soil is in constant use in vegetation. Indeed there are few mixtures of the earths found in soils that contain any chemically combined water; water is expelled from the earth by most substances that combine with them. Thus, if a combination of lime and water be exposed to carbonic acid, the carbonic acid takes the place of water; and compounds of alumina and silica, or other compounds of the earths, do not chemically unite with water; and soils, as it has been stated, are formed either by earthy carbonates, or compounds of the pure earths and metallic oxides. When saline substances exist in soils, they may be united to water both chemically and mechanically; but they are always in too small a quantity to influence materially the relations of the soil to water.

559. " The power of the soil to absorb water by cohesive attraction, depends in great measure upon the state of division of its parts; the more divided they are, the greater is their absorbent power. The different constituent parts of soils likewise appear to act, even by cohesive attraction, with different degrees of energy. Thus vegetable substances seem to be more absorbent than animal substances; animal substances more so than compounds of alumina and silica; and compounds of alumina and silica more absorbent than carbonates of lime and magnesia: these differences may, however, possibly depend upon the differences in their state of division, and upon the surface exposed. The power of soils to absorb water from air is much connected with fertility. When this power is great, the plant is supplied with moisture in dry seasons; and the effect of evaporation in the day is counteracted by the absorption of aqueous vapor from the atmosphere, by the interior parts of the soil during the day, and by both the exterior and interior during night.

" The stiff clays approaching to pipe-clays in their nature, which take up the greatest quantity of water when it is poured upon them in a fluid form, are not the soils which absorb most moisture from the atmosphere in dry weather. They cake, and present only a small surface to the air; and the vegetation on them is generally burnt up almost as readily as on sands.

" The soils that are most efficient in supplying the plant with water by atmospheric absorption, are those in which there is a due mixture of sand, finely divided clay, and carbonate of lime, with some animal or vegetable matter, and which are so loose and light as to be freely permeable to the atmosphere. With respect to this quality, carbonate of lime, and animal, and vegetable matter, are of great use in soils; they give absorbent power to the soil without giving it likewise tenacity; sand, which also destroys tenacity, on the contrary, gives little absorbent power. The absorbent powers of soils with respect to atmospheric moisture, is always greatest in the most fertile soils; so that it affords one method of judging of the productiveness of land.

" 1000 parts of a celebrated soil from Ormiston, in East Lothian, which contained more than half its weight of finely divided matter, of which 11 parts were carbonate of lime, and 9 parts vegetable matter, when dried at 212°, gained in an hour by exposure to air saturated with moisture, at a temperature of 62°, 18 grains. 1000 parts of a very fertile soil from the banks of the river Parret, in Somersetshire, under the same circumstances, gained 16 grains. 1000 parts of a soil from Mersea, in Essex, worth 45*s.* an acre, gained 13 grains. 1000 grains of a fine sand from Essex, worth 28*s.* an acre, gained 11 grains. 1000 of a coarse sand, worth 15*s.* an acre, gained only 8 grains. 1000 of a soil of Bagshot heath gained only 3 grains.

" Water, and the decomposing animal and vegetable matter existing in the soil, constitute the true nourishment of plants; and as the earthy parts of the soil are useful in retaining water, so as to supply it in the proper proportions to the roots of the vegetables, so they are likewise efficacious in producing the proper distribution of the animal or vegetable matter; when equally mixed with it they prevent it from decomposing too rapidly; and by their means the soluble parts are supplied in proper proportions.

560. " The power of soils to absorb moisture ought to be much greater in warm or dry countries, than in cold and moist ones; and the quantity of clay, or vegetable, or animal matter they contain greater. Soils also on declivities ought to be more absorbent than in plains or in the bottom of valleys. Their productiveness likewise is influenced by the nature of the sub-soil or the stratum on which they rest. When soils are immediately situated upon a bed of rock or stone, they are much sooner rendered dry by evaporation than where the sub-soil is of clay or marle; and a prime cause of the great fertility of the land in the moist climate of Ireland, is the proximity of the rocky strata to the soil. A clayey sub-soil will sometimes be of material advantage to a sandy soil; and in this case it will retain moisture in such a manner as to be capable of supplying that lost by the earth above, in consequence of evaporation or the consumption of it by plants. A sandy or gravelly sub-soil often corrects the imperfections of too great a degree of absorbent power in the true soil.

" In calcareous countries, where the surface is a species of marle, the soil is often found only a few inches above the limestone; and its fertility is not impaired by the proximity of the rock; though in a less absorbent soil, this situation would occasion barrenness; and the sandstone and limestone-hills in Derbyshire and North Wales, may be easily distinguished at a distance, in summer, by the different tints of the vegetation. The grass on the sandstone-hills usually appears brown and burnt up; that on the limestone-hills flourishing and green.

"In a moist climate, where the quantity of rain that falls annually equals from 40 to 60 inches, as in Lancashire, Cornwall, and some parts of Ireland, a siliceous sandy soil is much more productive than in dry districts; and in such situations wheat and beans will require a less coherent and absorbent soil than in drier situations; and plants having bulbous roots will flourish in a soil containing as much as 14 parts out of 15 of sand. Even the exhausting powers of crops will be influenced by like circumstances. In cases where plants cannot absorb sufficient moisture, they must take up more manure. And in Ireland, Cornwall, and the western Highlands of Scotland, corn will exhaust less than in dry inland situations. Oats, particularly in dry climates, are impoverishing in a much higher degree than in moist ones.

561. "Many soils are popularly distinguished as *cold;* and the distinction, though at first view it may appear to be founded on prejudice, is really just. Some soils are much more *heated* by the rays of the sun, all other circumstances being equal, than others; and soils brought to the same degree of heat, cool in different times, *i. e.* some cool much faster than others. This property has been very little attended to in a philosophical point of view; yet it is of the highest importance in culture. In general, soils that consist principally of a stiff white clay are difficultly heated; and being usually very moist, they retain their heat only for a short time. *Chalks* are similar in one respect, that they are difficultly heated; but being drier they retain their heat longer, less being consumed in causing the evaporation of their moisture.

"A black soil, containing much soft vegetable matter, is most heated by the sun and air; and the colored soils, and the soils containing much carbonaceous matter, or ferruginous matter, exposed under equal circumstances to sun, acquire a much higher temperature than pale-colored soils.

"When soils are perfectly dry, those that most readily become heated by the solar rays, likewise cool most rapidly; but the darkest-colored dry soil, (that which contains abundance of animal or vegetable matter; substances which most facilitate the diminution of temperature,) when heated to the same degree, provided it be within the common limits of the effect of solar heat, will cool more slowly than a wet, pale soil, entirely composed of earthy matter.

Sir H. Davy "found that a rich black mould, which contained nearly one-fourth of vegetable matter, had its temperature increased in an hour from 65° to 88° by exposure to sun-shine; whilst a chalk soil was heated only to 69° under the same circumstances. But the mould removed into the shade, where the temperature was 62°, lost, in half an hour, 15°; whereas the chalk, under the same circumstances, had lost only 4°.

"A brown fertile soil, and a cold barren clay were each artificially heated to 88°, having been previously dried; they were then exposed in a temperature of 57°; in half an hour the dark soil was found to have lost 9° of heat; the clay had lost only 6°. An equal portion of the clay containing moisture, after being heated to 88°, was exposed in a temperature of 55°; in less than a quarter of an hour it was found to have gained the temperature of the room. The soils in all these experiments were placed in small tin plate trays two inches square, and half an inch in depth; and the temperature ascertained by a delicate thermometer.

"Nothing can be more evident than that the genial heat of the soil, particularly in spring, must be of the highest importance to the rising plant. And when the leaves are fully developed, the ground is shaded; and any injurious influence, which in the summer might be expected, from too great a heat, entirely prevented; so that the temperature of the surface, when bare and exposed to the rays of the sun, affords at least one indication of the degrees of its fertility; and the thermometer may be sometimes a useful instrument to the purchaser or improver of lands."

The moisture in the soil and sub-soil must also materially affect its temperature, and prevent, as in the case of constantly saturated aquatic soils, their ever attaining to any great degree either of heat or cold. The same observation will apply to moist peaty soils, or peat bogs.

562. Besides these uses of soils, which may be considered mechanical, "there is," Sir H. Davy observes, "another agency between soils and organisable matters, which may be regarded as chemical in its nature. The earths, and even the earthy carbonates, have a certain degree of chemical attraction for many of the principles of vegetable and animal substances. This is easily exemplified in the instance of alumina and oil; if an acid solution of alumina be mixed with a solution of soap, which consists of oily matter and potassa, the oil and the alumina will unite and form a white powder, which will sink to the bottom of the fluid.

"The extract from decomposing vegetable matter, when boiled with pipe-clay or chalk, forms a combination by which the vegetable matter is rendered more difficult of decomposition and of solution. Pure silica and siliceous sands have little action of this kind; and the soils which contain the most alumina and carbonate of lime, are those which act with the greatest chemical energy in preserving manures. Such soils merit the appellation which is commonly given to them of rich soils; for the vegetable nourishment is long preserved in them, unless taken up by the organs of plants. Siliceous sands, on the contrary, deserve the term hungry, which is commonly applied to them; for the vegetable and animal matters they contain, not being attracted by the earthy constituent parts of the soil, are more liable to be decomposed by the action of the atmosphere, or carried off from them by water.

"In most of the black and brown rich vegetable moulds, the earths seem to be in combination with a peculiar extractive matter, afforded during the decomposition of vegetables; this is slowly taken up or attracted from the earths by water, and appears to constitute a prime cause of the fertility of the soil."

The fertility of soils, it thus appears, must necessarily vary with the climate, the sub-soil, the inclination of the surface, and above all, by the mode of watering; and hence the proportions of earthy materials which may answer perfectly well in one geographical position, may be much less suitable in another. The flat sands of Norfolk, now rendered so fertile by culture, could not have supported vegetation without large additions of clay, in a hot country or on a mountain side. The thin soil of the higher Alps would soon be burned up were it not for the melting of the snow during the whole of summer, and the diminished influence of the sun in these lofty regions. By the same reasoning also a sandy soil will be more productive in a moist climate, like that of Ayrshire or Ireland, than in the dry climate of Kent or Sussex.

Sect. IV. *Of the Improvement of Soils.*

563. The object which the cultivator has in view in the study of soils, is to know how to improve them. To treat this subject with rigid chemical accuracy, soils ought to be considered as mineral mixtures, exclusive of all animal or vegetable matters; but as such soils seldom or never come within the province of culture, we deem it better to take the word soil in the usual sense, as denoting the upper surface of earthy matters in which plants are found, either in a growing state or in different stages of decay, or both. Soils may be rendered more fit for answering the purposes of vegetation by pulverization, by exposure to the atmosphere, by an alteration of their constituent parts, by changing their condition in respect to water, by changing their position in respect to atmospherical influence, and by a change in the kinds of plants cultivated.

Subsect. 1. *Pulverization.*

564. This is a very obvious improvement, and applicable to all soils, in proportion to their adhesive texture. Even a free siliceous soil will, if left untouched, become too compact for the proper admission of air, rain, and heat, and for the free growth of the fibres; and strong upland clays, not submitted to the plough or the spade, will, in a few years, be found in the possession of fibrous-rooted perennial grasses, which form a clothing on their surface, or strong tap-rooted trees, as the oak, which force their way through the interior of the mass. Annuals and ramentaceous-rooted herbaceous plants cannot penetrate into such soils.

The first object then of pulverization is to give scope to the roots of vegetables, for without abundance of these no plant will become vigorous, whatever may be the richness of the soil in which it is placed. The fibres of the roots, as we have seen (417.), take up the extract of the soil by intro-susception; the quantity taken up, therefore, will not depend alone on the quantity in the soil, but in the number of absorbing fibres. The more the soil is pulverized, the more these fibres are increased, the more extract is absorbed, and the more vigorous does the plant become. Pulverization therefore is not only advantageous previously to planting or sowing, but also during the progress of vegetation, when applied in the intervals between the plants. In this last case it operates also in the way of pruning, and by cutting off or shortening the extending fibres, causes them to branch out numerous others, by which the mouths or pores of the plants are greatly increased, and such food as is in the soil has the better chance of being sought after, and taken up by them. Tull and Du Hamel relate various experiments, which decidedly prove that *cæteris paribus*, the multiplication of the fibres, is as the inter-pulverization; but the strength of the vegetable, in consequence of this multiplication of fibres, must depend a good deal on the quantity of food or of extract within their reach. The root of a willow-tree, as we have seen (440.), has the fibres prodigiously increased by coming in contact with the water in a river, and so have various other aquatic trees and plants, as alder, mint, *Lysimachia thrysiflora*, *Calla palustris*, *Œnanthe fistulosa*, &c.; but their herbs or trunks are not proportionally increased unless the water be impregnated with organised remains.

A second use of pulverization is to increase the capillary attraction, or sponge-like property of soils, by which their humidity is rendered more uniform. It is evident this capillary attraction must be greatest where the particles of the earth are finely divided; for gravels and sands hardly retain water at all, while clays, not opened by pulverization or other means, either do not absorb water, or when, by long action it is absorbed, they retain too much. Water is not only necessary to the growth of plants as such, but it is essential to the production of extract from the vegetable matters which they contain; and unless the soil, by pulverization or otherwise is so constituted as to retain the quantity of water requisite to produce this extract, the addition of manures will be in vain. Manure is useless to vegetation till it becomes soluble in water, and it would remain useless in a state of solution, if it so abounded as wholly to exclude air, for then the fibres or mouths, unable to perform their functions, would soon decay and rot off.

"Earths," Grisenthwaite observes, "are also amongst the worst conductors of heat with which we are acquainted, and consequently, it would be a considerable time before the gradually increasing temperature of spring could communicate its genial warmth to the roots of vegetables, if their lower strata were not heated by some other means. To remove this defect, which always belongs to a close, compact soil, it is necessary to have the land open, that there may be a free ingress of the warm air and tepid rains of spring. There are other advantages also connected with the free circulation of moisture in a soil. Water is known to be a condenser and solvent of carbonic acid gas, which, when the land is open, can be immediately carried to the roots of vegetables, and contribute to their growth; but if the land be close, and the water lie on or near its surface, then the carbonic acid gas, which always exists in the atmosphere, and is carried down by rains, will soon be dissipated. An open soil, besides being favorable to the transmission of nutriment to the roots of plants, is also favorable to the extension of those roots, and thereby enlarges the field whence the nutriment can be derived. Nor are these the only benefits resulting from a friable soil, for, in addition to its being best adapted to the purpose of supplying vegetables with food, it is also most suitable for effecting those changes in the manurei tself, which are equally necessary to the preparation of such food.

"Animal and vegetable substances, exposed to the alternate action of heat, moisture, light, and air, undergo spontaneous decompositions, which would not take place independent of it.

"When all these reasons are considered, can it be at all surprising that Tull should have fancied that no other assistances were required in the well-management of the business of husbandry? By observing the constant and striking advantages derived from keeping the land in a highly pulverized condition, he supposed that nothing else was required to promote vegetation. Hence he directed every attention to that object. The practice was good as far as it extended, but not being conducted upon principle, its views were not sufficiently comprehensive, and, consequently, its anticipations were frequently frustrated, and unmerited discredit was brought against the system itself. Had he been acquainted with the uses of a soil in vegetation, he would not have been disappointed, because he would have moderated expectation. He would have discovered that the pulverization of the soil was of no other benefit to the plants that grow in it than as it 'increased the number of their fibrous roots or mouths by which they imbibe their food; facilitated the more speedy and perfect preparation of this food, and conducted the food so prepared more regularly to their roots.'"

A very considerable advantage gained by pulverization is that of burying a considerable portion of atmospheric air in the soil. This air, so confined, is decomposed by the moisture retained in the soil; ammonia is formed by the union of the hydrogen of the water with the nitrogen of the atmosphere; and nitre, by the union of oxygen and nitrogen; the oxygen may also unite with the carbon contained in the soil, and form carbonic acid gas, and carburetted hydrogen. Heat is given out during these processes, and "Hence," as Dr. Darwin remarks, (*Phytologia*, sect. xii. 1.) "the great propriety of cropping lands immediately after they have been comminuted and turned over; and this the more especially, if manure has been added at the same time, as the process of fermentation will go on faster when the soil is loose, and the interstices filled with air, than afterwards, when it becomes compressed with its own gravity, the relaxing influence of rains, and the repletion of the partial vacuums formed by the decomposition of the inclosed air. The advantage of the heat thus obtained in exciting vegetation, whether in a seed or root, especially in spring, when the soil is cold, must be very considerable."

"The depth of pulverization," Sir H. Davy observes, "must depend upon the nature of the soil, and of the subsoil. In rich clayey soils it can scarcely be too deep; and even in sands, unless the subsoil contains some principles noxious to vegetables, deep comminution should be practised. When the roots are deep, they are less liable to be injured, either by excess of rain or drought; the radicles are shot forth into every part of the soil; and the space from which the nourishment is derived is more considerable than when the seed is superficially inserted in the soil."

It is hardly necessary to observe that pulverization should, in all cases, be accompanied with the admixture of the parts of soils by turning them over. It is difficult, indeed, to pulverize without effecting this end, at least by the implements in common use; but if it could be effected, it would be injurious, because the difference of gravity between the organised matters and the earths, has a constant tendency to separate them, and would, in a short time, leave the surface of the soil too rich and spongy, and the lower part too compact and earthy.

Subsect. 2. *Aeration, or Exposure of Soils to the Atmosphere.*

565. It is consistent with the experience of every cultivator, that soils are benefited by exposure to the atmosphere. This is generally considered as one of the advantages of fallowing, and its use in gardening is experienced in compost heaps, and in winter and summer ridging. The precise advantages, however, of exposure to the air, independently of the concurrent influence of water, heat, and the other effects mentioned, as attendant on pulverization, do not seem at present to be correctly ascertained. It is allowed that carbonic acid gas may be absorbed by calcareous earths, and Dr. Thompson considers that the earths alone may thus probably administer food to plants; but Sir H. Davy seems to consider mere exposure to the atmosphere as of no benefit to soils whatever. "It has been supposed by some writers," he says, "that certain principles necessary to fertility are derived from the atmosphere, which are exhausted by a succession of crops, and that these are again supplied during the repose of the land, and the exposure of the pulverized soil to the influence of the air; but this in truth is not the case. The earths commonly found in soils cannot be combined with more oxygen; none of them unite to azote; and such of them as are capable of attracting carbonic acid, are always saturated with it in those soils on which the practice of fallowing is adopted. The vague ancient opinion of the use of nitre, and of nitrous salts in vegetation, seems to have been one of the principal speculative reasons for the defence of summer fallows. Nitrous salts are produced during the exposure of soils containing vegetable and animal remains, and in greatest abundance in hot weather; but it is probably by the combination of azote from these remains with oxygen in the atmosphere that the acid is formed; and at the expense of an element, which otherwise would have formed ammonia; the compounds of which are much more efficacious than the nitrous compounds in assisting vegetation."

It is proper to observe that this reasoning is more speculative than experimental, and seems influenced, in some degree, by the opinion adopted by the author, that fallows are of little use in husbandry. One obvious advantage of aeration in summer, or a summer fallow, is, that the soil may thus be heated by the sun to a degree which it never could be, if partially covered with the foliage of even the widest drilled crops. For this purpose, if the soil is laid up in large lumps, it is evident it will receive more heat by exposing a greater surface to the atmosphere, and it will retain this heat longer than can be expected, from the circumstance of the lumps reflecting back the rays of heat radiated by each other. A clayey soil, in this way, it is said, (*Farmers' Magazine*, 1815,) may be heated to 120°, which may in some degree alter its absorbent powers as to water, and contribute materially to the destruction of vegetable fibre. By the aeration of lands in winter, minute mechanical division is obtained by the freezing of the water in the soil; for, as water in the solid state occupies more space than when fluid, the particles of earthy matters, and of decomposing stones, are thus rent asunder, and crumble down in a fine mould. Rough stony soils will thus receive an accession to their mould or finer soil every winter. But chemical experiment can alone discover the various modes and degrees of extent to which exposure to the air increases the fertility of soils. In the mean time, the cultivator will find aeration of all lands, but especially of clays, a certain source of amelioration, whether performed in summer or winter, and independently of the destruction of seeds, weeds, insects, and eggs, effected by a well-conducted summer fallow.

Subsect. 3. *Alteration of the constituent Parts of Soils.*

566. We have already stated what are the properties of a good or fertile soil (555.), and that these will vary, in some degree, according to the climate, aspect, or position of the surface, and mode of watering, whether natural or artificial (562.).

The constituent parts of soils may be altered by the addition of ingredients in which they are deficient, by the subtraction of such as superabound, or by the chemical changes of some constituent part by the action of fire. In ascertaining the composition of faulty soils with a view to their improvement by adding to *their constituent parts,* any particular ingredient which is the cause of their unproductiveness, should be particularly attended to; if possible, they should be compared with fertile soils in the same neighbourhood, and in similar situations, as the difference of the composition may, in many cases, indicate the most proper methods of improvement. If, on washing a sterile soil, it is found to contain the salts of iron, or any acid matter, it may be ameliorated by the application of quick-lime. A soil of good apparent texture, containing sulphate of iron, will be sterile; but the obvious remedy is a top-dressing with lime, which converts the sulphate into a manure. If there be an excess of calcareous matter in the soil, it may be improved by the application of sand or clay. Soils too abundant in sand are benefited by the use of clay, or marle, or vegetable matter. Light sands are often benefited by a dressing of peat, and peat by dressings of sand; though the former is in its nature but a temporary improvement. When peats are acid, or contain ferruginous salts, calcareous matter is absolutely necessary in bringing them into cultivation.

The best natural soils are those of which the materials have been derived from different strata; which have been minutely divided by air and water, and are intimately blended together; and in improving soils artificially, the cultivator cannot do better than imitate the processes of nature.

The materials necessary for the purpose are seldom far distant; coarse sand is often found immediately on chalk; and beds of sand and gravel are common below clay. The labor of improving the texture or constitution of the soil, is repaid by a great permanent advantage; less manure is required; and its fertility insured; and capital laid out in this way secures for ever the productiveness, and consequently the value of the land.

567. The *removal of superabundant ingredients in soils* may sometimes be one of the simplest and most effectual means of their improvement.

It occasionally happens that the surface of a well-proportioned soil is thickly covered with peat, with drifted sand, with gravel, or with small stones. Extensive examples of the former occur in Stirlingshire, and of the latter in Norfolk. In such cases, a simple and effectual mode of improvement consists in removing the superincumbent strata, and cultivating that below. This can seldom be put in practice on a large scale, with such heavy materials as gravel or stones; but some hundreds of acres of rich alluvial soil, deeply covered by peat, have been bared and cultivated in Flanders moss in Stirlingshire; an operation commenced by the celebrated Lord Kaimes, (*Gen. Rep. of Scot. App.* v. 5.) copied by his neighbours, and continued by his and their successors. The moss is floated off by streams of water, which empty themselves in the Frith of Forth. In this river, by the winds and tides, it is cast on shore in the bays and recesses, impregnated with salt; and here it engenders vegetation on the encroaching surfaces of sand and gravel. Coatings of sand or gravel can seldom be removed on a scale of sufficient extent for agriculture, but have, in some instances, for the purposes of gardening. Sometimes this improvement may be effected by trenching down the surface, and raising up the strata of better earth.

568. The chemical changes which can be effected in soils by *incineration* are considerable. This practice was known to the Romans, is more or less in use in most parts of Europe, and has lately excited some degree of attention from the successful experiments of Craig of Cally, in Kirkcudbrightshire, and M. Gen. Beatson in Sussex. See *Farmers' Mag.* 1810, and Beatson's *New System of Cultivation*, &c. 1820.

The theory of burning soils is thus given by Sir H. Davy. "It rests," he says, "entirely on chemical doctrines. The basis of all common soils, are mixtures of the primitive earths and oxide of iron; and these earths have a certain degree of attraction for each other. To regard this attraction in its proper point of view, it is only necessary to consider the composition of any common siliceous stone. Feldspar, for instance, contains siliceous, aluminous, calcareous earths, fixed alkali, and oxide of iron, which exist in one compound, in consequence of their chemical attractions for each other. Let this stone be ground into impalpable powder, it then becomes a substance like clay: if the powder be heated very strongly, it fuses, and on cooling forms a coherent mass similar to the original stone; the parts separated by mechanical division adhere again in consequence of chemical attraction. If the powder is heated less strongly, the particles only superficially combine with each other, and form a gritty mass, which, when broken into pieces, has the characters of sand.

"If the power of the powdered feldspar to absorb water from the atmosphere before, and after the application of the heat, be compared, it is found much less in the last case. The same effect takes place when the powder of other siliceous or aluminous stones is made the subject of experiment, and two equal portions of basalt ground into impalpable powder, of which one had been strongly ignited, and the other exposed only to a temperature equal to that of boiling water, gained very different weights in the same time when exposed to air. In four hours the one had gained only two grains, whilst the other had gained seven grains.

"When clay or tenacious soils are burnt, the effect is of the same kind; they are brought nearer to a state analogous to that of sands. In the manufacture of bricks the general principle is well illustrated; if a piece of dry brick earth be applied to the tongue, it will adhere to it very strongly, in consequence of its power to absorb water; but after it has been burnt, there will be scarcely a sensible adhesion.

"The process of burning renders the soil less compact, less tenacious and retentive of moisture; and when properly applied, may convert a matter that was stiff, damp, and in consequence cold, into one powdery, dry, and warm; and much more proper as a bed for vegetable life.

"The great objection made by speculative chemists, to paring and burning, is, that it destroys vegetable and animal matter, or the manure in the soil; but in cases in which the texture of its earthy ingredients is permanently improved, there is more than a compensation for this temporary disadvantage. And in some soils where there is an excess of inert vegetable matter, the destruction of it must be beneficial; and the carbonaceous matter remaining in the ashes may be more useful to the crop than the vegetable fibre, from which it was produced.

"Three specimens of ashes from different lands that had undergone paring and burning were examined by chemical analysis. The first was from a chalk soil, and 200 grains contained 80 of carbonate of lime, 11 gypsum, 9 charcoal, 15 oxide of iron, 3 saline matter, sulphate of potash, muriate of magnesia, with a minute quantity of vegetable alkali. The remainder alumina and silica. Suppose 2660 bushels to be the common produce of an acre of ground, then, according to this calculation, they would give 172900 lbs. containing carbonate of lime, 69160 lbs., gypsum, 9509.5., oxide of iron, 12967.5., saline matter, 2593.5., charcoal, 7780.5.

"In this instance there was undoubtedly a very considerable quantity of matter capable of being active as manure produced in the operation of burning. The charcoal very finely divided, and exposed on a large surface, must be gradually converted into carbonic acid. And gypsum and oxide of iron seem to produce the very best effects when applied to lands containing an excess of carbonate of lime.

"The second specimen was from a soil near Coleorton, in Leicestershire, containing only four per cent. of carbonate of lime, and consisting of three-fourths light siliceous sand, and about one-fourth clay. This had been turf before burning, and 100 parts of the ashes gave 6 parts charcoal, 3 muriate of soda and sulphate of potash, with a trace of vegetable alkali, 9 oxide of iron, and the remainder the earths.

"In this instance, as in the other, finely divided charcoal was found, the solubility of which would be increased by the presence of the alkali. The third instance was, that of a stiff clay, from Mount's Bay, Cornwall. This land had been brought into cultivation from a heath by burning about ten years before; but having been neglected, furze was springing up in different parts of it, which gave rise to the second paring and burning, 100 parts of the ashes contained 8 parts of charcoal, 2 of saline matter, principally common salt, with a little vegetable alkali, 7 oxide of iron, 2 carbonate of lime, the remainder alumina and silica.

"Here the quantity of charcoal was greater than in the other instances. The salt was probably owing to the vicinity of the sea, it being but two miles off. In this land there was certainly an excess of dead vegetable fibre, as well as unprofitable living vegetable matter.

"Many obscure causes have been referred to for the purpose of explaining the effects of paring and burning; but they may be referred entirely to the diminution of the coherence and tenacity of clays, and to the destruction of inert, and useless vegetable matter, and its conversion into a manure.

"Dr. Darwin, in his Phytologia, has supposed, that clay, during torrefaction, may absorb some nutritive principles from the atmosphere that afterwards may be supplied to plants; but the earths are pure metallic oxides, saturated with oxygen; and the tendency of burning is to expel any other volatile principles that they may contain in combination. If the oxide of iron in soils is not saturated with oxygen, torrefaction tends to produce its further union with this principle; and hence in burning, the color of clays changes to red. The oxide of iron containing its full proportion of oxygen has less attraction for acids than the other oxide, and is consequently less likely to be dissolved by any fluid acids in the soil; and it appears in this state to act in the same manner as the earths. A very ingenious author, Naismith (*in Elements of Agr.*), supposes that the oxide of iron, when combined with carbonic acid, is poisonous to plants; and that one use of torrefaction is to expel the carbonic acid from it; but the carbonate of iron is not soluble in water, and is a very inert substance; and a luxuriant crop of cresses has been raised in a soil composed of one-fifth carbonate of iron, and four-fifths carbonate of lime. Carbonate of iron abounds in some of the most fertile soils in England, particularly the red hop soil. And there is no theoretical ground for supposing, that carbonic acid, which is an essential food of plants, should, in any of its combinations, be poisonous to them; and it is known that lime and magnesia are both noxious to vegetation, unless combined with this principle.

"All soils that contain too much dead vegetable fibre, and which consequently lose from one-third to one-half of their weight by incineration, and all such as contain their earthly constituents in an impalpable state of division, *i. e.* the stiff clays and marles, are improved by burning; but in coarse sands, or rich soils containing a just mixture of the earths; and in all cases in which the texture is sufficiently loose, or the organisable matter sufficiently soluble, the process of torrefaction cannot be useful.

"All poor siliceous sands must be injured by it; and here practice is found to accord with theory. A. Young in his Essay on Manures, states, 'that he found burning injure sand;' and the operation is never performed by good cultivators upon siliceous sandy soils, after they have once been brought into cultivation."

Subsect. 4. *Changing the Condition of Lands in respect to Water.*

569. How much the natural products of soils depend on their situation as to water, we have already seen (508.). It may be removed where superabundant, supplied when deficient, or added as a vehicle of nourishing ingredients, and as affording the stimulus of heat or cold.

Stagnant water may be considered as injurious to all the useful classes of plants, by obstructing perspiration and introsusception, and thus diseasing their roots and submerged parts. Where the surface soil is properly constituted, and rests on a subsoil moderately porous, both will hold water by capillary attraction, and what is not so retained will sink into the interior strata by its gravity; but where the subsoil is retentive, it will resist, or not admit with sufficient rapidity, the percolation of water to the strata below, which accumulating in the surface-soil, till its proportion becomes excessive as a component part, not only carries off the extractive matter, but diseases the plants. Hence the origin of surface-draining, that is, laying land in ridges or beds, or intersecting it with small open gutters.

Where the upper stratum is porous in some places, and retentive in others, and on a retentive base, the water, in its progress along the porous bed or layer, will be interrupted by the retentive places in a great variety of ways, and there accumulating will burst through the upper surface in the form of springs, which are more injurious than surface-water, as being colder, and generally permanent in their operation. Hence the origin of under-draining in all its varieties of collecting, extracting, and conveying water.

570. The water of rivers may become injurious to lands on their banks, by too frequently overflowing their surface. In this case the stream may be included by mounds of earth, or other materials impervious to water; and thus aquatic soils rendered dry and fit for useful herbage or aration. The same may be said of lands occasionally overflown by the sea. Hence the origin of embanking, an art carried to a great extent in Holland and Italy. (See *Smeaton's posthumous Works. Sigismondi, Agr. Tosc.* and our article *Embankment*, in the supplement to the Encyc. Brit. 1819.)

571. Plants, in general, can no more live without water, than they can prosper in soils where it is superabundant; and it is therefore supplied by art on a large scale, either by surface, or subterraneous irrigation. In both practices important points are to imitate nature in producing motion, and in applying the water in the mornings or evenings, or under a clouded sky, and also at moderate intervals. The effects of water constantly employed, would, in most cases, be such as attend stagnated water, aquatic soils, or land springs; and employed in hot sunshine, or after violent heats, it may check evaporation, and destroy life, exactly as happens to those who may have bathed in cold spring water after long and violent exercise in a hot day. *Phytologia*, xv. 3. 5.

In surface irrigation the water is conveyed in a system of open channels which require to be most numerous in such grounds as are under drilled annual crops, and least so in such as are sown in breadths, beds, or ridges, under perennial crops.

The arrangements for surface irrigation for the mere supply of water, are distinguished from those for irrigation, for the supply of nutriment and heat, by never requiring waste or conduit gutters, all the water laid on being absorbed by the soil. This mode of watering has existed from time immemorial. The children of Israel are represented as sowing their seed and "watering it with their foot;" that is, as Calmet explains it, raising the water from the Nile by a machine worked by the feet, from which it was conducted in such channels as we have been describing. It is general in the south of France and Italy; but less required in Britain.

572. *Subterraneous Irrigation* may be effected by a system of drains or covered gutters in the subsoil, which, proceeding from a main conduit, or other supply, can be charged with water at pleasure. For grounds under the culture of annual plants, this mode would be more convenient, and for all others more economical as to the use of water, than surface irrigation. Where the under-stratum is gravelly, and rests on a retentive stratum, this mode of watering may take place without drains, as it may also on perfectly flat lands, by filling to the brim, and keeping full for several days, surrounding trenches

but the beds or fields between the trenches must not be of great extent. This practice is used in Lombardy on the alluvial lands near the embouchures of the Po. In Lincolnshire the same mode is practised by shutting up the flood-gates of the mouths of the great drains in the dry seasons, and thus daming up the water through all the ramifications of the drainage from the sea to their source. This was first suggested by G. Rennie and Sir Joseph Banks, after the drainage round Boston, completed about 1810. A similar plan, on a smaller scale, had been previously practised in Scotland, where deep mosses had been drained and cultivated on the surface, but where, in summer, vegetation failed from deficiency of moisture. It was first adopted by J. Smith, (See *Essay on the Improvement of Peat-Moss*, 1795,) on a farm in Ayrshire, and has subsequently been brought into notice by J. Johnston, the first delineator and professor of Elkinston's system of draining.

573. *Irrigation with a View to conveying Additions to the Soil, or affording Heat or Cold to Plants*, has long been practised, and is an evident imitation of the overflowing of alluvial lands, whether in meadow or aration. In the former case it is called irrigation or flooding, and in the latter, warping. Warping is used chiefly as a mode of enriching the soil by an increase of the alluvial depositions, or warp of rivers, during winter, where the surface is not under crop, and is common on the banks of the Ouse. The rationale of irrigation, for either purpose, is thus given by Sir H. Davy. " In general in nature the operation of water is to bring earthy substances into an extreme state of division. But in the artificial watering of meadows, the beneficial effects depend upon many different causes, some chemical, some mechanical. Water is absolutely essential to vegetation; and when land has been covered by water in the winter, or in the beginning of spring, the moisture that has penetrated deep into the soil, and even the subsoil, becomes a source of nourishment to the roots of the plants in the summer, and prevents those bad effects that often happen in lands in their natural state, from a long continuance of dry weather. When the water used in irrigation has flowed over a calcareous country, it is generally found impregnated with carbonate of lime; and in this state it tends, in many instances, to ameliorate the soil. Common river water also generally contains a certain portion of organisable matter, which is much greater after rains than at other times; and which exists in the largest quantity when the stream rises in a cultivated country. Even in cases when the water used for flooding is pure, and free from animal or vegetable substances, it acts by causing a more equable diffusion of nutritive matter existing in the land; and in very cold seasons it preserves the tender roots and leaves of the grass from being affected by frost. Water is of greater specific gravity at 42° Fahrenheit, than at 32°, the freezing point; and hence in a meadow irrigated in winter, the water immediately in contact with the grass is rarely below 40°, a degree of temperature not at all prejudicial to the living organs of plants.

" In 1804, in the month of March, the temperature in a water meadow near Hungerford was examined by a very delicate thermometer. The temperature of the air at seven in the morning was 29°. The water was frozen above the grass. The temperature of the soil below the water in which the roots of the grass were fixed, was 43°." Water may also operate usefully in warm seasons by moderating temperature, and thus retarding the over-rapid progress of vegetation. The consequence of this retardation will be greater magnitude and improved texture of the grosser parts of plants, a more perfect and ample developement of their finer parts, and above all, an increase in the size of their fruits and seeds. We apprehend this to be one of the principal uses of flooding rice-grounds in the East; for it is ascertained that the rice-plant will perfect its seeds in Europe, and even in this country, without any water beyond what is furnished by the weather, and the natural moisture of a well constituted soil. " In general, those waters which breed the best fish are the best fitted for watering meadows; but most of the benefits of irrigation may be derived from any kind of water. It is, however, a general principle, that waters, containing ferruginous impregnations, though possessed of fertilizing effects, when applied to a calcareous soil, are injurious on soils that do not effervesce with acids; and that calcareous waters, which are known by the earthy deposit they afford when boiled, are of most use on siliceous soils, or other soils containing no remarkable quantity of carbonate of lime."

Subsect. 5. *Changing the Condition of Lands, in respect to Atmospherical Influence.*

574. This may be effected by altering the position of the surface of the soil, as to solar influence, or by sheltering it from violent currents of air, or storms, or in some degree from the rays of the sun.

Changing the Condition of Lands, as to Solar Influence, is but a limited means of improvement; but is capable of being turned to some account in gardening. It is effected by altering the position of their surface, so as that surface may be more or less at right angles to the plane of the sun's rays, according as heat or cold is to be increased or diminished. The influence of the sun's rays upon any plane are demonstrated to be as their number and perpendicularity to that plane, neglecting the effects of the atmosphere. Hence one advantage of ridging lands, provided the ridges run north and south; for on such surfaces the rays of the morning sun will take effect sooner on the east side, and remain longer in operation on the west side; whilst at mid-day his elevation will compensate, in some degree, for the obliquity of his rays to both sides of the ridge. In culture, on a small scale, ridges or sloping beds for winter-crops may be made south-east and north-west, with their slope to the south, at an angle of forty degrees, and as steep on the north side as the mass can be got to stand; and on the south slope of such ridge, *cæteris paribus*, it is evident much earlier crops may be produced than on level ground. The north side, however, will be lost during this early cropping; but as early crops are soon gathered, the whole can be laid level in time for a main crop.

Hence also the advantage of grounds sloping to the south, south-east, or south-west, in point of precocity, and of those sloping to the north for lateness and diminished evaporation. Another advantage of such surfaces is, that they dry sooner after rains, whether by the operation of natural or artificial drainage, or, in the case of sloping to the south, by evaporation.

575. *Shelter*, whether by walls, hedges, strips of plantation, or trees scattered over the surface, may be considered generally as increasing or preserving heat, and lessening evaporation from the soil. But if the current of air should be of a higher temperature than that of the earth, screens against wind will prevent the earth from being so soon heated; and from the increased evaporation arising from so great a multiplication of vegetable surface by the trees, more cold will be produced after rains than in grounds perfectly naked, and the atmosphere kept in a more moist state. When the temperature of a current of air is lower than that of the earth, screens will prevent its carrying off so much heat; but more especially scattered trees, the tops of which will be chiefly cooled whilst the under surfaces of their lower branches reflect back the rays of heat as they radiate from the surface of the soil. Heat in its transmission from one body to another, follows the same laws as light; and, therefore, the temperature of the surface in a forest will, in winter, be considerably higher than that of a similarly constituted soil exposed to the full influence of the weather. The early flowering of plants, in woods and hedges, is a proof of this: but as such soils cannot be so easily heated in summer, and are cooled like others after the sinking in of rains, or the melting of snows, the effect of the reflection is nearly neutralized, and the average temperature of the year will probably be found not greater than that of open lands.

Sect. V. *Rotation of Crops.*

576. There are few cultivators that have not experienced the advantage of this practice, though its beneficial influence has not yet been fully accounted for by chemists. The most general theory is, that though all plants will live on the same food, as the chemical constituents of their roots, and leaves are nearly the same; yet that many species require particular substances to bring their seeds or fruits to perfection, as the analysis of these seeds or fruits often affords substances different from those which constitute the body of the plant (603.). A sort of rotation actually takes place in nature, for perennial herbaceous plants have a tendency to extend their circumference, and rot and decay at their centre. This is more especially the case with travelling roots, as in mint, strawberry, creeping crowfoot, potatoe, &c.

The following is Sir H. Davy's rationale of rotation. "It is a great advantage in the convertible system of cultivation, that the whole of the manure is employed; and that those parts of it which are not fitted for one crop, remain as nourishment for another. Thus, if the turnip is the first in the order of succession, this crop, manured with recent dung, immediately finds sufficient soluble matter for its nourishment; and the heat produced in fermentation assists the germination of the seed and the growth of the plant. If, after turnips, barley with grass-seeds is sown, then the land, having been little exhausted by the turnip crop, affords the soluble parts of the decomposing manure to the grain. The grasses, rye-grass, and clover remain, which derive a small part only of their organised matter from the soil, and probably consume the gypsum in the manure which would be useless to other crops: these plants, likewise, by their large systems of leaves, absorb a considerable quantity of nourishment from the atmosphere; and when ploughed in at the end of two years, the decay of their roots and leaves affords manure for the wheat crop; and at this period of the course, the woody fibre of the farm-yard manure which contains the phosphate of lime and the other difficultly soluble parts, is broken down: and as soon as the most exhausting crop is taken, recent manure is again applied.

"Peas and beans, in all instances, seem well adapted to prepare ground for wheat;

and in some rich lands they are raised in alternate crops for years together. Peas and beans contain a small quantity of a matter analogous to albumen; but it seems that the azote, which forms a constituent part of this matter, is derived from the atmosphere. The dry bean-leaf, when burnt, yields a smell approaching to that of decomposing animal matter; and in its decay in the soil, may furnish principles capable of becoming a part of the gluten in wheat. Though the general composition of plants is very analogous, yet the specific difference in the products of many of them, prove that they must derive different materials from the soil; and though the vegetables having the smallest systems of leaves will proportionably most exhaust the soil of common nutritive matter, yet particular vegetables, when their produce is carried off, will require peculiar principles to be supplied to the land in which they grow. Strawberries and potatoes at first produce luxuriantly in virgin mould, recently turned up from pasture; but in a few years they degenerate, and require a fresh soil. Lands, in a course of years, often cease to afford good cultivated grasses; they become (as it is popularly said) tired of them; and one of the probable reasons for this is, the exhaustion of the gypsum contained in the soil.

"The most remarkable instance of the powers of vegetables to exhaust the soil of certain principles necessary to their growth is found in certain funguses. Mushrooms are said never to rise in two successive seasons on the same spot; and the production of the phænomena called fairy rings has been ascribed by Dr. Wollaston to the power of the peculiar fungus which forms it, to exhaust the soil of the nutriment necessary for the growth of the species. The consequence is, that the ring annually extends; for no seeds will grow where their parents grew before them; and the interior part of the circle has been exhausted by preceding crops; but where the fungus has died, nourishment is supplied for grass, which usually rises within the circle, coarse, and of a dark green colour."

577. Grisenthwaite contends, on theoretical principles, that a rotation is unnecessary, and, in a strict chemical sense, what he asserts cannot be denied. His theory is merely a refinement on the common idea of the uses of a rotation stated above; but by giving some details of the constituent parts of certain grains and certain manures, he has presented it in a more clear and striking point of view than has hitherto been done. To apply the theory in every case, the constituent parts of all manures, and of all plants, (1st their roots and leaves, and 2dly their seeds, fruits, or germs,) must be known. In respect to manures this is the case, and it may be said to be in a great degree the case as to the most useful agricultural plants; but, unfortunately for our purpose, the same cannot be said of garden productions in general, though no branch of culture can shew the advantage of a rotation of crops more than horticulture, in the practice of which it is found that grounds become tired of particular crops, notwithstanding that manures are applied at pleasure. If the precise effects of a rotation were ascertained, and the ingredients peculiarly necessary to every species pointed out, nothing could be more interesting than the results of experimental trials; and whoever shall point out a simple and œconomical mode by which the potatoe may be grown successively in the same soil, and produce annually, neglecting the effects of climate, as dry and well-flavoured tubers, or nearly so, as they generally produce the first and second years on a new soil, will confer a real benefit on society. That wheat may be grown many years on the same soil by the use of animal manures, or such as contain gluten, Grisenthwaite's theory would justify us in believing chemically; and it ought to be fairly tried by such cultivators as Coke and Curwen. Till this is done in the face of the whole agricultural world, and the produce of every crop, and all the particulars of its culture, accurately reported on annually, the possibility of the thing may be assented to from the premises; but

"A man convinced against his will
Is of the same opinion still;"

and, in fact, even the best agricultural chemists do not consider that we are sufficiently advanced in that branch of the science to draw any conclusion, *a priori*, very much at variance with general opinion and experience.

Grisenthwaite deserves credit for boldly throwing out the idea. He says, "There is one particular of very considerable practical importance connected with soils, (that is, as he uses the term soil, — earthy matters, exclusive of all others,) which it would be improper to pass over in this place. Amongst agriculturists, and in theories of agriculture, it has been an invariable custom to ascribe to particular soils, a peculiar adaptation of crops, and, as far as experience has extended, the opinion appears to have been confirmed. Clays are thought to be peculiarly fitted for the growth of beans, and wheat — chalk for peas and clover. And light land, as better calculated for barley than wheat. These are all fanciful distinctions, and have been serious impediments in the way of agricultural improvement. If we revert to the definition of a soil, which has been given in this chapter, we shall find that it has no reference whatever to crops. A soil contributes nothing to their formation, and therefore, provided the plants resemble each other in their relation to stability, the same soil, whatever it may be, will answer as well for one crop as another. As this will probably be objected to by practical men, who seldom reason upon facts, it will be necessary to descend to a plain and simple exemplification of it. It being my object in this place to show, that lands, which are now confined to the growth of inferior crops, may be employed in the production of those more valuable, I shall select for my purpose what is commonly considered a barley soil, which is generally composed of alumina, or chalk, and so much gravel, or sand, as to render it scarcely adhesive under any circumstances; and which is usually very pulverulent. If to a soil of such a description, there be added as much manure as is necessary for the production of a crop of barley, and a crop of barley be produced on it, then it is evident that such a soil is adapted to the formation of vegetable matter; and, since the vegetable matter of all crops is the same, or composed of the same elements, it is obvious that such a soil would also be adapted to the formation of the vegetable matter of a crop of wheat. It is here that agricultural enquiry should commence. We have before us the fact, that the land is capable of producing vegetation; if we required still further proof of that fact, such proof would be amply furnished in its spontaneous, and luxuriant production of weeds. Why then, it may be asked, will it produce a good crop of barley, and not of wheat? If the soil were constituted in the best manner possible, it would still contribute nothing to the formation of either the wheat or barley crop. Whatever either of those crops took up for that purpose, must be substances superadded to the soil; and why should those substances which, in one situation, or soil, can operate with success, not perform the same offices in the other? no reason whatever can be assigned. If it be asked, why such land has, experimentally, been found unproductive of wheat, and yet productive of barley; it may be answered, that the present system of agriculture has left the successful growth of both to accident, and such accident has supplied the substances needed for barley, but not those required for wheat. If a practical farmer were asked, why such land would not grow as good crops of wheat as it does of barley, it is probable that he would answer — It is too light, or, which amounts to the same thing, wheat prefers a stiffer soil. These are, it is obvious, no reasons at all, until it be shown how the vegetable process of barley differs from the vegetable process of wheat, or any other grain. I have never yet seen, nor heard of any fact that could establish the existence of a dissimilarity in the manner of vegetable growth, from the first changes of germination to the moment that fructification commences, that could, with any propriety, be said to depend upon the soil. But after that moment, peculiar substances are formed, and it is no longer a proof, because a certain soil, manured in a certain manner, has produced a particular crop, as barley, that it would also have produced any other, as wheat. So far from there being any proof that such indiscriminate production would take place, it is highly probable, independent of all experience, that it would not. It is necessary that I should guard the reader from extending this reasoning too far. In endeavouring to establish the truth, that the same soil which has produced one crop may be made to produce any other, I do not mean to contend for the equality of all soils, as regards the purposes of vegetation; so far from it, that such a doctrine would be directly adverse to the opinions already advanced concerning the uses of a soil. An open soil will suffer more from the action of water, air, and heat, than one that is compact, and consequently will sooner be exhausted."

"The reason why a change of cropping has been generally adopted, certainly did not arise out of any *a priori* anticipations of the mind, that the land would tire of one kind of grain. There would exist nothing apparent to justify such a conclusion; it must, therefore, have resulted from experience. It is probable that this change of cropping is rendered necessary from the exhaustion of those specific saline substances which existed in the soil in sufficient quantity for one crop, but not for more. Can any other reason be assigned, why a piece of land which this year has grown a particular grain, should not be able to grow the same grain next year, and so on, without any alteration in the grain, or deficiency in the crop, more than may be occasioned by the variation of seasons? None. If a piece of land which has just produced a crop of wheat, could have restored to it all that the wheat crop has abstracted from it, there can be no doubt but that that land would grow as good a crop of wheat the next season, as it did the former. Why should it not? Its condition, and capabilities are the same. To ascribe choice and discrimination to land, is to trifle with our understandings. Why then has experience shown the superiority of changing the kind of grain, over that of continuing to crop the same land with the same kind? To this it may be answered, that whilst the business of agriculture was conducted independently of principle, there was no other, and certainly no better guide, than experience. Hence the failure of crops, when repeated too often in succession, suggested the expediency of change. And a change being found to succeed, it became a maxim to guide the operation of the farmer, who has continued to respect it to the present hour." *New Theory*, &c.

Chap. II.

Of Manures.

578. Every thing in culture may be said to depend on the use of manures. " It is in vain," as Grisenthwaite observes, " that the soil is composed of the best substances, in the best proportions; that when so composed it is kept in the best possible condition for vegetation, unless manure be added to it of such a kind, and in such a state, as is favourable to the growth of plants. The pulverization of land, the exposure of it to the frost of winter, irrigation and draining, are all regarded as important, only as far as they adapt it to the reception of manure, and are calculated to render its uses in vegetation more serviceable." That certain decaying organised substances, buried in the soil, increase the produce of vegetables, is a fact known from time immemorial. " Where the shepherd kept his flock, he might afterwards witness more luxuriant herbage, than in situations apparently similar, but, where they had not been kept. This, and many other accidental occurrences would soon satisfy the mind of the most negligent and incurious, that the productiveness of the soil might be greatly assisted by artificial means. Without theory or principle, he would seize on every instance of successful vegetation, and endeavour to imitate the means that had rendered it so. He would collect leaves, and store the dung of his animals, and thereby accomplish much, although he would leave many important resources entirely disregarded; but this, his first step, would be an advance so far in the practice of husbandry, that it would see nothing excelling itself for many centuries; even now, little, very little more is done than was thus accomplished by the first rude improvements of uncivilized man.

" The probable reason why so little knowledge has been acquired concerning the manner in which plants derive nourishment, may be found in the obscurity of the processes of vegetation; every thing is done imperceptibly to human sense; the roots are silently and incessantly at work absorbing the soluble substances in the soil, whilst the leaves are constantly performing the same functions, unperceived, in the air. Observation can detect nothing. It required much patient investigation, and many well-directed experiments to be made, before these powers and offices of the roots and leaves were discovered. It was not the practical man that explored the secret recesses of vegetation, or attempted to develope its laws. It was philosophy, with its complicated apparatus, and its comprehensive views, that led men into the laboratory of nature, and explained the manner in which she conducts her operations. The results of her labors have unfolded many truths of the greatest importance to culture; amongst which, that of the preparation and adaptation of manures to purposes of husbandry, is not the least.

" Every species of matter capable of promoting the growth of vegetables may be considered as manure; and we shall find, on examining the constituents of vegetables, that they are composed of oxygen, hydrogen, carbon, and nitrogen, or azote, with a small proportion of saline bodies. It is evident, therefore, that the substances employed as manure should also be composed of these elements, for unless they are, there will be a deficiency of some of the elements in the vegetable itself; and it is probable, that such deficiency may prevent the formation of those substances within it, for which its peculiar organisation is contrived, and upon which its healthy existence depends. The elementary bodies above enumerated, are all contained in animal, and the three first in vegetable matters. Sometimes vegetables, though very seldom, contain a small quantity of nitrogen. As certain salts are also constantly found to be present in healthy living vegetables, manures or vegetable food may, consequently, be distinguished into animal, vegetable, and saline."

The authors whom we have already mentioned (547.) as producing the first chemical treatises on soils were also the first to treat chemically of manures. Of these, the latest in the order of time, is Sir H. Davy, from whose highly satisfactory work we shall extract the greater part of this chapter; introducing, at the same time, the ingenious refinements of Grisenthwaite.

Sect. I. *Of Manures of Animal and Vegetable Origin.*

579. These constitute by far the most important class of manures or vegetable food, and may be considered as to the theory of their operation, their specific kinds, and their preservation and application in practice.

Subsect. 1. *Theory of the Operation of Manures of Animal and Vegetable Origin.*

We have, in considering the anatomy of the plant (344. and 350.), found that "The pores in the fibres of the roots of plants are so small, that it is with difficulty they can be discovered by the microscope; it is not therefore probable, that solid substances can pass into them from the soil." Sir H. Davy, "tried an experiment on this subject; some impalpable powdered charcoal, procured by washing gunpowder, and dissipating the sulphur by heat, was placed in a phial containing pure water, in which a plant of peppermint was growing; the roots of the plant were pretty generally in contact with the charcoal. The experiment was made in the beginning of May, 1805; the growth of the plant was very vigorous during a fortnight, when it was taken out of the phial: the roots were cut through in different parts; but no carbonaceous matter could be discovered in them, nor were the smallest fibrils blackened by charcoal, though this must have been the case had the charcoal been absorbed in a solid form. No substance is more necessary to plants than carbonaceous matter; and if this cannot be introduced into the organs of plants, except in a state of solution, there is every reason to suppose that other substances less essential will be in the same case.

"Vegetable and animal substances deposited in the soil, as is shown by universal experience, are consumed during the process of vegetation; and they can only nourish the plant by affording solid matters capable of being dissolved by water, or gaseous substances capable of being absorbed by the fluids in the leaves of vegetables; but such parts of them as are rendered gaseous, and that pass into the atmosphere, must produce a comparatively small effect, for gasses soon become diffused through the mass of the surrounding air; the great object in the application of manure should be to make it afford as much soluble matter as possible to the roots of the plant; and that in a slow and gradual manner, so that it may be entirely consumed in forming its sap and organised parts.

"Mucilaginous, gelatinous, saccharine, oily, and extractive fluids, and solutions of carbonic acid in water, are substances that in their unchanged states contain almost all the principles necessary for the life of plants; but there are few cases in which they can be applied as manures in their pure forms; and vegetable manures, in general, contain a great excess of fibrous and insoluble matter, which must undergo chemical changes before they can become the food of plants.

"It will be proper to take a scientific view of the nature of these changes; of the causes which occasion them, and which accelerate or retard them; and of the products they afford. If any fresh vegetable matter which contains sugar, mucilage, starch, or other of the vegetable compounds soluble in water be moistened, and exposed to air, at a temperature from 55° to 80°, oxygen will soon be absorbed, and carbonic acid formed; heat will be produced, and elastic fluids, principally carbonic acid, gaseous oxyde of carbon, and hydro-carbonate will be evolved; a dark-coloured liquid, of a slightly sour or bitter taste, will likewise be formed; and if the process be suffered to continue for a time sufficiently long, nothing solid will remain, except earthy and saline matter, colored black by charcoal. The dark-colored fluid formed in the fermentation always contains acetic acid; and when albumen or gluten exists in the vegetable substance, it likewise contains volatile alkali. In proportion as there is more gluten, albumen, or matters soluble in water in the vegetable substances exposed to fermentation, so in proportion all other circumstances being equal, will the process be more rapid. Pure woody fibre alone undergoes a change very slowly; but its texture is broken down, and it is easily resolved into new elements, when mixed with substances more liable to change, containing more oxygen and hydrogen. Volatile and fixed oils, resins, and wax, are more susceptible of change than woody fibre, when exposed to air and water; but much less liable than the other vegetable compounds; and even the most inflammable substances, by the absorption of oxygen, become gradually soluble in water.

"Animal matters in general are more liable to decompose than vegetable substances; oxygen is absorbed, and carbonic acid and ammonia formed in the process of their putrefaction. They produce fœtid compound elastic fluids, and likewise azote: they afford dark-colored acid and oily fluids, and leave a residuum of salts and earths mixed with carbonaceous matter.

"The principal substances which constitute the different parts of animals, or which are found in their blood, their secretions, or their excrements, are gelatine, fibrine, mucus, fatty, or oily matter, albumen, urea, uric acid, and different acid, saline, and earthy matters.

"Of these *gelatine* is the substance which, when combined with water, forms jelly. It is very liable to putrefaction. According to Gay Lussac and Thenard, it is composed of 47.88 of carbon; 27.207 of oxygen; 7.914 of hydrogen; 16.998. Total 100. These proportions cannot be considered as definite, for they do not bear to each other the ratios of any simple multiples of the number representing the elements; the case seems to be the same with other animal compounds: and even in vegetable substances, in general, the proportions are far from having the same simple relations as in the binary compounds capable of being made artificially, such as acids, alkalies, oxides, and in salts.

" *Fibrine* constitutes the basis of the muscular fibre of animals, and a similar substance may be obtained from recent fluid blood; by stirring it with a stick, the fibrine will adhere to the stick. It is not soluble in water; but by the action of acid, as Hatchet has shown, it becomes soluble, and analogous to gelatine. It is less disposed to putrefy than gelatine. According to Gay Lussac and Thenard, 100 parts of fibrine contain of carbon 53.360; oxygen 19.685; hydrogen 7.021; azote 19.934.

" *Mucus* is very analogous to vegetable *gum* in its characters; and as Dr. Bostock has stated, it may be obtained by evaporating saliva. No experiments have been made upon its analysis; but it is probably similar to gum in composition. It is capable of undergoing putrefaction, but less rapidly than fibrine.

" *Animal Fat* and *Oils* have not been accurately analysed; but there is great reason to suppose that their composition is analogous to that of similar substances from the vegetable kingdom.

" *Albumen* is a substance which has only lately been discovered in the vegetable kingdom. It abounds in the juice of the papaw tree (*Caraca papaya*): when this juice is boiled, the albumen falls down in a coagulated state. It is likewise found in mushrooms, and in different species of fungi. Albumen in its pure form, is a thick, glairy, tasteless fluid; precisely the same as the white of the egg.

" *Urea* may be obtained by the evaporation of human urine, till it is of the consistence of a syrup; and the action of alcohol on the crystalline substance, which forms when the evaporated matter cools. In this way a solution of urea in alcohol is procured, and the alcohol may be separated from the urea by heat. Urea is very soluble in water, and is precipitated from water by diluted nitric acid in the form of bright pearl-colored crystals; this property distinguishes it from all other animal substances. According to Fourcroy and Vauquelin, 100 parts of urea, when distilled, yield 92.027 parts of carbonate of ammonia; 4.608 of carburetted hydrogen gas; 3.225 of charcoal. Urea, particularly when mixed with albumen or gelatine, readily undergoes putrefaction.

" *Uric acid*, as has been shown by Dr. Egan, may be obtained from human urine by pouring an acid into it; and it often falls down from urine in the form of brick-colored crystals. It consists of carbon, hydrogen, oxygen, and azote: but their proportions have not yet been determined. Uric acid is one of the animal substances least liable to undergo the process of putrefaction. According to the different proportions of these principles in animal compounds, so are the changes they undergo different. When there is much saline or earthy matter mixed or combined with them, the progress of their decomposition is less rapid than when they are principally composed of fibrine, albumen, gelatine, or urea.

" The ammonia given off from animal compounds in putrefaction may be conceived to be formed at the time of their decomposition by the combination of hydrogen and azote; except this matter, the other products of putrefaction are analogous to those afforded by the fermentation of vegetable substances; and the soluble substances formed abound in the elements, which are the constituent parts of vegetables, in carbon, hydrogen, and oxygen.

" Whenever manures consist principally of matter soluble in water, it is evident that their fermentation or putrefaction should be prevented as much as possible; and the only cases in which these processes can be useful, are when the manure consists principally of vegetable or animal fibre. The circumstances necessary for the putrefaction of animal substances are similar to those required for the fermentation of vegetable substances; a temperature above the freezing point, the presence of water, and the presence of oxygen, at least in the first stage of the process. To prevent manures from decomposing, they should be preserved dry, defended from the contact of air, and kept as cool as possible. Salt and alcohol appear to owe their powers of preserving animal and vegetable substances to their attraction for water, by which they prevent its decomposing action, and likewise to their excluding air."

Subsect. 2. *Of the different Species of Manures of Animal and Vegetable Origin.*

580. " As different manures contain different proportions of the elements necessary to vegetation, so they require a different treatment to enable them to produce their full effects in culture. The properties and nature of the manures in common use require to be detailed.

"All green succulent plants contain saccharine or mucilaginous matter, with woody fibre, and readily ferment. They cannot, therefore, if intended for manure, be used too soon after their death. Hence the advantage of digging or ploughing in green crops, whether natural, of weeds, or sown on purpose; they must not, however, be turned too deep, otherwise, as Mrs. Ibbetson has shown, (*Philos. Mag.* 1816,) fermentation will be prevented by compression and exclusion of air.

"When green crops are to be employed for enriching a soil, they should be ploughed in, if it be possible, when in flower, or at the time the flower is beginning to appear, for it is at this period that they contain the largest quantity of easily soluble matter, and that their leaves are most active in forming nutritive matter. Green crops, pond-weeds, the paring of hedges or ditches, or any kind of fresh vegetable matter, requires no preparation to fit them for manure. The decomposition slowly proceeds beneath the soil; the soluble matters are gradually dissolved, and the slight fermentation that goes on, checked by the want of a free communication of air, tends to render the woody fibre soluble without occasioning the rapid dissipation of elastic matter.

"When old pastures are broken up and made arable, not only has the soil been enriched by the death and slow decay of the plants which have left soluble matters in the soil; but the leaves and roots of the grasses, living at the time, and occupying so large a part of the surface, afford saccharine, mucilaginous, and extractive matters, which become immediately the food of the crop, and the gradual decomposition affords a supply for successive years.

"Rape-cake, which is used with great success as a manure, contains a large quantity of mucilage, some albuminous matter, and a small quantity of oil. This manure should be used recent, and kept as dry as possible before it is applied. It forms an excellent dressing for turnip crops; and is most economically applied by being thrown into the soil at the same time with the seed.

"Malt-dust consists chiefly of the infant radicle separated from the grain. Sir H. Davy never made any experiment upon this manure; but has great reason to suppose it must contain saccharine matter, and this will account for its powerful effects. Like rape cake, it should be used as dry as possible, and its fermentation prevented.

"Linseed-cake is too valuable as a food for cattle to be much employed as a manure. The water in which flax and hemp are steeped for the purpose of obtaining the pure vegetable fibre, has considerable fertilizing powers. It appears to contain a substance analogous to albumen, and likewise much vegetable extractive matter. It putrefies very readily. By the watering process, a certain degree of fermentation is absolutely necessary to obtain the flax and hemp in a proper state; the water to which they have been exposed should therefore be used as a manure as soon as the vegetable fibre is removed from it. Washing with soap has been successfully substituted for watering by ley.

581. "*Sea-weeds*, consisting of different species of fuci, algæ, and confervæ, are much used as a manure on the sea coasts of Britain and Ireland. By digesting the common fucus, which is the sea-weed usually most abundant on the coast, in boiling water, one-eighth of a gelatinous substance will be obtained, with characters similar to mucilage. A quantity distilled gave nearly four-fifths of its weight of water, but no ammonia; the water had an empyreumatic and slightly sour taste; the ashes contained sea salt, carbonate of soda, and carbonaceous matter. The gaseous matter afforded was small in quantity, principally carbonic acid, and gaseous oxide of carbon, with a little hydro-carbonate. This manure is transient in its effects, and does not last for more than a single crop, which is easily accounted for from the large quantity of water, or the elements of water it contains. It decays without producing heat when exposed to the atmosphere, and seems, as it were, to melt down and dissolve away. A large heap has been entirely destroyed in less than two years, nothing remaining but a little black fibrous matter.

"Some of the firmest part of a fucus were suffered to remain in a close jar, containing atmospheric air, for a fortnight: in this time it had become very much shrivelled; the sides of the jar were lined with dew. The air examined was found to have lost oxygen, and contained carbonic acid gas.

"Sea weed is sometimes suffered to ferment before it is used; but this process seems wholly unnecessary, for there is no fibrous matter rendered soluble in the process, and a part of the manure is lost.

"The best cultivators use it as fresh as it can be procured; and the practical results of this mode of applying it are exactly conformable to the theory of its operation. The carbonic acid formed by its incipient fermentation must be partly dissolved by the water set free in the same process; and thus become capable of absorption by the roots of plants.

"The effects of the sea-weed, as manure, must principally depend upon this carbonic acid, and upon the soluble mucilage the weed contains; some fucus which had fermented so as to have lost about half its weight, afforded less than one-twelfth of mucilaginous matter; from which it may be fairly concluded that some of this substance is destroyed in fermentation.

582. " *Dry straw* of wheat, oats, barley, beans, and peas, and spoiled hay, or any other similar kind of dry vegetable matter, is, in all cases, useful manure. In general, such substances are made to ferment before they are employed, though it may be doubted whether the practice should be indiscriminately adopted.

" From 400 grains of dry barley straw eight grains of matter soluble in water were obtained, which had a brown color, and tasted like mucilage. From 400 grains of wheaten straw, were obtained five grains of a similar substance.

" There can be no doubt that the straw of different crops immediately ploughed into the ground, affords nourishment to plants; but there is an objection to this method of using straw, from the difficulty of burying long straw, and from its rendering the husbandry foul.

" When straw is made to ferment, it becomes a more manageable manure; but there is likewise, on the whole, a great loss of nutritive matter. More manure is perhaps supplied for a single crop; but the land is less improved than it would be, supposing the whole of the vegetable matter could be finely divided and mixed with the soil.

" It is usual to carry straw that can be employed for no other purpose to the dunghill, to ferment, and decompose; but it is worth experiment, whether it may not be more economically applied when chopped small by a proper machine, and kept dry till it is ploughed in for the use of a crop. In this case, though it would decompose much more slowly, and produce less effect at first, yet its influence would be much more lasting.

" Mere woody fibre seems to be the only vegetable matter that requires fermentation to render it nutritive to plants. Tanners' spent bark is a substance of this kind. A. Young, in his excellent Essay on Manures, states, 'that spent bark seemed rather to injure than assist vegetation;" which he attributes to the astringent matter that it contains. But, in fact, it is freed from all soluble substances, by the operation of water in the tan-pit; and if injurious to vegetation, the effect is probably owing to its agency upon water, or to its mechanical effects. It is a substance very absorbent and retentive of moisture, and yet not penetrable by the roots of plants.

583. " *Inert peaty matter* is a substance of the same kind. It remains for years exposed to water and air without undergoing change, and in this state yields little or no nourishment to plants.

" Woody fibre will not ferment, unless some substances are mixed with it, which act the same part as the mucilage, sugar, and extractive or albuminous matters, with which it is usually associated in herbs and succulent vegetables. Lord Meadowbank has judiciously recommended a mixture of common farm-yard dung for the purpose of bringing peat into fermentation; any putrescible or fermentable substance will answer the end; and the more a substance heats, and the more readily it ferments, the better will it be fitted for the purpose.

" Lord Meadowbank states, " that one part of dung is sufficient to bring three or four parts of peat into a state in which it is fitted to be applied to land; but of course the quantity must vary according to the nature of the dung and of the peat. In cases in which some living vegetables are mixed with the peat, the fermentation will be more readily effected.

" Tanners' spent bark, shavings of wood, and saw-dust, will probably require as much dung to bring them into fermentation as the worst kind of peat. Woody fibre may be likewise prepared so as to become a manure, by the action of lime.

" It is evident, from the analysis of woody fibre by Gay Lussac and Thenard, (which shows that it consists principally of the elements of water and carbon, the carbon being in larger quantities than in the other vegetable compounds,) that any process which tends to abstract carbonaceous matter from it, must bring it nearer in composition to the soluble principles; and this is done in fermentation by the absorption of oxygen and production of carbonic acid; and a similar effect, it will be shown, is produced by lime.

584. " *Wood-ashes*, imperfectly formed, that is, wood-ashes containing much charcoal, are said to have been used with success as a manure. A part of their effects may be owing to the slow and gradual consumption of the charcoal, which seems capable, under other circumstances than those of actual combustion, of absorbing oxygen so as to become carbonic acid.

" In April 1803, some well-burnt charcoal was enclosed by Sir H. Davy, in a tube, half filled with pure water, and half with common air; the tube was hermetically sealed. The tube was opened under pure water, in the spring of 1804, at a time when the atmospheric temperature and pressure were nearly the same as at the commencement of the experiment. Some water rushed in; and on expelling a little air by heat from the tube, and analyzing it, it was found to contain only seven per cent. of oxygen. The water in the tube, when mixed with lime-water, produced a copious precipitate; so that carbonic acid had evidently been formed and dissolved by the water.

585. " *Manures from animal substances*, in general, require no chemical preparation to

fit them for the soil. The great object of the farmer is to blend them with the earthy constituents in a proper state of division, and to prevent their too rapid decomposition.

"The entire parts of the muscles of land animals are not commonly used as manure, though there are many cases in which such an application might be easily made. Horses, dogs, sheep, deer, and other quadrupeds that have died accidentally, or of disease, after their skins are separated, are often suffered to remain exposed to the air, or immersed in water, till they are destroyed by birds or beasts of prey, or entirely decomposed; and in this case, most of their organised matter is lost for the land in which they lie, and a considerable portion of it employed in giving off noxious gasses to the atmosphere.

"By covering dead animals with five or six times their bulk of soil, mixed with one part of lime, and suffering them to remain for a few months; their decomposition would impregnate the soil with soluble matters, so as to render it an excellent manure; and by mixing a little fresh quick lime with it at the time of its removal, the disagreeable effluvia would be in a great measure destroyed; and it might be applied in the same way as any other manure to crops.

"Fish forms a powerful manure, in whatever state it is applied; but it cannot be ploughed in too fresh, though the quantity should be limited. A. Young records an experiment, in which herrings spread over a field, and ploughed in for wheat, produced so rank a crop, that it was entirely laid before harvest.

"The refuse pilchards in Cornwall are used throughout the county as a manure, with excellent effects. They are usually mixed with sand or soil, and sometimes with sea-weed, to prevent them from raising too luxuriant a crop. The effects are perceived for several years.

"In the fens of Lincolnshire, Cambridgeshire, and Norfolk, the little fishes called sticklebacks, are caught in the shallow waters in such quantities, that they form a great article of manure in the land bordering on the fens.

"It is easy to explain the operation of fish as a manure. The skin is principally gelatine; which from its slight state of cohesion, is readily soluble in water: fat or oil is always found in fishes, either under the skin or in some of the viscera; and their fibrous matter contains all the essential elements of vegetable substances.

"Amongst oily substances, blubber has been employed as a manure. It is most useful when mixed with clay, sand, or any common soil, so as to expose a large surface to the air, the oxygen of which produces soluble matter from it. Lord Somerville used blubber with great success at his farm in Surrey. It was made into a heap with soil, and retained its powers of fertilizing for several successive years. The carbon and hydrogen abounding in oily substances, fully account for their effects; and their durability is easily explained from the gradual manner in which they change by the action of air and water."

586. "*Bones* are much used as a manure in the neighbourhood of London. After being broken, and boiled for grease, they are sold to the farmer. The more divided they are, the more powerful are their effects. The expense of grinding them in a mill would probably be repaid by the increase of their fertilizing powers; and in the state of powder they might be used in the drill husbandry, and delivered with the seed, in the same manner as rape-cake. Bone-dust and bone-shavings, the refuse of the turning manufacture, may be advantageously employed in the same way. The basis of bone is constituted by earthy salts, principally phosphate of lime, with some carbonate of lime and phosphate of magnesia; the easily decomposable substances in bone, are fat, gelatine, and cartilage, which seems of the same nature as coagulated albumen. According to the analysis of Fourcroy and Vauquelin, ox-bones are composed of decomposable animal matter 51, phosphate of lime 37.7, carbonate of lime 10, phosphate of magnesia 1.3. Total 100.

"M. Merat Guillot has given the following estimate of the composition of the bones of different animals: the first number representing phosphate of lime, and the second carbonate of lime. Bone of calf 54; horse 67.5—1.25; sheep 70—5; elk 90—1; hog 52—1; hare 85—1; pullet 72—1.5; pike 64—1; Carp 45—5; horses' teeth, 85.5—20.5; ivory 64—1.

"The remaining parts of the 100 must be considered as decomposable animal matter.

"Horn is a still more powerful manure than bone, as it contains a larger quantity of decomposable animal matter. From 500 grains of ox horn, Hatchett obtained only 1.5 grains of earthy residuum, and not quite half of this was phosphate of lime. The shavings or turnings of horn form an excellent manure, though they are not sufficiently abundant to be in common use. The animal matter in them seems to be of the nature of coagulated albumen, and it is slowly rendered soluble by the action of water. The earthy matter in horn, and still more that in bones, prevents the too rapid decomposition of the animal matter, and renders it very durable in its effects.

" Hair, woollen rags, and feathers, are all analogous in composition, and principally consist of a substance similar to albumen united to gelatine. This is shown by the ingenious researches of Hatchett. The theory of their operation is similar to that of bone and horn shavings.

" The refuse of the different manufactures of skin and leather form very useful manures; such as the shavings of the currier, furriers' clippings, and the offals of the tan-yard and of the glue-maker. The gelatine contained in every kind of skin is in a state fitted for its gradual solution or decomposition; and when buried in the soil, it lasts for a considerable time, and constantly affords a supply of nutritive matter to the plants in its neighbourhood.

587. " *Blood* contains certain quantities of all the principles found in other animal substances, and is consequently a very good manure. It has been already stated that it contains fibrine; it likewise contains albumen; the red particles in it, which have been supposed by many foreign chemists to be colored by iron in a particular state of combination with oxygen and acid matter, Brande considers as formed of a peculiar animal substance, containing very little iron. The scum taken from the boilers of the sugar-bakers, and which is used as manure, principally consists of bullocks' blood, which has been employed for the purpose of separating the impurities of common brown sugar, by means of the coagulation of its albuminous matter by the heat of the boiler.

" The different species of corals, corallines, and sponges, must be considered as substances of animal origin. From the analysis of Hatchett, it appears that all these substances contain considerable quantities of a matter analogous to coagulated albumen; the sponges afford likewise gelatine. According to Merat Guillot, white coral contains equal parts of animal matter and carbonate of lime; red coral 46.5 of animal matter, and 53.5 of carbonate of lime; articulated coraline 51 of animal matter, and 49 of carbonate of lime. These substances are never used as manure in this country, except in cases when they are accidentally mixed with sea-weed; but it is probable that the corallines might be advantageously employed, as they are found in considerable quantity on the rocks, and bottoms of the rocky pools on many parts of our coast, where the land gradually declines towards the sea; and they might be detached by hoes, and collected without much trouble.

588. " Amongst excrementations, animal substances used as manures, *urine* is the one upon which the greatest number of chemical experiments have been made, and the nature of which is best understood. The urine of the cow contains, according to the experiments of Brande: water 65, phosphate of lime 3, muriates of potassa and ammonia 15, sulphate of potassa 6, carbonates, potassa, and ammonia 4, urea 4.

" The urine of the horse, according to Fourcroy and Vauquelin, contains, of carbonate of lime 11, carbonate of soda 9, benzoate of soda 24, muriate of potassa 9, urea 7, water and mucilage 940. In addition to these substances, Brande found in it phosphate of lime.

" The urine of the ass, the camel, the rabbit, and domestic fowls, have been submitted to different experiments, and their constitution have been found similar. In the urine of the rabbit, in addition to most of the ingredients above mentioned, Vauquelin detected gelatine; and the same chemist discovered uric acid in the urine of domestic fowls. Human urine contains a greater variety of constituents than any other species examined. Urea, uric acid, and another acid similar to it in nature, called rosacic acid, acetic acid, albumen, gelatine, a resinous matter, and various salts are found in it. The human urine differs in composition, according to the state of the body, and the nature of the food and drink made use of. In many cases of disease there is a much larger quantity of gelatine and albumen than usual in the urine; and in diabetes it contains sugar. It is probable that the urine of the same animal must likewise differ according to the different nature of the food and drink used; and this will account for discordances in some of the analyses that have been published on the subject. Urine is very liable to change, and to undergo the putrefactive process; and that of carnivorous animals more rapidly than that of graminivorous animals. In proportion as there is more gelatine and albumen in urine, so in proportion does it putrefy more quickly. The species of urine that contain most albumen, gelatine, and urea, are the best as manures; and all urine contains the essential elements of vegetables in a state of solution. During its putrefaction of urine the greatest part of the soluble animal matter that it contains is destroyed; it should consequently be used as fresh as possible; but if not mixed with solid matter, it should be diluted with water, as, when pure, it contains too large a quantity of animal matter to form a proper fluid nourishment for absorption by the roots of plants.

" Putrid urine abounds in ammoniacal salts; and though less active than fresh urine, is a very powerful manure. According to a recent analysis published by Berzelius, 1000 parts of urine are composed of, water 933, urea 30.1, uric acid 1, muriate of ammonia, free lactic acid, lactate of ammonia and animal matter 17.14. The remainder different salts, phosphates, sulphates, and muriates.

"Amongst excrementitious solid substances used as manures, one of the most powerful is the dung of birds that feed on animal food, particularly the dung of sea birds. The guano, which is used to a great extent in South America, and which is the manure that fertilizes the sterile plains of Peru, is a production of this kind. It exists abundantly, as we are informed by Humboldt, on the small islands in the South Sea, at Chinche, Ilo, Iza, and Arica. Fifty vessels are laden with it annually at Chinche, each of which carries from 1500 to 2000 cubical feet. It is used as a manure only in very small quantities; and particularly for crops of maize. Some experiments were made on specimens of guano in 1805. It appeared as a fine brown powder; it blackened by heat, and gave off strong ammoniacal fumes; treated with nitric acid, it afforded uric acid. In 1806, Fourcroy and Vauquelin published an elaborate analysis of guano. They state that it contains a fourth part of its weight of uric acid, partly saturated with ammonia, and partly with potassa; some phosphoric acid combined with the bases, and likewise with lime. Small quantities of sulphate and muriate of potassa, a little fatty matter, and some quartzose sand.

"It is easy to explain its fertilizing properties: from its composition it might be supposed to be a very powerful manure. It requires water for the solution of its soluble matter to enable it to produce its full beneficial effect on crops.

"The dung of sea-birds has never been much used as a manure in this country; but it is probable that even the soil of the small islands on our coast much frequented by them would fertilize. Some dung of sea-birds, brought from a rock on the coast of Merionethshire, produced a powerful, but transient effect on grass.

"The rains in our climate must tend very much to injure this species of manure, where it is exposed to them, soon after its deposition; but it may probably be found in great perfection in caverns or clefts in rocks, haunted by cormorants and gulls. Some recent cormorants' dung, when examined, had not at all the appearance of the guano; it was of a greyish white color; had a very fœtid smell, like that of putrid animal matter; when acted on by quick-lime, it gave abundance of ammonia; treated with nitric acid, it yielded uric acid.

589. "*Night-soil*, it is well known, is a very powerful manure, and very liable to decompose. It differs in composition; but always abounds in substances composed of carbon, hydrogen, azote, and oxygen. From the analysis of Berzelius, it appears that a part of it is always soluble in water; and in whatever state it is used, whether recent or fermented, it supplies abundance of food to plants. The disagreeable smell of night-soil may be destroyed by mixing it with quick-lime; and if exposed to the atmosphere in thin layers, strewed over with quick-lime in fine weather, it speedily dries, is easily pulverized, and in this state, may be used in the same manner as rape-cake, and delivered into the furrow with the seed.

"The Chinese, who have more practical knowledge of the use and application of manures than any other people existing, mix their night-soil with one-third of its weight of a fat marl, make it into cakes, and dry it by exposure to the sun. These cakes, we are informed by the French missionaries, have no disagreeable smell, and form a common article of commerce of the empire. Desiccated night-soil, in a state of powder, forms an article of internal commerce in France, and is known under the name of *poudrette*. The earth, by its absorbent powers, probably prevents, to a certain extent, the action of moisture upon the dung, and likewise defends it from the effects of air.

590. "After night-soil, *pigeons' dung* comes next in order, as to fertilizing power. 100 grains digested in hot water for some hours, produced 23 grains of soluble matter, which afforded abundance of carbonate of ammonia by distillation; and left carbonaceous matter, saline matter, principally common salt, and carbonate of lime as a residuum. Pigeons' dung, when moist, readily ferments, and after fermentation, contains less soluble matter than before; from 100 parts of fermented pigeons' dung, only eight parts of soluble matter were obtained, which gave proportionally less carbonate of ammonia in distillation than recent pigeons' dung. It is evident that this manure should be applied as new as possible; and when dry, it may be employed in the same manner as the other manures capable of being pulverized.

"The soil in woods, where great flocks of wood-pigeons roost, is often highly impregnated with their dung, and it cannot be doubted, would form a valuable manure. Such soil will often yield ammonia when distilled with lime. In the winter likewise it usually contains abundance of vegetable matter, the remains of decayed leaves, and the dung tends to bring the vegetable matter into a state of solution. Manuring was, and still is, in great esteem in Persia.

"The dung of domestic fowls approaches very nearly in its nature to pigeons' dung. Uric acid has been found in it. It gives carbonate of ammonia by distillation, and immediately yields soluble matter to water. It is very liable to ferment.

"The dung of fowls is employed, in common with that of pigeons, by tanners, to bring on a slight degree of putrefaction in skins that are to be used for making soft leather; for this purpose the dung is diffused through water. In this state it rapidly undergoes putrefaction, and brings on a similar change in the skin. The excrements of dogs are employed by the tanner with similar effects. In all cases, the contents of the *grainer*, as the pit is called in which soft skins are prepared by dung, must form a very useful manure.

"Rabbits' dung has never been analysed. It is used with great success as a manure by some farmers, who find it profitable to keep rabbits in such a manner as to preserve their dung. It is laid on as fresh as possible, and is found better the less it has fermented.

591. "The *dung of cattle*, oxen, and cows, has been chemically examined by Einhof and Thaer. They found that it contained matter soluble in water; and that it gave in fermentation nearly the same products as vegetable substances, absorbing oxygen, and producing carbonic acid gas.

"The recent dung of sheep, and of deer, afford, when long boiled in water, soluble matters, which equal from two to three *per cent.* of their weight. These soluble substances, procured by solution and evaporation, when examined, contain a very small quantity of matter analogous to animal mucus; and are principally composed of a bitter extract, soluble both in water and in alcohol. They give ammoniacal fumes by distillation, and appear to differ very little in composition. Some blades of grass were watered for several successive days with a solution of these extracts; they evidently became greener in consequence, and grew more vigorously than grass in other respects, under the same circumstances.

"The part of the dung of cattle, sheep, and deer, not soluble in water, appears to be mere woody fibre, and precisely analogous to the residuum of those vegetables that form their food after they have been deprived of all their soluble materials.

"The dung of horses gives a brown fluid, which, when evaporated, yields a bitter extract, which affords ammoniacal fumes more copiously than that from the dung of oxen.

"If the pure dung of cattle is to be used as manure, like the other species of dung which have been mentioned, there seems no reason why it should be made to ferment except in the soil; or, if suffered to ferment, it should be only in a very slight degree. The grass, in the neighbourhood of recently voided dung, is always coarse and dark green; some persons have attributed this to a noxious quality in unfermenting dung; but it seems to be rather the result of an excess of food furnished to the plants.

Subsect. 3. *Of the Preservation and Application of Manures of Animal and Vegetable Origin.*

592. In practice, the great mass of manures procured by the cultivator are a mixture of animal and vegetable matters, and the great source of supply is the farm or stable-yard. Here the excrementitious matter of horses, cattle, swine, and poultry, is mixed with straw, haulm, chaff, and various kinds of litter. To what degree should this be fermented before it is applied to the soil? And how can it best be preserved when not immediately wanted?

"A slight incipient fermentation is undoubtedly of use in the dunghill; for, by means of it a disposition is brought on in the woody fibre to decay and dissolve, when it is carried to the land, or ploughed into the soil; and woody fibre is always in great excess in the refuse of the farm. Too great a degree of fermentation is, however, very prejudicial to the composite manure in the dunghill; it is better that there should be no fermentation at all before the manure is used, than that it should be carried too far. The excess of fermentation tends to the destruction and dissipation of the most useful part of the manure; and the ultimate results of this process are like those of combustion. It is a common practice amongst farmers to suffer the farm-yard dung to ferment till the fibrous texture of the vegetable matter is entirely broken down; and till the manure becomes perfectly cold, and so soft as to be easily cut by the spade. Independent of the general theoretical views unfavorable to this practice, founded upon the nature and composition of vegetable substances, there are many arguments and facts which shew that it is prejudicial to the interests of the farmer.

"During the violent fermentation which is necessary for reducing farm-yard manure to the state in which it is called *short muck*, not only a large quantity of fluid, but likewise of gaseous matter is lost; so much so, that the dung is reduced one-half, or two-thirds in weight; and the principal elastic matter disengaged, is carbonic acid with some ammonia; and both these, if retained by the moisture in the soil, as has been stated before, are capable of becoming an useful nourishment of plants.

"In October, 1808," Sir H. Davy "filled a large retort capable of containing three pints of water, with some hot fermenting manure, consisting principally of the litter and dung of cattle; he adapted a small receiver to the retort, and connected the whole with a mercurial pneumatic apparatus, so as to collect the condensible and elastic fluids which might rise from the dung. The receiver soon became lined with dew, and drops began in a few hours to trickle down the sides of it. Elastic fluid likewise was generated; in three days thirty-five cubical inches had been formed, which, when analysed, were found to contain twenty-one cubical inches of carbonic acid, the remainder was hydrocarbonate mixed with some azote, probably no more than existed in the common air in the receiver. The fluid matter collected in the receiver at the same time amounted to nearly half an ounce. It had a saline taste, and a disagreeable smell, and contained some acetate and carbonate of ammonia. Finding such products given off from fermenting litter, he introduced the beak of another retort, filled with similar dung, very hot at the time, in the soil amongst the roots of some grass in the border of a garden; in less than a week a very distinct effect was produced on the grass; upon the spot exposed to the influence of the matter disengaged in fermentation, it grew with much more luxuriance than the grass in any other part of the garden. Besides the dissipation of gaseous matter, when fermentation is pushed to the extreme, there is another disadvantage in the loss of *heat*, which, if excited in the soil, is useful in promoting the germination of the seed, and in assisting the plant in the first stage of its growth, when it is most feeble and most liable to disease: and the fermentation of manure in the soil must be particularly favorable to the wheat crop in preserving a genial temperature beneath the surface late in autumn, and during winter. Again, it is a general principle in chemistry, that in all cases of decomposition, substances combine much more readily at the moment of their disengagement, than after they have been perfectly formed. And in fermentation beneath the soil, the fluid matter produced is applied instantly, even whilst it is warm, to the organs of the plant, and consequently is more likely to be efficient, than in manure that has gone through the process; and of which all the principles have entered into new combinations."

593. "There are reasons sufficiently strong," Grisenthwaite observes, "to discourage the practice of allowing dung-heaps to ferment, and rot without interruption. It appears that public opinion has slowly adopted the decisions of chemical reasoning, and *dung-pies*, as they are called, have been formed with a view to save what was before lost; a stratum of mould, sustaining the heap, being placed to receive the fluid parts, and a covering of mould being applied to prevent the dissipation of the aerial, or gaseous products. These purposes and contrivances, unfortunately, like many of the other operations of husbandry, were not directed by scientific knowledge. To cover is so commonly believed to confine, that there is no wonder that the practical cultivator adopted it in this instance from such a consideration. But it is in vain; the elasticity of the gases generated, is such as no covering whatever could possibly confine. If it were perfectly compact, it could only preserve as much carbonic acid as is equal to the volume, or bulk of air within it; a quantity too inconsiderable to be regarded, could it even be saved; but every particle of it must be disengaged, and lost, when the covering is removed."

"In the writings of scientific agriculturists, a great mass of facts may be found in favor of the application of farm-yard dung in a recent state. A. Young, in the *Essay on Manures*, already quoted, adduces a number of excellent authorities in support of the plan. Many, who doubted, have been lately convinced; and perhaps there is no subject of investigation in which there is such a union of theoretical and practical evidence. Within the last seven years Coke has entirely given up the system formerly adopted on his farm, of applying fermented dung; and his crops have been since as good as they ever were, and his manure goes nearly twice as far. A great objection against slightly fermented dung is, that weeds spring up more luxuriantly where it is applied. If there are seeds carried out in the dung, they certainly will germinate; but it is seldom that this can be the case to any extent; and if the land is not cleansed of weeds, any kind of manure, fermented or unfermented, will occasion their rapid growth. If slightly fermented farm-yard dung is used as a top-dressing for pastures, the long straws and unfermented vegetable matter remaining on the surface should be removed as soon as the grass begins to rise vigorously, by raking, and carried back to the dunghill: in this case no manure will be lost, and the husbandry will be at once clean and economical. In cases when farm-yard dung cannot be immediately applied to crops, the destructive fermentation of it should be prevented as much as possible: the principles on which this may be effected have been already alluded to. The surface should be defended as much as possible from the oxygen of the atmosphere; a compact marl, or a tenacious clay, offers the best protection against the air; and before the dung is covered over, or, as it were, sealed up, it should be dried as much as possible. If the dung is found at any time to heat strongly, it should be turned over, and cooled by exposure to air.

"Watering dunghills is sometimes recommended for checking the progress of fermentation; but this practice is inconsistent with just chemical views. It may cool the dung for a short time; but moisture, as before stated, is a principal agent in all processes of decomposition. Dry fibrous matter will never ferment. Water is as necessary as air to the process; and to supply it to fermenting dung, is to supply an agent which will hasten its decay. In all cases when dung is fermenting, there are simple tests by which the rapidity of the process, and consequently the injury done, may be discovered. If a thermometer, plunged into the dung, does not rise to above one hundred degrees of Fahrenheit, there is little danger of much aeriform matter flying off. If the temperature is higher, the dung should be immediately spread abroad. When a piece of paper, moistened in muriatic acid, held over the steams arising from a dung-hill, gives dense fumes, it is a certain test that the decomposition is going too far, for this indicates that volatile alkali is disengaged.

594. " *When dung is to be preserved for any time*, the situation in which it is kept is of importance. It should, if possible, be defended from the sun. To preserve it under sheds would be of great use; or to make the site of a dunghill on the north side of a wall. The floor on which the dung is heaped, should, if possible, be paved with flat stones; and there should be a little inclination from each side towards the centre, in which there should be drains connected with a small well, furnished with a pump, by which any fluid matter may be collected for the use of the land. It too often happens that a dense mucilaginous and extractive fluid is suffered to drain away from the dunghill, so as to be entirely lost to the farm.

" Street and road dung and the sweepings of houses, may be all regarded as composite manures; the constitution of them is necessarily various, as they are derived from a number of different substances. These manures are usually applied in a proper manner, without being fermented.

" Soot, which is principally formed from the combustion of pit-coal or coal, generally contains likewise substances derived from animal matters. This is a very powerful manure. It affords ammoniacal salts by distillation, and yields a brown extract to hot water, of a bitter taste. It likewise contains an empyreumatic oil. Its great basis is charcoal, in a state in which it is capable of being rendered soluble by the action of oxygen and water. This manure is well fitted to be used in the dry state, thrown into the ground with the seed, and requires no preparation.

" The doctrine of the proper application of manures from organised substances, offers an illustration of an important part of the economy of nature, and of the happy order in which it is arranged.

" The death and decay of animal subtances tend to resolve organized forms into chemical constituents; and the pernicious effluvia disengaged in the process seem to point out the propriety of burying them in the soil, where they are fitted to become the food of vegetables. The fermentation and putrefaction of organised substances in the free atmosphere are noxious processes; beneath the surface of the ground, they are salutary operations. In this case the food of plants is prepared where it can be used; and that which would offend the senses and injure the health, if exposed, is converted by gradual processes into forms of beauty and of usefulness; the fœtid gas is rendered a consituent of the aroma of the flower, and what might be poison, becomes nourishment to animals and to man."

Sect. II. *Of Manures of Mineral Origin.*

595. This class of manures is probably of more recent invention, and doubtless of more uncertain use than those which have just been discussed. " The conversion of matter that has belonged to living structures into organised forms, is a process that can be easily understood; but it is more difficult to follow those operations by which earthy and saline matters are consolidated in the fibre of plants, and by which they are made subservient to their functions." These are capable of being materially elucidated by modern chemistry, and shall here be considered as to their theory, operation, and specific kinds.

Subsect. 1. *Theory of the Operation of Mineral Manures.*

Various opinions have prevailed on this subject, and much has been written on lime and common salt, both in the way of speculation, and reasoning from facts, which, from want of chemical knowledge, has turned to no useful account, and cultivators, till very lately contented themselves with stating that these substances acted as stimuli to the soil, something like condiments to the digestive organs of animals. Even chemists themselves are not yet unanimous in all their opinions, but still the result of their enquiries will be found of the greatest benefit to the scientific cultivator.

596. " Some enquirers," Sir H. Davy observes, " adopting that sublime generalization of the ancient philosophers, that matter is the same in essence, and that the different substances considered as elements by chemists, are merely different arrangements of the same indestructible particles, have endeavoured to prove, that all the varieties of the principles found in plants, may be formed from the substances in the atmosphere; and that vege-

table life is a process in which bodies that the analytical philosopher is unable to change or to form, are constantly composed and decomposed.

"But the general results of experiments are very much opposed to the idea of the composition of the earths, by plants, from any of the elements found in the atmosphere, or in water; and there are various facts contradictory to the idea. Jacquin states, that the ashes of glass-wort, (*Salsola soda*,) when it grows in inland situations, afford the vegetable alkali; when it grows on the sea-shore, where compounds which afford the fossile or marine alkali are more abundant, it yields that substance. Du Hamel found, that plants which usually grow on the sea-shore, made small progress when planted in soils containing little common salt. The sun-flower, when growing in lands containing no nitre, does not afford that substance; though when watered by a solution of nitre, it yields nitre abundantly. The tables of de Saussure shew, that the ashes of plants are similar in constitution to the soils in which they have vegetated. De Saussure made plants grow in solutions of different salts, and he ascertained, that in all cases, certain portions of the salts were absorbed by the plant, and found unaltered in their organs.

"Even animals do not appear to possess the power of forming the alkaline and earthy substances. Dr. Fordyce found, that when canary-birds, at the time they were laying eggs, were deprived of access to carbonate of lime, their eggs had soft shells; and if there is any process for which nature may be conceived most likely to supply resources of this kind, it is that connected with the reproduction of the species.

"As the evidence on the subject now stands, it seems fair to conclude, that the different earths and saline substances found in the organs of plants, are supplied by the soils in which they grow; and in no cases composed by new arrangements of the elements in air or water. What may be our ultimate view of the laws of chemistry, or how far our ideas of elementary principles may be simplified, it is impossible to say. We can only reason from facts. We cannot imitate the powers of composition belonging to vegetable structures; but at least we can understand them: and as far as our researches have gone, it appears, that in vegetation compound forms are uniformly produced from simpler ones; and the elements in the soil, the atmosphere, and the earth absorbed and made parts of beautiful and diversified structures.

"The views which have been just developed lead to correct ideas of the operation of those manures which are not necessarily the result of decayed organised bodies, and which are not composed of different proportions of carbon, hydrogen, oxygen, and azote. — They must produce their effect, either by becoming a constituent part of the plant, or by acting upon its more essential food, so as to render it more fitted for the purposes of vegetable life."

Subsect. 2. *Of the Species of Mineral Manures.*

597. "The only substances," Sir H. Davy continues, "which can with propriety be called fossile manures, and which are found unmixed with the remains of any organised beings, are certain alkaline earths or alkalies, and their combinations.

"The only alkaline earths which have been hitherto applied in this way, are lime and magnesia. Potassa and soda, the two fixed alkalies, are both used in certain of their chemical compounds.

"The most common form in which lime is found on the surface of the earth, is in a state of combination with carbonic acid or fixed air. If a piece of limestone, or chalk, be thrown into a fluid acid, there will be an effervescence. This is owing to the escape of the carbonic acid gas. The lime becomes dissolved in the liquor. When limestone is strongly heated, the carbonic acid gas is expelled, and then nothing remains but the pure alkaline earth; in this case there is a loss of weight; and if the fire has been very high, it approaches to one-half the weight of the stone; but in common cases, limestones, if well dried before burning, do not lose much more than from 35 to 40 *per cent.*, or from seven to eight parts out of twenty.

"When burnt lime is exposed to the atmosphere, in a certain time it becomes mild, and is the same substance as that precipitated from lime-water; it is combined with carbonic acid gas. Quick-lime, when first made, is caustic and burning to the tongue, renders vegetable blues green, and is soluble in water; but when combined with carbonic acid, it loses all these properties, its solubility, and its taste: it regains its power of effervescing, and becomes the same chemical substance as chalk, or limestone.

"Very few limestones, or chalks, consist entirely of lime and carbonic acid. The statuary marbles, or certain of the rhomboidal spars, are almost the only pure species; and the different properties of limestones, both as manures and cements, depend upon the nature of the ingredients mixed in the limestone; for the true calcareous element, the carbonate of lime is uniformly the same in nature, properties, and effects, and consists of one proportion of carbonic acid 41.4, and one of lime 55.

"When a limestone does not copiously effervesce in acids, and is sufficiently hard to scratch glass, it contains siliceous, and probably aluminous earth. When it is deep brown, or red, or strongly colored of any of the shades of brown or yellow, it contains oxide of iron. When it is not sufficiently hard to scratch glass, but effervesces slowly, and makes the acid in which it effervesces milky, it contains magnesia. And when it is black, and emits a fœtid smell, if rubbed, it contains coaly or bituminous matter.

"Before any opinion can be formed of the manner in which the different ingredients in limestones modify their properties, it will be necessary to consider the operation of the pure calcareous element as a manure, and as a cement.

"Quick-lime, in its pure state, whether in powder, or dissolved in water, is injurious to plants. In several instances grass has been killed by watering it with lime-water. But lime, in its state of combination with carbonic acid, is a useful ingredient in soils. Calcareous earth is found in the ashes of the greater number of plants; and exposed to the air, lime cannot long continue caustic, for the reasons that were just now assigned, but soon becomes united to carbonic acid. When newly-burnt lime is exposed to air, it soon falls into powder; in this case it is called slacked lime; and the same effect is immediately produced by throwing water upon it, when it heats violently, and the water disappears. Slacked lime is merely a combination of lime, with about one-third of its weight of water; *i. e.* fifty-five parts of lime absorb seventeen parts of water; and in this case it is composed of a definite proportion of water, and is called by chemists *hydrate of lime;* and when hydrate of lime becomes carbonate of lime by long exposure to air, the water is expelled, and the carbonic acid gas takes its place. When lime, whether freshly burnt or slacked, is mixed with any moist fibrous vegetable matter, there is a strong action between the lime and the vegetable matter, and they form a kind of compost together, of which a part is usually soluble in water. By this kind of operation, lime renders matter which was before comparatively inert, nutritive; and as charcoal and oxygen abound in all vegetable matters, it becomes at the same time converted into carbonate of lime.

598. "Mild lime, powdered limestone, marls, or chalks, have no action of this kind upon vegetable matter; by their action they prevent the too rapid decomposition of substances already dissolved; but they have no tendency to form soluble matters. It is obvious from these circumstances, that the operation of quick-lime, and marl, or chalk, depends upon principles altogether different. Quick-lime, in being applied to land, tends to bring any hard vegetable matter that it contains into a state of more rapid decomposition and solution, so as to render it a proper food for plants. Chalk and marle, or carbonate of lime, will only improve the texture of the soil, or its relation to absorption; it acts merely as one of its earthy ingredients." "Chalk has been recommended as a substance calculated to correct the sourness of land. It would surely have been a wise practice to have previously ascertained the certainty of this existence of acid, and to have determined its nature, in order that it might be effectually removed. The fact really is, that no soil was ever yet found to contain any notable quantity of uncombined acid. The acetic and carbonic acids are the only two that are likely to be generated by any spontaneous decomposition of animal or vegetable bodies, and neither of these has any fixity when exposed to the air." Chalk having no power of acting on animal and vegetable substances, can be no otherwise serviceable to land than as it alters its texture. "Quick-lime, when it becomes mild, operates in the same manner as chalk; but in the act of becoming mild, it prepares soluble out of insoluble matter." "Boullion la Grange says, that gelatine oxygenized becomes insoluble, and vegetable extract we know becomes so from the same cause; now lime has the property of attracting oxygen, and consequently, of restoring the property of solubility to those substances which have been deprived of it, from a combination with oxygen. Hence the uses of lime on peat lands, and on all soils containing an excess of vegetable insoluble matter."

"When lime is employed upon land where there is present any quantity of animal matter, it occasions the evolution of a quantity of ammonia, which may, perhaps, be imbibed by the leaves of plants, and afterwards undergo some change so as to form gluten.

"It is upon this circumstance that the operation of lime in the preparation for wheat crops depends; and its efficacy in fertilizing peats, and in bringing into a state of cultivation all soils abounding in hard roots or dry fibres, or inert vegetable matter.

"The solution of the question whether quick-lime ought to be applied to a soil, depends upon the quantity of inert vegetable matter that it contains. The solution of the question, whether marl, mild lime, or powdered limestone, ought to be applied, depends upon the quantity of calcareous matter already in the soil. All soils are improved by mild lime, and ultimately by quick-lime, which do not effervesce with acids; and sands more than clays.

"When a soil, deficient in calcareous matter, contains much soluble vegetable manure, the application of quick-lime should always be avoided, as it either tends to decompose the soluble matters by uniting to their carbon and oxygen so as to become mild lime, or it combines with the soluble matters, and forms compounds having less attraction for water than the pure vegetable substance. The case is the same with respect to most animal manures; but the operation of the lime is different in different cases, and depends upon the nature of the animal matter. Lime forms a kind of insoluble soap with oily matters, and then gradually decomposes them by separating from them oxygen and carbon. It combines likewise with the animal acids and probably assists their decomposition by abstracting carbonaceous matter from them combined with oxygen; and consequently it must render them less nutritive. It tends to diminish likewise the nutritive powers of albumen from the same causes; and always destroys, to a certain extent, the efficacy of animal manures; either by combining with certain of their elements, or by giving to them new arrangements. Lime should never be applied with animal manures, unless they are too rich, or for the purpose of preventing noxious effluvia. It is injurious when mixed with any common dung, and tends to render the extractive matter insoluble.

" A quantity of brown soluble extract, which was procured from sheeps' dung, was mixed with five times its weight of quick-lime, and then moistened with water; the mixture heated very much; it was suffered to remain for fourteen hours, and was then acted on by six or seven times its bulk of pure water: the water, after being passed through a filter, was evaporated to dryness; the solid matter obtained was scarcely colored, and was lime mixed with a little saline matter.

" In those cases in which fermentation is useful to produce nutriment from vegetable substances, lime is always efficacious. Some moist tanners' spent bark was mixed with one-fifth of its weight of quick-lime, and suffered to remain together in a close vessel for three months; the lime had become colored, and was effervescent: when water was boiled upon the mixture, it gained a tint of fawn-color, and by evaporation furnished a fawn-colored powder, which must have consisted of lime united to vegetable matter, for it burnt when strongly heated, and left a residuum of mild lime.

" The limestones containing alumina and silica are less fitted for the purposes of manure than pure limestones; but the lime formed from them has no noxious quality Such stones are less efficacious, merely because they furnish a smaller quantity of quick-lime.

" There is very seldom any considerable portion of coaly matter in bituminous limestones; never as much as five parts in 100; but such limestones make very good lime. The carbonaceous matter can do no injury to the land, and may, under certain circumstances, become a food of the plant.

599. " The subject of the application of the magnesian limestone is one of great interest. It had been long known to farmers in the neighbourhood of Doncaster, that lime made from a certain limestone, applied to the land, often injured the crops considerably. Tennant, in making a series of experiments upon this peculiar calcareous substance, found that it contained magnesia; and on mixing some calcined magnesia with soil, in which he sowed different seeds, he found that they either died or vegetated in a very imperfect manner, and the plants were never healthy. And with great justice and ingenuity he referred the bad effects of the peculiar limestone to the magnesian earth it contains. There are cases, however, in which this magnesian limestone is used with good effect.

" Magnesia has a much weaker attraction for carbonic acid than lime, and will remain in the state of caustic or calcined magnesia for many months, though exposed to the air. And as long as any caustic lime remains, the magnesia cannot be combined with carbonic acid, for lime instantly attracts carbonic acid from magnesia. When a magnesian limestone is burnt, the magnesia is deprived of carbonic acid much sooner than the lime; and if there is not much vegetable or animal matter in the soil to supply by its decomposition carbonic acid, the magnesia will remain for a long while in the caustic state; and in this state acts as a poison to certain vegetables. And that more magnesian lime may be used upon rich soils, seems to be owing to the circumstance that the decomposition of the manure in them supplies carbonic acid. And magnesia, in its mild state, *i. e.* fully combined with carbonic acid, seems to be always an useful constituent of soils. Carbonate of magnesia (procured by boiling the solution of magnesia in supercarbonate of potassa,) was thrown upon grass, and upon growing wheat and barley, so as to render the surface white; but the vegetation was not injured in the slightest degree. And one of the most fertile parts of Cornwall, the Lizard, is a district in which the soil contains mild magnesian earth.

" It is obvious, from what has been said, that lime from the magnesian limestone may be applied in large quantities to peats; and that where lands have been injured by the application of too large a quantity of magnesian lime, peat will be a proper and efficient remedy.

"A simple test of magnesia in a limestone is its slight effervescence with acids, and its rendering diluted nitric acid, or aqua fortis milky. From the analysis of Tennant, it appears to contain from 20.3 to 22.5 magnesia; 29.5 to 31.7 lime; 47.2 carbonic acid; 0.8 clay and oxide of iron.

"Magnesian limestones are usually colored brown or pale yellow. They are found in Somersetshire, Leicestershire, Derbyshire, Shropshire, Durham and Yorkshire; and in many parts of Ireland, particularly near Belfast.

"In general, when limestones are not magnesian, their purity will be indicated by their loss of weight in burning; the more they lose, the larger is the quantity of calcareous matter they contain. The magnesian limestones contain more carbonic acid than the common limestones; and I have found all of them lose more than half their weight by calcination.

"Besides being used in the forms of lime and carbonate of lime, calcareous matter is applied for the purposes of agriculture in other combinations. One of these bodies is gypsum or sulphate of lime. This substance consists of sulphuric acid (the same body that exists combined with water in oil of vitriol, and lime; and when dry it is composed of 55 parts of lime and 75 parts of sulphuric acid. Common gypsum or selenite, such as that found at Shotover Hill, near Oxford, contains, besides sulphuric acid and lime, a considerable quantity of water; and its composition may be thus expressed: sulphuric acid one proportion 75; lime one proportion 55; water two proportions 34.

"The nature of gypsum is easily demonstrated; if oil of vitriol be added to quicklime, there is a violent heat produced; when the mixture is ignited, water is given off, and gypsum alone is the result, if the acid has been used in sufficient quantity; and gypsum mixed with quick-lime, if the quantity has been deficient. Gypsum, free from water, is sometimes found in nature, when it is called anhydrous selenite. It is distinguished from common gypsum by giving off no water when heated.

"When gypsum, free from water, or deprived of water by heat, is made into a paste with water, it rapidly sets by combining with that fluid. Plaster of Paris is powdered dry gypsum, and its property as a cement, and its use in making casts, depends upon its solidifying a certain quantity of water, and making with it a coherent mass. Gypsum is soluble in about 500 times its weight of cold water, and is more soluble in hot water; so that when water has been boiled in contact with gypsum, crystals of this substance are deposited as the water cools. Gypsum is easily distinguished by its properties of affording precipitates to solutions of oxalates and of barytic salts. In America it is employed with signal success; it has been advantageously used in Kent, but in most counties of England it has failed, though tried in various ways, and upon different crops.

600. "Very discordant notions have been formed as to the mode of operation of gypsum. It has been supposed by some persons to act by its power of attracting moisture from the air; but this agency must be comparatively insignificant. When combined with water, it retains that fluid too powerfully to yield it to the roots of the plant, and its adhesive attraction for moisture is inconsiderable; the small quantity in which it is used likewise is a circumstance hostile to this idea.

"It has been erroneously said that gypsum assists the putrefaction of animal substances, and the decomposition of manure.

"In examining the ashes of sainfoin, clover, and rye-grass, it was found that they afforded considerable quantities of gypsum; and this substance probably is intimately combined as a necessary part of their woody fibre. If this be allowed, it is easy to explain the reason why it operates in such small quantities; for the whole of a clover crop, or sainfoin crop, on an acre, according to estimation, would afford by incineration only three or four bushels of gypsum. The reason why gypsum is not generally efficacious, is probably because most cultivated soils contain it in sufficient quantities for the use of the grasses. In the common course of cultivation, gypsum is furnished in the manure; for it is contained in stable dung, and in the dung of all cattle fed on grass; and it is not taken up in corn crops, or crops of peas and beans, and in very small quantities in turnip crops; but where lands are exclusively devoted to pasturage and hay, it will be continually consumed. Should these statements be confirmed by future inquiries, a practical inference of some value may be derived from them. It is possible that lands which have ceased to bear good crops of clover, or artificial grasses, may be restored by being manured with gypsum. This substance is found in Oxfordshire, Gloucestershire, Somersetshire, Derbyshire, Yorkshire, &c. and requires only pulverization for its preparation.

"Some very interesting documents upon the use of sulphate of iron or green vitriol, which is a salt produced from peat in Bedfordshire, have been made by Dr. Pearson; and there is little doubt that the peat salt and the vitriolic water acted chiefly by producing gypsum. The soils on which both are efficacious are calcareous; and sulphate of iron is decomposed by the carbonate of lime in such soils. The sulphate of iron consists of sulphuric acid and oxide of iron, and is an acid and a very soluble salt; when a solution of it is mixed with carbonate of lime, the sulphuric acid quits the oxide of iron to unite to the lime, and the compounds produced are insipid and comparatively insoluble.

"Vitriolic impregnations in soils where there is no calcareous matter are injurious; but it is probably in consequence of their supplying an excess of ferruginous matter to the sap. Oxide of iron, in small quantities, forms an useful part of soils; it is found in the ashes of plants, and probably is hurtful only in its acid combinations. The ashes of all peats do not afford gypsum. In general, when a recent peat-ash emits a strong smell, resembling that of rotten eggs when acted upon by vinegar, it will furnish gypsum.

"Phosphate of lime is a combination of phosphoric acid and lime, one proportion of each. It is a compound insoluble in pure water, but soluble in water containing any acid matter. It forms the greatest part of calcined bones. It exists in most excrementitious substances, and is found both in the straw and grain of wheat, barley, oats, and rye, and likewise in beans, peas, and tares. It exists in some places in these islands native, but only in very small quantities. Phosphate of lime is generally conveyed to the land in the composition of other manure, and it is probably necessary to corn crops and other white crops.

"Bone ashes ground to powder will probably be found useful on arable lands containing much vegetable matter, and may perhaps enable soft peats to produce wheat; but the powdered bone in an uncalcined state is much to be preferred in all cases when it can be procured.

601. "The saline compounds of magnesia will require very little discussion as to their uses as manures. In combination with sulphuric acid, magnesia forms a soluble salt. This substance, it is stated by some inquirers, has been found of use as a manure; but it is not found in nature in sufficient abundance, nor is it capable of being made artificially sufficiently cheap to be of useful application in the common course of husbandry.

"Wood ashes consist principally of the vegetable alkali united to carbonic acid; and as this alkali is found in almost all plants, it is not difficult to conceive that it may form an essential part of their organs. The general tendency of the alkalies is to give solubility to vegetable matters; and in this way they may render carbonaceous and other substances capable of being taken up by the tubes in the radical fibres of plants. The vegetable alkali likewise has a strong attraction for water, and even in small quantities, may tend to give a due degree of moisture to the soil, or to other manures; though this operation, from the small quantities used or existing in the soil, can be only of a secondary kind.

"The mineral alkali or soda is found in the ashes of sea-weed, and may be procured by certain chemical agencies from common salt. Common salt consists of the metal named sodium, combined with chlorine; and pure soda consists of the same metal united to oxygen. When water is present, which can afford oxygen to the sodium, soda may be obtained in several modes from salt. The same reasoning will apply to the operation of the pure mineral alkali, or the carbonated alkali, as to that of the vegetable alkali; and when common salt acts as a manure, it is probably by entering into the composition of the plant in the same manner as gypsum, phosphate of lime, and the alkalies. Sir John Pringle has stated, that salt in small quantities assists the decomposition of animal and vegetable matter. This circumstance may render it useful in certain soils. Common salt likewise is offensive to insects. That in small quantities it is sometimes a useful manure, and it is probable that its efficacy depends upon many combined causes. Some persons have argued against the employment of salt; because when used in large quantities, it either does no good, or renders the ground sterile; but this is a very unfair mode of reasoning. That salt in large quantities rendered land barren, was known long before any records of agricultural science existed. We read in the Scriptures, that Abimelech took the city of Schechem, 'and beat down the city, and sowed it with salt;' that the soil might be for ever unfruitful. Virgil reprobates a salt soil; and Pliny, though he recommends giving salt to cattle, yet affirms, that when strewed over land it renders it barren. But these are not arguments against a proper application of it. Refuse salt in Cornwall, which, however, likewise contains some of the oil and exuviæ of fish, has long been known as an admirable manure. And the Cheshire farmers contend for the benefit of the peculiar produce of their county.

"It is not unlikely, that the same causes influence the effects of salt, as those which act in modifying the operation of gypsum. Most lands in this island, particularly those near the sea, probably contain a sufficient quantity of salt for all the purposes of vegetation; and in such cases the supply of it to the soil will not only be useless, but may be injurious. In great storms the spray of the sea has been carried more than fifty miles from the shore; so that from this source salt must be often supplied to the soil. Salt is found in almost all sandstone rocks, and it must exist in the soil derived from these rocks. It is a constituent likewise of almost every kind of animal and vegetable manure.

" Besides these compounds of the alkaline earths and alkalies, many others have been recommended for the purposes of increasing vegetation; such are nitre, or the nitrous acid combined with potassa. Sir Kenelm Digby states, that he made barley grow very luxuriantly by watering it with a very weak solution of nitre; but he is too speculative a writer to awaken confidence in his results. This substance consists of one proportion of azote, six of oxygen, and one of potassium; and it is not unlikely that it may furnish azote to form albumen, or gluten, in those plants that contain them; but the nitrous salts are too valuable for other purposes to be used as manures.

602. " Dr. Home states, that sulphate of potassa, which was just now mentioned, is found in the ashes of some peats, is a useful manure. But Naismith (*Elements of Agriculture*, p. 78.) questions his results; and quotes experiments hostile to his opinion, and, as he conceives, unfavorable to the efficacy of any species of saline manure.

" Much of the discordance of the evidence relating to the efficacy of saline substances depends upon the circumstance of their having been used in different proportions, and, in general, in quantities much too large.

" Solutions of saline substances were used twice a week, in the quantity of two ounces, on spots of grass and corn, sufficiently remote from each other to prevent any interference of results. The substances tried were super-carbonate, sulphate, acetate, nitrate, and muriate of potassa; sulphate of soda, sulphate, nitrate, muriate, and carbonate of ammonia. It was found, that in all cases when the quantity of the salt equalled one-thirtieth part of the weight of the water, the effects were injurious; but least so in the instances of the carbonate, sulphate, and muriate of ammonia. When the quantities of the salts were one-three hundredth part of the solution, the effects were different. The plants watered with the solutions of the sulphates grew just in the same manner as similar plants watered with rain-water. Those acted on by the solution of nitre, acetate, and super-carbonate of potassa, and muriate of ammonia, grew rather better. Those treated with the solution of carbonate of ammonia grew most luxuriantly of all. This last result is what might be expected, for carbonate of ammonia consists of carbon, hydrogen, azote, and oxygen. There was, however, another result which was not anticipated; the plants watered with solution of nitrate of ammonia did not grow better than those watered with rain-water. The solution reddened litmus paper; and probably the free acid exerted a prejudicial effect, and interfered with the result.

" Soot doubtless owes part of its efficacy to the ammoniacal salts it contains. The liquor produced by the distillation of coal contains carbonate and acetate of ammonia, and is said to be a very good manure.

" Soapers' waste has been recommended as a manure, and it has been supposed that its efficacy depended upon the different saline matters it contains; but their quantity is very minute indeed, and its principal ingredients are mild lime and quick-lime. In the soapers' waste, from the best manufactories, there is scarcely a trace of alkali. Lime, moistened with sea-water, affords more of this substance, and is said to have been used in some cases with more benefit than common lime.

" It is unnecessary to discuss to any greater extent the effects of saline substances on vegetation; except the ammoniacal compounds, or the compounds containing nitric, acetic, and carbonic acid; none of them can afford by their decomposition any of the common principles of vegetation, carbon, hydrogen, and oxygen.

" The alkaline sulphates and the earthy muriates are so seldom found in plants, or are found in such minute quantities, that it can never be an object to apply them to the soil. The earthy and alkaline substances seem never to be formed in vegetation; and there is every reason to believe, that they are never decomposed; for, after being absorbed, they are found in their ashes.

" The metallic bases of them cannot exist in contact with aqueous fluids; and these metallic bases, like other metals, have not as yet been resolved into any other forms of matter by artificial processes; they combine readily with other elements; but they remain undestructible, and can be traced undiminished in quantity, through their diversified combinations."

Sect. III. *Of the specific Application of fermentative, and Fossil or Saline Manures.*

603. Grisenthwaite, as we have already observed, is the first to have generalized the fact of peculiar substances being found in plants, in addition to the common elements of oxygen, hydrogen, carbon, and nitrogen; and though his examples, like most of Sir H. Davy's, are taken from agriculture, yet we deem the subject of more than sufficient importance to gardening to warrant us in placing his theory before the reader.

" Elements of primary principles," he says, " admit of no alteration, but as regards magnitude and figure. Hence, when one substance composed of certain elements is designed to be transmuted into any other substance; as sugar, by fermentation, into alcohol or acetic acid, or manure into grain, it is obvious, that the elements of the second must necessarily be contained in the first, for if they be not, the transmutation cannot take place. This will render it evident that a knowledge of the elements or constituents of bodies, which are intended to be changed into each other by certain processes, should be previously possessed in order that the processes may be conducted with a probability of success. We are therefore led to enquire into the nature of certain crops, and to consider whether their peculiar elements be provided for, in the manure as it is now prepared by agriculturists. If they be not, it is but reasonable to infer, that the failure of many crops may be referred to the deficiency of certain elements in the manure.

" If all crops were composed of the same elements, this discrimination would not be needed; and upon such a supposition the practices of husbandry have been uniformly conducted, and are now conducted; with what disadvantage will perhaps appear in the sequel.

" To illustrate the preceding reasoning, the wheat crop may be selected with considerable advantage, as it is that which is not only the most important to the interests of mankind, but because the presence of particular substances in it are better known, and more generally acknowledged. If we examine the straw of wheat, we shall find it composed of what may be considered common vegetable matter, or matter composed of oxygen, hydrogen, and carbon, with a small quantity of carbonate of lime; so also, if we examine the constituents of the grain, we shall find them distinguished into starch and gluten; and if we carry our researches still farther, we shall find that the elements of the starch are precisely the same with the elements of common vegetable matters; but the elements of the gluten will be found analogous to those of animals; or in addition to oxygen, hydrogen, and carbon, there will be found nitrogen. The production of this nitrogen, as has been already observed, cannot be effected by mere common vegetable matter, and, therefore, the manure employed in the production of the straw and starch, could not produce the gluten also. If the presence of gluten were accidental, or the value of the flour did not depend on it, then little care need be taken to provide for its formation; but as it is required to be constantly present, and the value of the flour does essentially depend on it, therefore a provision ought to be made for it. In quantity it is not inconsiderable, but it composes nearly one-third part of the grain. That the operations of husbandry as regard wheat should be conducted without any reference to this peculiar substance, is very remarkable. That the failure of crops has never been ascribed to its deficiency is still more wonderful. What has been advanced concerning manures in general, may afford some explanation of the cause of this neglect. The processes of vegetation, and the constituents of vegetables, are not known to the practical farmer, because they have been difficult to ascertain; and the nature of his manure is involved in the same obscurity. He supposes it to contain every thing needed for every crop.

" That the gluten of wheat-flour may always be present, it is necessary that a quantity of animal substance should exist in the manure applied to the land, where the wheat-crop is intended to be raised. That a certain portion of such animal substance is applied, is proved from the fact of gluten being always found to exist in that grain; but, it is highly probable, that the quantity is not always sufficient; and if not sufficient, the crop will be defective either in quality or quantity. If we pursue our investigations a step farther than we have done, we shall discover that phosphate of lime is as constant a constituent of wheat-flour as gluten itself. Phosphate of lime, therefore, is as much needed for the production of a crop of wheat as the substances which supply the starch and gluten. It is not a little remarkable, that this phosphate of lime, is soluble in no known fluid, except through the medium of an animal substance, as gelatine, &c. and consequently the same animal substances which furnish the elements of the gluten, will also furnish a medium for the phosphate of lime; which appears to be equally indispensable to the formation of a perfect grain of wheat. It not only furnishes a medium, but generally a quantity of the phosphate itself.

" The only substance now employed for the production of gluten, is the urine of live-stock; the alvine excrementitious matter having been proved to contain little or no nitrogen; this urine is applied either by folding, or mixed with the farm-yard manure; in both of which situations, it is constantly forming ammonia, which is dissipated; so that a very inconsiderable part of the whole is retained to answer the purposes of vegetation. The practice adopted in Flanders of saving it has been already alluded to.

" When the utmost attention is paid to prevent the loss of any of the animal substances, accidentally present in farm-yard manure, it still remains a question, whether there be a sufficiency for the purposes to which it is to be applied. That there is not always a sufficiency of some kinds of manure is obvious from the immense quantities of oil-cake which are so employed. Oil-cake, although a very excellent substance for such a purpose, can furnish little else than nourishment to the straw, and starch of the wheat-crop. It cannot contribute to the formation of gluten; and gluten, as has been observed, composes one-third part of all that is valuable in the whole crop.

"Bones, and other animal substances, have been highly recommended for grass or pasture lands. To discover the injudiciousness of applying such substances to crops indiscriminately, it will be necessary to become acquainted with the fact, that there is no kind of grain except wheat, raised artificially for the purposes of man, or cattle, that contains any notable quantity of any substance analogous to that of animals. Hence, when bones, &c. are used on grass-lands, or for the barley crop, &c. all the nitrogen, with so much hydrogen, and probably carbonic acid gas, as is sufficient to form a subcarbonate of ammonia, will be entirely lost. If bones be the animal matter employed, every one hundred pounds weight will yield about fifty pounds of solid gelatine, of which twenty pounds, at least, will be thus wasted, or two-fifths of all that is valuable in the bone. If, instead of being employed for grass, &c. they had been used for wheat, all this might probably have been saved. This is not mere opinion; its truth is obvious to every one conversant with the chemical nature of bones and grass.

"Phosphate of lime composes a part of the grain of wheat, and is supplied by animal substances. Bones furnish an abundance of it. That this constituent of the wheat crop, as well as several other constituents of different crops, should not be disregarded altogether, although they form very minute proportions of those crops, must appear reasonable to every one who knows, that, in their selections, there is exercised a constant discrimination. That wheat *always* takes up phosphate of lime is a proof scarcely needing further evidence, that it answers some useful, and perhaps indispensable purpose in the grain. It does not exist in the straw: and barley, or oats, or clover, grown on the same land, at the same time with the wheat, take up no portion of it whatever. If there had not existed this constancy in the selection of particular substances; if phosphate of lime had sometimes been taken up by barley or clover, and sulphate of lime had been found in wheat, then we might have concluded that the whole was accidental, and being accidental, that they assisted in no way whatever the formation of other parts of the grain, nor contributed to promote the general economy of the vegetable. They who are unwilling to admit the performance of certain uses by these substances, must depart from a mode of reasoning which philosophy has long countenanced, and which we must hereafter employ, whenever we are anxious to explore the causes of physical effects.

"As little attention has hitherto been paid to these saline bodies, as they regard the process of vegetation, and much less as they respect the operations of husbandry, they are, for the sake of distinction, called *specific manures*; and the gluten of wheat a specific vegetable matter. Hereafter, when a more complete analysis of vegetables shall be made, it is probable that a nomenclature, founded on these specific substances, may at least classify, if not particularize, every kind of plant.

"If we turn our attention from the wheat to the barley crop, we shall find fresh evidence to confirm the opinion of specific saline substances being present in particular plants. In the latter of these grains, instead of phosphate of lime, there is always found a small quantity of either nitrate of soda or nitrate of potassa (salt-petre); whence we may conclude, that those salts should be present in the soil where barley is to be grown. Whether they be or not, the farmer at present is entirely ignorant. These salts, though spontaneously produced by nature in many situations, still require the presence of certain substances for their production, several of which it is as improbable should be accidentally furnished, as the salt itself. It has been objected, that if this salt be found ever so necessary to the barley crop, yet its expensiveness will preclude the possibility of its being used. This is erroneous. Although salt-petre, if required in large quantities as a manure, would be too expensive, yet in the quantity actually wanted, its price is an object of little consideration. The simple process of steeping the seed in a solution of it would probably be sufficient; for which purpose, a few pounds would suffice for an acre of land. What has been just advanced concerning the necessity of particular saline bodies to the wheat and barley crops, may be further extended to other crops, and thus add fresh evidence to support the conclusions already drawn. It is well known that bean-straw always yields, on incineration, a large quantity of subcarbonate of potash; but whether the subcarbonate exist in the straw, or be formed by the decomposition of a sulphate, or other salts of a potassa, has never been determined. To determine which of these is present in the entire vegetable, would be to furnish information concerning the means of rendering that crop more uniformly successful than it now is. Can prejudice so far operate on the mind as to make it discountenance the belief that some particular salt is possessed of certain properties capable of assisting the growth of the bean? If it can, then the same prejudice may reject the belief that soda is necessary to the bile, and sulphur to the hair, and iron to the blood of animals. The quantities are alike minute, and their presence probably alike indispensable. A deficiency of these in animals would be followed by disease, and perhaps death; and, most likely, the same consequences would attend the want of particular saline bodies in plants.

"In the pea crop has been discovered a considerable quantity of superoxalate of lime, and thus, as we pursue our researches, we still find discrimination keeping an equal pace. Neither the phosphate of lime, nor the nitrate of soda or potassa, has a universal use pertaining to it. They are needed for particular vegetables; but however they may promote the growth of wheat or barley, can afford no assistance to the pea. The pea demands the superoxalate of lime.

"As the oxalic acid is seldom found in large quantities in a state of nature, so as to be applied as a manure, it is probable that the pea plant has the power of forming it. This is rendered still more probable from the circumstance that the oxalic acid is composed of the same elements as common vegetable matter, namely, oxygen, hydrogen, and carbon. It may, perhaps, be urged, that similar formations may take place in other salts, and thus render the attention of the agriculturist to these objects altogether unnecessary. But such a conclusion will not be warranted by this example. We every where find a sufficiency of the elements of vegetables; and to vary the proportions of those elements is to compose a class of bodies very comprehensive in their nature. All vegetables and vegetable products, amongst which are gums, resins, starch, &c. together with the changes which they are liable to undergo, are included under them. But what have been called mineral acids are products of a peculiar kind, and from the strong affinity subsisting between their elements, are seldom found in those elements. It is even a rare instance that the acids are discovered uncombined with other bodies. Sulphur is not often found, except in the neighbourhood of volcanoes; and phosphorus was never found in a natural state. It could not even continue to exist, were it actually produced, if exposed to the atmosphere. These observations will, therefore, completely remove all doubt respecting the necessary previous existence of the mineral acids, and the salts composed of them and bases, as they are commonly detected in vegetables. They must convince us of the necessity of supplying plants with them ready formed; or with their elements, where a spontaneous generation of them can be effected.

"In the principal grain crops which interest the agriculturist, there exists a particular saline substance peculiar to each, so, if we turn our attention to the grasses and turnips, we shall still find the same discrimination." Of this gypsum, as the saline food of clover, saintfoin, and lucerne, as already mentioned (414.), is a striking instance. It has been highly extolled in America, but for what purposes, and upon what principle, does not appear to be explained. It has been applied to crops of every description, and if it were used with any view whatever, it was that of improving what is vulgarly understood by the soil. Neither wheat, nor barley, nor oats, derive any advantage from its use, as it forms no necessary constituent of those grains; but clover, lucerne, &c. will, in the luxuriance of their crops, bear ample testimony in its behalf. These plants require gypsum for healthy vegetation, for the assimilation of manures to their own peculiar nature, or the developement of some of their distinctive characters. The evident advantages resulting from its use are such, as will no doubt bring that substance into general request. It is somewhat remarkable, that in Flanders a kind of ashes is employed with great success as manure for the clover crop; and which by analysis have been found to contain about twelve *per cent.* of gypsum. If we examine a turnip chemically, we shall always find a considerable quantity of a hydrosulphuret, or a hydroguretted sulphuret of lime, substances not discoverable in any of the crops heretofore considered, and therefore constituting the specific saline substance of the turnip. Its production has never been regarded, and consequently its explanation has not been attempted. Sulphur is known to exist in albumen; and albumen exists in almost all animal fluids; and, in a coagulated state, in most of the solids; at least hair, the nails, &c. contain a very great quantity of it. From the former, it is probable, is furnished all which is found in the manure of the agriculturist. Lately the practice of paring salt marshes, and burning the sod, has been much recommended as providing a quantity of excellent manure for the turnip crop. It is not difficult to explain the manner in which such manure accomplishes such beneficial effects. The sod of marshes, which is occasionally covered by the sea, is impregnated with a variety of salts, amongst which are some sulphates, probably of lime and soda. These, by combustion, are converted into sulphurets; and sulphurets, when brought into contact with water, evolve sulphuretted hydrogen gas, the very substance which has been observed to be constantly present in turnips; and whose presence, according to the reasoning hitherto pursued, is probably necessary for the successful growth of that vegetable.

"The uncertainty of obtaining the requisite quantity of sulphuret by this process, renders it desirable that some one more determinate should be found, and such is immediately offered us in the sulphate of lime, (gypsum). If gypsum, as has been stated, be mixed with carbon, (common coals will answer,) and be then exposed to a considerable heat, the sulphuric acid of the sulphate will be decomposed, and a sulphuret be formed, which may then be ground, and applied as a top-dressing to the turnip crop, where it will, most probably, effect greater advantages than are now produced by the ashes of sea marshes.

"It may be necessary to caution those who may be disposed to try the efficacy of this substance, against carrying the process of calcination too far, which would completely defeat the purpose intended. In order to ascertain whether it have or have not been carried too far, a small quantity of the sulphuret obtained may be dissolved in a glass of water, and a few drops of any acid be added to it. If the decomposition has been well conducted, the addition of the acid will extricate a considerable quantity of sulphuretted hydrogen gas, which may be readily recognised by its fetid smell, resembling that of the Harrowgate mineral water.

"Thus then has been established the existence of specific saline substances in a great variety of crops; all of which are particularly interesting to the practical agriculturist. It would be needless to recapitulate the evidence which has been advanced to prove the essential services performed by those substances. They who doubt the utility of the general, and constant operations of nature; who can attach to obvious discrimination nothing of design, will continue sceptical, in spite of proofs, however demonstrative. It is highly probable, that if our enquiries were directed to other vegetables, that we should discover the same discrimination. It is not meant that every particular kind of plant would be found to possess a peculiar kind of saline substance. It is probable that there are classes of plants which are benefited by the same salt. The acquisition of such knowledge would not only gratify the curious, but be extremely useful in every branch of culture."

Perpetuation of Crops.—"The information derived from the preceding facts, leads to a conclusion which is of the highest importance, as well as of the greatest novelty; namely, the perpetuation of any one crop on the same land, for any number of successive seasons."

Chap. III.

Of Heat, Light, Electricity, Water, and the Atmosphere.

604. The particular agency of these substances in vegetation and culture has been so frequently illustrated, that it only remains to give a general idea of their natures.

Sect. I. *Heat, Light, and Electricity.*

"Two opinions are current respecting the nature of heat. By some philosophers it is conceived to be a peculiar subtile fluid, of which the particles repel each other, but have a strong attraction for the particles of other matter. By others it is considered as a motion or vibration of the particles of matter, which is supposed to differ in velocity in different cases, and thus to produce the different degrees of temperature. Whatever decision be ultimately made respecting these opinions, it is certain that there is matter moving in the space between us and the heavenly bodies capable of communicating heat; the motions of which are rectilineal: thus the solar rays produce heat in acting on the surface of the earth. The beautiful experiments of Dr. Herschel have shown that there are *rays* transmitted from the sun which do not illuminate; and which yet produce more heat than the visible rays; and Ritter and Dr. Wollaston have shown that there are other invisible rays distinguished by their chemical effects.

"The different influence of the different solar rays on vegetation have not yet been studied; but it is certain that the rays exercise an influence independent of the heat they produce. Thus plants kept in darkness, but supplied with heat, air, and moisture, grow luxuriantly, but they never gain their natural colors; their leaves are white or pale, and their juices watery and peculiarly saccharine.

"Heat is capable of being communicated from one body to other bodies; and its common effect is to expand them, to enlarge them in all their dimensions. This is easily exemplified. A solid cylinder of metal, after being heated, will not pass through a ring barely sufficient to receive it when cold. When water is heated in a globe of glass having a long slender neck, it rises in the neck; and if heat be applied to air confined in such a vessel inverted above water, it makes its escape from the vessel, and passes through the water. Thermometers are instruments for measuring degrees of heat by the expansion of fluids in narrow tubes. Mercury is generally used, of which 100,000 parts at the freezing point of water become 101,835 parts at the boiling point, and on Fahrenheit's scale these parts are divided into 180 degrees. Solids, by a certain increase of heat, become fluids, and fluids gases, or elastic fluids. Thus ice is converted by heat into water, and by still more heat it becomes steam; and heat disappears, or, as it is called, is rendered latent during the conversion of solids into fluids, or fluids into gases, and re-appears or becomes sensible when gases become fluids, or fluids solids: hence cold is produced during evaporation, and heat during the condensation of steam.

"There are a few exceptions to the law of expansion of bodies by heat, which seem to depend either upon some change in their chemical constitution, or on their becoming crystallized. Clay contracts by heat, which seems to be owing to its giving off water. Cast iron and antimony, when melted, crystallize in cooling, and expand. Ice is much lighter than water. Water expands a little even before it freezes, and it is of the greatest density at about 41° or 42°, the freezing point being 32°; and this circumstance is of considerable importance in the general economy of nature. The influence of the changes of seasons and of the position of the sun on the phenomena of vegetation, demonstrates the effects of heat on the functions of plants. The matter absorbed from the oil must be in a fluid state to pass into their roots, and when the surface is frozen they can derive no nourishment from it. The activity of chemical changes likewise is increased by a certain increase of temperature, and even the rapidity of the ascent of fluids by capillary attraction.

"This last fact is easily shown by placing in each of two wine glasses a similar hollow stalk of grass, so bent as to discharge any fluid in the glasses slowly by capillary attraction; if hot water be in one glass, and cold water in the other, the hot water will be discharged much more rapidly than the cold water. The fermentation and decomposition of animal and vegetable substances require a certain degree of heat, which is consequently necessary for the preparation of the food of plants; and as evaporation is more rapid in proportion as the temperature is higher, the superfluous parts of the sap are most readily carried off at the time its ascent is quickest."

605. "The heat which is radiated by the sun to the earth," Dr. Wells observes, "if suffered to accumulate, would quickly destroy the present constitution of our globe. This evil is prevented by the radiation of heat by the earth to the heavens, during the night, when it receives from them little or no heat in return. But, through the wise economy of means, which is witnessed in all the operations of Nature, the prevention of this evil is made the source of great positive good. For the surface of the earth, having thus become colder than the neighbouring air, condenses a part of the watery vapour of the atmosphere into dew, the utility of which is too manifest to require elucidation. This fluid appears chiefly where it is most wanted, on herbage, and low plants, avoiding, in great measure, rocks, bare earth, and considerable masses of water. Its production, too, tends to prevent the injury that might arise from its own cause; since the precipitation of water, upon the tender parts of plants, must lessen the cold in them, which occasions it. The prevention, either wholly or in part, of cold, from radiation, in substances on the ground, by the interposition of any solid body between them and the sky, arises in the following manner: the lower body radiates its heat upwards, as if no other intervened between it and the sky; but the loss, which it hence suffers, is more or less compensated by what is radiated to it, from the body above, the under surface of which possesses always the same, or very nearly the same temperature as the air. The manner in which clouds prevent, or occasion to be small, the appearance of a cold at night, upon the surface of the earth, is by radiating heat to the earth, in return for that which they intercept in its progress from the earth towards the heavens. For although, upon the sky becoming suddenly cloudy during a calm night, a naked thermometer, suspended in the air, commonly rises 2 or 3 degrees: little of this rise is to be attributed to the heat evolved by the condensation of watery vapour in the atmosphere, for the heat so extricated must soon be dissipated; whereas the effect of greatly lessening, or preventing altogether, the appearance of a superior cold on the earth to that of the air, will be produced by a cloudy sky, during the whole of a long night.

"Dense clouds, near the earth, must possess the same heat as the lower atmosphere, and will therefore send to the earth, as much, or nearly as much heat as they receive from it by radiation. But similarly dense clouds, if very high, though they equally intercept the communication of the earth with the sky, yet being, from their elevated situation, colder than the earth, will radiate to it less heat than they receive from it, and may, consequently, admit of bodies on its surface becoming several degrees colder than the air. Islands, and parts of continents close to the sea, being, by their situation, subject to a cloudy sky, will, from the smaller quantity of heat lost by them through radiation to the heavens, at night, in addition to the reasons commonly assigned, be less cold in winter, than countries considerably distant from any ocean.

"Fogs, like clouds, will arrest heat, which is radiated upwards by the earth and if they be very dense, and of considerable perpendicular extent, may remit to it as much as they receive. Fogs do not, in any instance, furnish a real exception to the general rule, that whatever exists in the atmosphere, capable of stopping or impeding the passage of radiant heat, will prevent or lessen the appearance at night of a cold on the surface of the earth, greater than that of the neighbouring air. The water deposited upon the earth, during a fog at night, may sometimes be derived from two different sources, one of which is a precipitation of moisture from a considerable part of the atmosphere, in consequence of its general cold; the other, a real formation of dew, from the condensation, by means of the superficial cold of the ground, of the moisture of that portion of the air, which comes in contact with it. In such a state of things, all bodies will become moist, but those especially, which most readily attract dew in clear weather.

"When bodies become cold from radiation, the degree of effect observed must depend, not only on their radiating power, but in part also on the greater or less ease with which they can derive heat, by conduction, from warmer substances in contact with them.

"Bodies, exposed in a clear night to the sky, must radiate as much heat to it during the prevalence of wind, as they would do if the air were altogether still. But in the former case, little or no cold will be observed upon them above that of the atmosphere, as the frequent application of warm air must quickly return a heat equal, or nearly so, to that which they had lost by radiation. A slight agitation of the air is sufficient to produce some effect of this kind; though, as has already been said, such an agitation, when the air is very pregnant with moisture, will render greater the quantity of dew, one requisite for a considerable production of this fluid being more increased by it, than another is diminished.

"It has been remarked, that the hurtful effects of cold occur chiefly in hollow places. If this be restricted to what happens on serene and calm nights, and it does not, I believe, hold true in any other circumstances, two reasons from different sources are to be assigned for it. The first is, that the air being stiller in such a situation, than in any other, the cold, from radiation, in the bodies which it contains, will be less diminished by renewed applications of warmer air; the second, that from the longer continuance of the same air in contact with the ground, in depressed places than in others, less dew will be deposited, and therefore less heat extricated during its formation.

"An observation closely connected with the preceding, namely, that in clear and still nights, frosts are less severe upon hills, than in neighbouring plains, has excited more attention, chiefly from its contradicting what is commonly regarded an established fact, that the cold of the atmosphere always increases with the distance from the earth. But on the contrary the fact is certain, that in very clear and still nights, the air near to the earth is colder than that which is more distant from it, to the height at least of 220 feet, this being the greatest to which experiments relate. If then a hill be supposed to rise from a plain to the height of 220 feet, having upon its summit a small, flat surface covered with grass; and if the atmosphere, during a calm and serene night, be admitted to be 10° warmer there than it is near the surface of the low ground, which is a less difference, than what sometimes occurs in such circumstances, it is manifest, that, should both the grass upon the hill, and that upon the plain, acquire a cold of 10° by radiation, the former will, notwithstanding, be 10° warmer than the latter. Hence also the tops of trees are sometimes found dry when the grass on the ground's surface has been found covered with dew.

"I had often, in the pride of half knowledge, smiled at the means frequently employed by gardeners, to protect tender plants from cold, as it appeared to me impossible, that a thin mat, or any such flimsy substance, could prevent them from attaining the temperature of the atmosphere, by which alone I thought them liable to be injured. But, when I had learned, that bodies on the surface of the earth become, during a still and serene night, colder than the atmosphere, by radiating their heat to the heavens, I perceived immediately a just reason for the practice, which I had before deemed useless. Being desirous, however, of acquiring some precise information on this subject, I fixed, perpendicularly, in the earth of a grass-plat, four small sticks, and over their upper extremities, which were six inches above the grass, and formed the corners of a square, the sides of which were two feet long, drew tightly a very thin cambric handkerchief. In this disposition of things, therefore, nothing existed to prevent the free passage of air from the exposed grass, to that which was sheltered, except the four small sticks, and there was no substance to radiate heat downwards to the latter grass, except the cambric handkerchief. The temperature of the grass, which was thus shielded from the sky, was, upon many nights, afterwards examined by me, and was always found higher than that of neighbouring grass which was uncovered, if this was colder than the air. When the difference in temperature, between the air several feet above the ground and the unsheltered grass, did not exceed 5°, the sheltered grass was about as warm as the air. If that difference, however, exceeded 5°, the air was found to be somewhat warmer than the sheltered grass. Thus, upon one night, when fully exposed grass was 11° colder than the air, the latter was 3° warmer than the sheltered grass; and the same difference existed on another night, when the air was 14° warmer than the exposed grass. One reason for this difference, no doubt, was that the air, which passed from the exposed grass, by which it had been very much cooled, to that under the handkerchief, had deprived the latter of part of its heat; another, that the handkerchief, from being made colder than the atmosphere by the radiation of its upper surface to the heavens, would remit somewhat less heat to the grass beneath, than what it received from that substance. But still, as the sheltered grass, notwithstanding these drawbacks, was upon one night, as may be collected from the preceding relation, 8°, and upon another 11°, warmer than grass fully exposed to the sky, a sufficient reason was now obtained for the utility of a very slight shelter to plants, in averting or lessening injury from cold, on a still and serene night.

"In the next place, in order to learn whether any difference would arise from placing the sheltering substance at a much greater distance from the ground, I had four slender posts driven perpendicularly into the soil of a grass field, and had them so disposed in other respects, that their upper ends were six feet above the surface, and formed the angular points of a square, having sides eight feet in length. Lastly, over the tops of the posts was thrown an old ship flag of a very loose texture. Concerning the experiments made by means of this arrangement of things, I shall only say, that they led to the conclusion, as far as the events of different nights could rightly be compared, that the higher shelter had the same efficacy with the lower, in preventing the occurrence of a cold upon the ground, in a clear night, greater than that of the atmosphere, provided the oblique aspect of the sky was equally excluded from the spots on which my thermometers were laid.

"On the other hand, a difference in temperature, of some magnitude, was always observed on still and serene nights, between bodies sheltered from the sky by substances touching them, and similar bodies, which were sheltered by a substance a little above them. I found, for example, upon one night, that the warmth of grass, sheltered by a cambric handkerchief raised a few inches in the air, was 3° greater than that of a neighbouring piece of grass which was sheltered by a similar handkerchief actually in contact with it. On another night, the difference between the temperatures of two portions of grass, shielded in the same manner, as the two abovementioned, from the influence of the sky, was 4°. Possibly, experience has long ago taught gardeners the superior advantage of defending tender vegetables, from the cold of clear and calm nights, by means of substances not directly touching them; though I do not recollect ever having seen any contrivance for keeping mats, or such like bodies, at a distance from the plants which they were meant to protect.

"Walls, I believe, as far as warmth is concerned, are regarded as useful, during a cold night, to the plants which touch them, or are near to them, only in two ways; first, by the mechanical shelter which they afford against cold winds, and secondly, by giving out the heat which they had acquired during the day. It appearing to me, however, that, on clear and calm nights, those on which plants frequently receive much injury from cold, walls must be beneficial in a third way, namely, by preventing, in part, the loss of heat, which they would sustain from radiation, if they were fully exposed to the sky; the following experiment was made for the purpose of determining the justness of this opinion. A cambric handkerchief having been placed, by means of two upright sticks, perpendicularly to a grass-plat, and at right angles to the course of the air, a thermometer was laid upon the grass close to the lower edge of the handkerchief, on its windward side. The thermometer thus situated was several nights compared with another lying on the same grass-plat, but on a part of it fully exposed to the sky. On two of these nights, the air being clear and calm, the grass close to the handkerchief was found to be 4° warmer than the fully exposed grass. On a third, the difference was 6°. An analogous fact is mentioned by Gersten, who says, that an horizontal surface is more abundantly dewed, than one which is perpendicular to the ground.

"The covering of snow, which countries in high latitudes enjoy during the winter, has been very commonly thought to be beneficial to vegetable substances on the surface of the earth, as far as their temperature is concerned, solely by protecting them from the cold of the atmosphere. But were this supposition just, the advantage of the covering would be greatly circumscribed; since the upper parts of trees and of tall shrubs are still exposed to the influence of the air. Another reason, however, is furnished for its usefulness, by what has been said in this essay; which is, that it prevents the occurrence of the cold, which bodies on the earth acquire, in addition to that of the atmosphere, by the radiation of their heat to the heavens during still and clear nights. The cause, indeed, of this additional cold, does not constantly operate; but its presence, during only a few hours, might effectually destroy plants, which now pass unhurt through the winter. Again, as things are, while low vegetable productions are prevented, by their covering of snow, from becoming colder than the atmosphere in consequence of their own radiation, the parts of trees and tall shrubs, which rise above the snow, are little affected by cold from this cause. For their outermost twigs, now that they are destitute of leaves, are much smaller than the thermometers suspended by me in the air, which in this situation very seldom became more than 2° colder than the atmosphere. The larger branches, too, which, if fully exposed to the sky, would become colder than the extreme parts, are, in a great degree, sheltered by them; and, in the last place, the trunks are sheltered both by the smaller and the larger parts, not to mention that the trunks must derive heat, by conduction through the roots, from the earth kept warm by the snow. In a similar way is partly to be explained the manner, in which a layer of earth or straw preserves vegetable matters in our own fields, from the injurious effects of cold in winter." *Essay on Dew*, &c. 1819.

606. *Electricity.*—"When a piece of sealing-wax is rubbed by a woollen cloth, it gains the power of attracting light bodies, such as feathers or ashes. In this state it is said to be *electrical*; and if a metallic cylinder, placed upon a rod of glass, is brought in contact with the sealing-wax, it likewise gains the momentary power of attracting light bodies, so that electricity, like heat, is communicable. When two light bodies receive the same electrical influence, or are electrified by the same body, they repel each other. When one of them is acted on by sealing-wax, and the other by glass that has been rubbed by woollen, they attract each other; hence it is said, that bodies similarly electrified repel each other, and bodies dissimilarly electrified attract each other; and the electricity of glass is called vitreous or positive electricity, and that of sealing-wax resinous or negative electricity.

"When of two bodies made to rub each other one is found positively electrified, the other is always found negatively electrified, and, as in the common electrical machine, these states are capable of being communicated to metals placed upon rods or pillars of glass. Electricity is produced likewise by the contact of bodies; thus a piece of zinc and of silver give a slight electrical shock when they are made to touch each other, and to touch the tongue; and when a number of plates of copper and zinc, 100 for instance, are arranged in a pile with cloths moistened in salt and water, in the order of zinc, copper, moistened cloth, zinc, copper, moistened cloth, and so on, they form an electrical battery which will give strong shocks and sparks, and which is possessed of remarkable chemical powers. The luminous phenomena produced by common electricity are well known. It would be improper to dwell upon them in this place. They are the most impressive effects occasioned by this agent; and they offer illustrations of lightning and thunder.

"Electrical changes are constantly taking place in nature, on the surface of the earth, and in the atmosphere; but as yet the effects of this power in vegetation have not been correctly estimated. It has been shown by experiments made by means of the voltaic battery, (the instrument composed of zinc, copper, and water,) that compound bodies in general, are capable of being decomposed by electrical powers, and it is probable that the various electrical phenomena occurring in our system, must influence both the germination of seeds and the growth of plants. It has been found that corn sprouted much more rapidly in water positively electrified by the voltaic instrument, than in water negatively electrified; and experiments made upon the atmosphere show that clouds are usually negative; and, as when a cloud is in one state of electricity, the surface of the earth beneath is brought into the opposite state, it is probable that in common cases the surface of the earth is positive." A similar experiment is related by Dr. Darwin. *Phytologia*, sect. xiii. 3, 2.

"Different opinions are entertained amongst scientific men respecting the nature of electricity; by some, the phenomena are conceived to depend upon a single subtile fluid in excess in the bodies said to be positively electrified, in deficiency in the bodies said to be negatively electrified. A second class suppose the effects to be produced by two different fluids, called by them the vitreous fluid and the resinous fluid; and others regard them as affections or motions of matter, or an exhibition of attractive powers, similar to those which produce chemical combination and decomposition; but usually exerting their action on masses."

"A profitable application of electricity," Dr. Darwin observes, "to promote the growth of plants is not yet discovered; it is nevertheless probable, that in dry seasons, the erection of numerous metallic points on the surface of the ground, but a few feet high, might, in the night-time, contribute to precipitate the dew by facilitating the passage of electricity from the air into the earth; and that an erection of such points higher in the air by means of wires wrapped round tall rods, like angle rods, or elevated on buildings, might frequently precipitate showers from the higher parts of the atmosphere. Such points erected in gardens might promote a quicker vegetation of the plants in their vicinity, by supplying them more abundantly with the electric ether." *Phytologia*, xiii. 4.

J. Williams, (*Climate of Great Britain*, 348,) enlarging on this idea, proposes to erect large electrical machines, to be driven by wind, over the general face of the country, for the purpose of improving the climate, and especially for lessening that superabundant moisture which he contends is yearly increasing from the increased evaporating surface, produced by the vegetation of improved culture, and especially from the increase of pastures, hedges, and ornamental plantations.

SECT. II. *Water.*

607. Water, primarily reckoned a simple or elementary substance, is found to be a compound of oxygen and hydrogen gas. "If the metal called potassium be exposed in a glass tube to a small quantity of water, it will act upon it with great violence; elastic fluid will be disengaged, which will be found to be hydrogen; and the same effects will be produced upon the potassium, as if it had absorbed a small quantity of oxygen; and the hydrogen disengaged, and the oxygen added to the potassium, are in weight as 2 to 15; and if two in volume of hydrogen, and one in volume of oxygen, which have the weights of 2 and 15, be introduced into a close vessel, and an electrical spark passed through them, they will inflame and condense into 17 parts of pure water.

"We have already seen (393.) that water forms by far the greatest part of the sap of plants; and that this substance, or its elements, enters largely into the constitution of their organs and solid productions.

"Water is absolutely necessary to the economy of vegetation in its elastic and fluid state; and it is not devoid of use even in its solid form. Snow and ice are bad conductors of heat; and when the ground is covered with snow, or the surface of the soil or of water is frozen, the roots or bulbs of the plants beneath are protected by the congealed water from the influence of the atmosphere, the temperature of which in northern winters is usually very much below the freezing point; and this water becomes the first nourishment of the plant in early spring. The expansion of water during its congelation, at which time its volume increases one-twelfth, and its contraction of bulk during a thaw, tend to pulverize the soil, to separate its parts from each other, and to make it more permeable to the influence of the air."

SECT. III. *Of the Atmosphere.*

608. "Water, carbonic acid gas, oxygen, and azote, are the principal substances composing the atmosphere; but more minute enquiries respecting their nature and agencies are necessary to afford correct views of its uses in vegetation.

"If some of the salt, called muriate of lime, that has been just heated red, be exposed to the air, even in the driest and coldest weather, it will increase in weight, and become moist; and in a certain time will be converted into a fluid. If put into a retort and heated, it will yield pure water; will gradually recover its pristine state; and, if heated red, its former weight: so that it is evident that the water united to it was derived from the air. And that it existed in the air in an invisible and elastic form, is proved by the circumstance, that if a given quantity of air be exposed to the salt, its volume and weight will diminish, provided the experiment be correctly made.

"The quantity of water which exists in air, as vapor, varies with the temperature. In proportion as the weather is hotter, the quantity is greater. At 50° of Fahrenheit, air contains about 1-50th of its volume of vapor; and as the specific gravity of vapor is to that of air nearly as 10 to 15; this is about 1-75th of its weight."

"At 100°, supposing that there is a free communication with water, it contains about 1-14th part in volume, or 1-21st in weight. It is the condensation of vapor by diminution of the temperature of the atmosphere, which is probably the principal cause of the formation of clouds, and of the deposition of dew, mist, snow, or hail." Dr. Wells has proved, by a number of experiments, that dew is the production of a preceding cold in the substances upon which it appears; and that this cold is produced by the radiation of heat from those bodies on which dew is deposited. Dew is water precipitated from the atmosphere by the cold of the body on which it appears; and will be more or less abundant, not in proportion to the coldness of that body, but in proportion to the existing state of the air in regard to moisture. It is commonly supposed that the formation of dew produces cold; but, like every other precipitation of water from the atmosphere, it must evidently produce heat." *Essay on Dew*, 186.

"The power of different substances to absorb aqueous vapor from the atmosphere by cohesive attraction has been already referred to (562). The leaves of living plants appear to act upon this vapor likewise in its elastic form, and to absorb it. Some vegetables increase in weight from this cause, when suspended in the atmosphere and unconnected with the soil; such are the house-leek, and different species of the aloe. In very intense heats, and when the soil is dry, the life of plants seems to be preserved by the absorbent power of their leaves; and it is a beautiful circumstance in the economy of nature, that aqueous vapor is most abundant in the atmosphere when it is most needed for the purposes of life; and that when other sources of its supply are cut off, this is most copious.

"If a solution of lime in water be exposed to the air, a pellicle will speedily form upon it, and a solid matter will gradually fall to the bottom of the water, and in a certain time the water will become tasteless; this is owing to the combination of the lime which was dissolved in the water with carbonic acid gas, which existed in the atmosphere, as may be proved by collecting the film and the solid matter, and igniting them strongly in a little tube of platina or iron; they will give of carbonic acid gas, and will become quick-lime, which, added to the same water, will again bring it to the state of lime-water.

" The quantity of carbonic acid gas in the atmosphere is very small. It is not easy to determine it with precision, and it must differ in different situations; but where there is a free circulation of air, it is probably never more than 1-500th, nor less than 1-800th of the volume of air. Carbonic acid gas is nearly one-third heavier than the other elastic parts of the atmosphere in their mixed state; hence at first view it might be supposed that it would be most abundant in the lower regions of the atmosphere; but unless it has been immediately produced at the surface of the earth in some chemical process, this does not seem to be the case: elastic fluids of different specific gravities have a tendency to equable mixture by a species of attraction, and the different parts of the atmosphere are constantly agitated and blended together by winds or other causes. De Saussure found lime-water precipitated on Mount Blanc, the highest point of land in Europe; and carbonic acid gas has been always found, apperently in due proportion, in the air brought down from great heights in the atmosphere by aërostatic adventurers.

" The principal consumption of the carbonic acid in the atmosphere seems to be in affording nourishment to plants; and some of them appear to be supplied with carbon chiefly from this source.

" Carbonic acid gas is formed during fermentation, combustion, putrefaction, respiration, and a number of operations taking place upon the surface of the earth; and there is no other process known in nature by which it can be destroyed but by vegetation.

" After a given portion of air has been deprived of aqueous vapor and carbonic acid gas, it appears little altered in its properties; it supports combustion and animal life. There are many modes of separating its principal constituents, oxygen and azote, from each other. A simple one is by burning phosphorus in a confined volume of air: this absorbs the oxygen and leaves the azote; and 100 parts in volume of air, in which phosphorus has been burnt, yield 79 parts of azote; and by mixing this azote with 21 parts of fresh oxygen gas artificially procured, a substance having the original characters of air is produced. To procure pure oxygen from air, quicksilver may be kept heated in it, at about 600°, till it becomes a red powder; this powder, when ignited, will be restored to the state of quicksilver by giving off oxygen.

" Oxygen is necessary to some functions of vegetables; but its great importance in nature is in its relation to the economy of animals. It is absolutely necessary to their life. Atmospheric air taken into the lungs of animals, or passed in solution in water through the gills of fishes, loses oxygen; and for the oxygen lost, about an equal volume of carbonic acid appears.

" The effects of azote in vegetation are not distinctly known. As it is found in some of the products of vegetation, it may be absorbed by certain plants from the atmosphere.

" It prevents the action of oxygen from being too energetic, and serves as a medium in which the more essential parts of the air act; nor is this circumstance unconformable to the analogy of nature; for the elements most abundant on the solid surface of the globe, are not those which are the most essential to the existence of the living beings belonging to it.

" The action of the atmosphere on plants differs at different periods of their growth, and varies with the various stages of the development and decay of their organs. We have seen (403.) that if a healthy seed be moistened and exposed to air at a temperature not below 45°, it soon germinates, and shoots forth a plume, which rises upwards, and a radicle which descends. If the air be confined, it is found that in the process of germination the oxygen, or a part of it, is absorbed. The azote remains unaltered; no carbonic acid is taken away from the air; on the contrary, some is added.

" Seeds are incapable of germinating, except when oxygen is present. In the exhausted receiver of the air-pump, in pure azote, in pure carbonic acid, when moistened they swell, but do not vegetate; and if kept in these gasses, lose their living powers, and undergo putrefaction.

" If a seed be examined before germination, it will be found more or less insipid, at least not sweet; but after germination it is always sweet. Its coagulated mucilage, or starch, is converted into sugar in the process; a substance difficult of solution is changed into one easily soluble; and the sugar carried through the cells or vessels of the cotyledons, is the nourishment of the infant plant The absorption of oxygen by the seed in germination, has been compared to its absorption in producing the evolution of fœtal life in the egg; but this analogy is only remote. All animals, from the most to the least perfect classes, require a supply of oxygen. From the moment the heart begins to pulsate till it ceases to beat, the aeration of the blood is constant, and the function of respiration invariable; carbonic acid is given off in the process, but the chemical change produced in the blood is unknown; nor is there any reason to suppose the formation of any substance similar to sugar.

"It is evident, that in all cases of semination, the seeds should be sown so as to be fully exposed to the influence of the air. And one cause of the unproductiveness of cold clayey adhesive soils is, that the seed is coated with matter impermeable to air.

"In sandy soils the earth is always sufficiently penetrable by the atmosphere; but in clayey soils there can scarcely be too great a mechanical division of parts. Any seed not fully supplied with air, always produces a weak and diseased plant." We have already seen (421.) that carbon is added to plants from the air by the process of vegetation in sunshine; and oxygen is added to the atmosphere.

Sect. IV. *Of the Climate of Britain.*

609. The climate of Britain, relatively to others in the same latitude, is temperate, humid, and variable. The moderation of its temperature and its humidity are owing to our being surrounded by water, which being less affected by the sun than the earth, imbibes less heat in summer, and from its fluidity is less easily cooled in winter. As the sea, on our coasts never freezes, its temperature must always be above 33° or 34°; and hence, when air from the polar regions at a much lower temperature passes over it, that air must be in some degree heated by the radiation of the water. On the other hand, in summer the warm currents of air from the south, necessarily give out part of their heat in passing over a surface so much lower in temperature. The variable nature of our climate is chiefly owing to the unequal breadths of watery surface which surround us; on one side, a channel of a few leagues in breadth; on the other, the Atlantic ocean.

The climate also varies materially within itself: some districts are dry, as the east; others moist, as the west coast; in the northern extremity, dry, cold, and windy; in the south, warm and moist. Even in moist districts some spots are excessively dry, as part of Wigtonshire, from the influence of the Isle of Man, in warding off the watery clouds of the Atlantic; and, in dry districts, some spots are moist, from the influence of high mountains in attracting and condensing clouds charged with watery vapour.

It has been alleged by some (Williams in *The Climate of Britain*, &c. 1816), and it appears not improbable, that the humidity of our climate has of late years been much increased by the increase of evaporating surface, produced by the multiplicity of hedges and plantations; a surface covered with leaves being found to evaporate considerably more than a naked surface. If, as is generally alleged, the humidity of the climate was greater before the drainage of morasses, and the eradication of forests for agricultural purposes, a comparative return to the same state must have a tendency to produce the same results. However, it will be long before the irrigation of lands is carried to such a degree as to equal the effects of undrained morasses; and as to our woods and hedges, we must console ourselves with the beauty and the warmth which they produce, for the increase of vapour supposed to proceed from them.

In all ages, it has been customary for men engaged in the culture of vegetables, or the pasturage of animals, to study the weather; and we, in this country, are surprised at the degree of perfection to which the ancients attained in this knowledge. But it ought to be recollected, that the study of the weather in the countries occupied by the ancients, as Egypt, Greece, Italy, and the continent of Europe, is a very different thing from its study in an island situated like ours. It is easy to foretel weather in countries where months pass away without rain or clouds, and where some weeks together, at stated periods, are as certainly seasons of rain or snow. It may be asserted with truth, that there is a greater variety of weather in London in one week, than in Rome, Moscow, or Petersburg, in three months. It is not therefore entirely a proof of our degeneracy, or the influence of our artificial mode of living, that we cannot predict the weather with such certainty as the ancients; but a circumsance rather to be accounted for from the peculiarities of our situation.

Our climate however, variable as it is, admits of being studied, both generally and locally; and from various data, natural and artificial; but it is a study which requires habits of observation and reflection like all other studies; and to be brought to any useful degree of perfection must be attended to, not as it commonly is, as a thing by chance, and which every body knows, or is fit for, but as a serious and very intricate undertaking.

610. The *natural data* for this study are, 1. The vegetable kingdom; many plants shutting or opening their flowers, contracting or expanding their parts, &c. on approaching changes in the humidity or temperature of the atmosphere. 2. The animal kingdom; most of which, that are familiar to us, exhibiting signs on approaching changes, of which those by cattle and sheep are more especially remarkable; and hence shepherds are generally of all others, the most correct in their estimate of weather. 3. The mineral

kingdom; stones, earths, metals, salts, and water of particular sorts, often showing indications of approaching changes. 4. Appearances of the atmosphere, the moon, the general character of seasons, &c. The characters of clouds, the prevalence of particular winds, and other signs, are very commonly attended to.

"The influence of the moon on the weather has, in all ages, been believed by the generality of mankind: the same opinion was embraced by the ancient philosophers; and several eminent philosophers of later times have thought the opinion not unworthy of notice. Now, although the moon only acts (as far at least as we can ascertain) on the waters of the ocean by producing tides; it is nevertheless highly *probable*, according to the observations of Lambert, Toaldo, and Cotte, that in consequence of the lunar influence, great variations do take place in the atmosphere, and consequently in the weather. The following principles will show the grounds and reasons for their embracing the received notions on this interesting topic.

"There are ten situations in every revolution of the moon in her orbit when she must particularly exert her influence on the atmosphere; and when, consequently, changes of the weather most readily take place. These are:

"1. The *new*, and 2. the *full* moon, when she exerts her influence in conjunction with, or in opposition to the sun.

"3. and 4. The quadratures, or those aspects of the moon when she is 90° distant from the sun; or when she is in the middle point of her orbit, between the points of conjunction and opposition, namely, in the first and third quarters.

"5. The *perigee*, and, 6. The *apogee*, or those points of the moon's orbit, in which she is at the *least* and *greatest* distance from the earth.

"The two passages of the moon over the equator, one of which Toaldo calls, 7. The moon's *ascending*, and the other, 8. The moon's *descending* equinox, or the two *lunistices*, as De la Lande terms them.

"9. The *boreal lunistice*, when the moon approaches as near as she can in each lunation, (or period between one new moon and another) to our zenith (that point in the horison which is directly over our heads.)

"10. The *austral lunistice*, when she is at the greatest distance from our zenith; for the action of the moon varies greatly according to her obliquity. With these ten points Toaldo compared a table of forty-eight years' observations; the result is, that the probabilities, that the weather will change at a certain period of the moon are in the following proportions: New moon, 6 to 1. First quarter, 5 to 2. Full moon, 5 to 2. Last quarter, 5 to 4. Perigee, 7 to 1. Apogee, 4 to 1. Ascending equinox, 13 to 4. Northern lunistice, 11 to 4. Descending equinox, 11 to 4. Southern lunistice, 3 to 1.

"That is to say, a person may bet six to one, that the new moon will bring with it a change of weather. Each situation of the moon alters that state of the atmosphere which has been occasioned by the preceding one; and it seldom happens that any change in the weather takes place without a change in the lunar situations. These situations are combined, on account of the inequality of their revolutions, and the greatest effect is produced by the union of the syzigies, or the conjunction and opposition of a planet with the sun, with the apsides, or points in the orbits of planets, in which they are at the greatest and least distance from the sun or earth. The proportions of their power to produce variations are as follows: New moon coinciding with the perigee, 33 to 1. Ditto, with the apogee, 7 to 1. Full moon coinciding with the perigee, 10 to 1. Ditto, with the apogee, 8 to 1.

"The combination of these situations generally occasion storms and tempests; and this perturbing power will always have the greater effect, the nearer these combined situations are to the moon's passage over the equator, particularly in the months of March and September. At the new and full moons, in the months of March and September, and even at the solstices, especially the winter solstice, the atmosphere assumes a certain character, by which it is distinguished for three, and sometimes six months. The new moons which produce no change in the weather, are those that happen at a distance from the apsides.

"As it is perfectly true that each situation of the moon alters that state of the atmosphere which has been produced by another, it is, however, observed that many situations of the moon are favorable to good, and others to bad weather.

"Those belonging to the latter class, are, the perigee, new and full moon, passage of the equator, and the northern lunistice. Those belonging to the former are, the apogee, quadratures, and the southern lunistice. Changes of the weather seldom take place on the very days of the moon's situations, but either precede or follow them. It has been found by observation, that the changes affected by the lunar situations in the six winter months precede, and in the six summer months follow them.

"Besides the lunar situations to which the above observations refer, attention must be paid also to the fourth day before new and full moon, which are called the *octants*. At these times the weather is inclined to changes; and it may be easily seen, that these will follow at the next lunar situation. Virgil calls this fourth day a very sure prophet. If on that day the horns of the moon are clear and well defined, good weather may be expected; but if they are dull, and not clearly marked on the edges, it is a sign that bad weather will ensue. When the weather remains unchanged on the fourth, fifth, and sixth day of the moon, we may conjecture that it will continue so till full moon, even sometimes till the next new moon; and in that case, the lunar situations have only a very weak effect. Many observers of nature have also remarked, that the approach of the lunar situations is somewhat critical for the sick."

According to Dr. Herschel, the nearer the time of the moon's entrance, at full and change or quarters, is to midnight (that is within two hours before and after midnight), the more fair the weather is in summer, but the nearer to noon the less fair. Also, the moon's entrance, at full, change, and quarters, during six of the afternoon hours, viz. from four to ten, may be followed by fair weather; but this is mostly dependent on the wind. The same entrance during all the hours after midnight, except the two first, is unfavorable to fair weather; the like, nearly, may be observed in winter.

From observing the general character of seasons for a long period, certain general results may be deduced. On this principle, Kirwan, on perusing and comparing a number of observations taken in England from 1677 (*Trans. Ir. Acad.* v. 20.) to 1789, (a period of 112 years) found:

"1. That when there has been no storm before or after the vernal equinox, the ensuing summer is generally *dry*, at least five times in six.

"2. That when a storm happens from an easterly point, either on the 19th, 20th, or 21st of May, the succeeding summer is generally *dry*, at least four times in five.

"3. That when a storm arises on the 25th, 26th, or 27th of March (and not before) in any point, the succeeding summer is generally *dry*, four times in five.

"4. If there be a storm at S.W. or W.S.W. on the 19th, 20th, 21st, or 22d of March, the succeeding summer is generally *wet*, five times in six.

"In this country winters and springs, if dry, are most commonly cold; if moist, warm: — On the contrary, dry summers and autumns are usually hot, and moist summers cold; so that, if we know the moistness or dryness of a season, we can form a tolerably accurate judgment of its temperature. In this country also, Kirwan remarks, that it generally rains less in March than in November, in the proportion at a medium of 7 to 12. It generally rains less in April than October, in the proportion of 1 to 2, nearly at a medium. It generally rains less in May than September; the chances that it does so, are, at least, 4 to 3; but, when it rains plentifully in May (as 1.8 inches or more), it generally rains but little in September; and when it rains one inch, or less, in May, it rains plentifully in September.

"From a table kept by Dr. Rutty, in Dublin, for forty-one years, Kirwan has endeavoured to calculate the probabilities of particular seasons being followed by others: although his rules chiefly relate to the climate of Ireland, yet as there exists but little difference between that island and Great Britain, in the general appearance of the seasons, we shall mention some of his conclusions here:

"In forty-one years there were six wet springs, 22 dry, and 13 variable; 20 wet summers, 16 dry, and 5 variable; 11 wet autumns, 11 dry, and 19 variable.

"A season, according to Kirwan, is accounted wet, when it contains two wet months. In general, the quantity of rain, which falls in dry seasons, is less than five inches, in wet seasons more; variable seasons are those, in which there falls between 30lbs. and 36lbs., a lb. being equal to ·157639 of an inch."

A variety of useful observations founded on all these natural data, have been collected under the title of "The Shepherd of Banbury's Rules to judge of the Weather, &c."

611. The *artificial data*, are the barometer, hygrometer, rain-gauge, and thermometer. "By means of the *barometer*," Taylor observes, "we are enabled to regain, in some degree at least, that foreknowledge of the weather, which the ancients unquestionably did possess; though we know not the data on which they founded their conclusions. We shall therefore annex such rules, as have hitherto been found most useful in ascertaining the changes of the weather, by means of the barometer.

"1. The rising of the mercury presages, in general, fair weather; and its *falling*, foul weather, as rain, snow, high winds, and storms.

" 2. In very hot weather, especially if the wind is south, the sudden falling of the mercury foretels thunder.

" 3. In winter, the rising indicates frost; and in frosty weather, if the mercury falls three or four divisions, there will follow a thaw: but if it rises in a continued frost, snow may be expected.

" 4. When foul weather happens soon after the falling of the mercury, it will not be of long duration; nor are we to expect a continuance of fair weather, when it soon succeeds the rising of the quicksilver.

" 5. If, in foul weather, the mercury rises considerably, and continues rising for two or three days before the foul weather is over, a continuance of fair weather may be expected to follow.

" 6. In fair weather, when the mercury falls much and low, and continues falling for two or three days before rain comes, much wet must be expected, and probably high winds.

" 7. The unsettled motion of the mercury indicates changeable weather.

" 8. Respecting the words engraved on the register-plate of the barometer, it may be observed, that they cannot be strictly relied upon to correspond exactly with the state of the weather; though it will in general agree with them as to the mercury rising and falling. The words deserve to be particularly noticed when the mercury removes from 'changeable' upwards; as those on the lower part should be adverted to, when the mercury falls from 'changeable' downwards. In other cases, they are of no use: for, as its rising in any part forebodes a tendency to fair, and its falling to foul weather, it follows that, though it descend in the tube from settled to fair, it may nevertheless be attended with a little rain; and when it rises from the words 'much rain' to 'rain' it shows only an inclination to become fair, though the wet weather may still continue in a less considerable degree than it was when the mercury began to rise. But if the mercury, after having fallen to 'much rain,' should ascend to 'changeable,' it foretels fair weather, though of a shorter continuance than if the mercury had risen still higher; and so, on the contrary, if the mercury stood at 'fair' and descends to 'changeable,' it announces foul weather, though not of so long continuance, as if it had fallen lower.

" 9. Persons who have occasion to travel much in the winter, and who are doubtful whether it will rain or not, may easily ascertain this point by the following observation. — A few hours before he departs, let the traveller notice the mercury in the upper part of the tube of the barometer: if rain is about to fall, it will be indented, or concave; if otherwise, convex or protuberant.

" Towards the end of March, or more generally in the beginning of April, the barometer sinks very low, with bad weather; after which, it seldom falls lower than 29 degrees 5 minutes till the latter end of September or October, when the quicksilver falls again low, with stormy winds, for then the winter constitution of the air takes place. From October to April, the great falls of the barometer are from 29 degrees 5 minutes to 28 degrees 5 minutes, and sometimes lower; whereas during the summer constitution of the air, the quicksilver seldom falls lower than 29 degrees 5 minutes. It therefore follows that a fall of one-tenth of an inch, during the summer, is as sure an indication of rain, as a fall of between two and three-tenths is in the winter.

" It must, however, be observed, that these heights of the barometer hold only in places nearly on a level with the sea; for experiments have taught us, that for every eighty feet of nearly perpendicular height that the barometer is placed above the level of the sea, the quicksilver sinks one-tenth of an inch; observations alone therefore must determine the heights of the quicksilver, which in each place denote either fair or foul weather."

612. The *hygrometer* is of various sorts, but cord, fiddle-string, and most of the substances commonly used " become sensibly less and less accurate, so as at length not to undergo any visible alteration from the different states of the air, in regard to dryness or moisture. On this account a sponge may be preferred, as being less liable to be so changed. To prepare the sponge, first wash it in water, and when dry, wash it again in water wherein sal ammoniac, or salt of tartar, has been dissolved; and let it dry again. Now, if the air becomes moist, the sponge will grow heavier; and if dry, it will become lighter.

" Oil of vitriol is found to grow sensibly lighter or heavier in proportion to the lesser or greater quantity of moisture it imbibes from the air. The alteration is so great, that it has been known to change its weight from three drams to nine. The other acid oils, or, as they are usually called, spirits, or oil of tartar *per deliquium*, may be substituted for the oil of vitriol.

" In order to make an hygrometer with those bodies which acquire or lose weight in the air, place such a substance in a scale on the end of a steel-yard, with a counterpoise which shall keep it in equilibrio in fair weather; the other end of the steel-yard, rising or falling, and pointing to a graduated index, will shew the changes.

" If a line be made of good well dried whipcord, and a plummet be affixed to the end of it, and the whole be hung against a wainscot, and a line be drawn under it, exactly where the plummet reaches, in very moderate weather it will be found to rise above such line, and to sink below it when the weather is likely to become fair. But the whalebone hygrometer, originally invented by De Luc, is esteemed one of the best now in use.

613. " The *Rain-Gauge*, (also termed a *Pluviometer*,) is a machine for measuring the quantity of rain that falls. One of the best-constructed rain-gauges consists of a hollow cylinder, having within it a cork-ball attached to a wooden stem, which passes through a small opening at the top, on which is placed a large funnel. When this instrument is placed in the open air in a free place, the rain that falls within the circumference of the funnel will run down into the tube and cause the cork to float: and the quantity of water in the tube may be seen by the height to which the stem of the float is raised. The stem of the float is so graduated, as to show by its divisions the number of perpendicular inches of water which fell on the surface of the earth since the last observation. After every observation the cylinder must be emptied.

" Another very simple rain-gauge may be formed of a copper funnel, the area of whose opening is exactly ten square inches. Let this funnel be fixed in a bottle, and the quantity of rain caught is ascertained by multiplying the weight in ounces by .173, which gives the depth in inches and parts of an inch. In fixing these gauges, care must be taken, that the rain may have free access to them; hence the tops of buildings are usually the best places, though some conceive that the nearer the rain-gauge is placed to the ground, the more rain it will collect.

" In order to compare the quantities of rain collected in pluviometers at different places, the instruments should be fixed at the same heights above the ground in both places; because, at different heights, the quantities are always different, even at the same place."

614. As the weight of the atmosphere is measured by the barometer, so the *thermometer* shows the variations in the temperature of the weather; for every change of the weather is attended with a change in the temperature of the air, which a thermometer placed in the open air will point out, sometimes before any alteration is perceived in the barometer.

" The knowledge of the exact degree of cold in the winter is of consequence to the cultivator: for it has been observed, that when the frost is so keen that the thermometer sinks fourteen degrees on Fahrenheit's scale, most succulent vegetables are thereby destroyed, such as almost all the cabbage or kale tribe, turnips, &c.; for their juices being then frozen hard, their vessels are thereby torn asunder or split, so that when the thaw comes on, the whole substance, for instance, of turnips and apples, runs into a putrid mass. In this case the most likely way to prevent their being lost, is to immerse what is so frozen in cold water, till the frost is extracted by the water: the loss is thereby delayed a little, for what is not used very speedily will soon putrefy, notwithstanding this care.

" The scale affixed to Fahrenheit's thermometer is divided into degrees or equal parts; its freezing point is 32 degrees above 0 (or zero, as it is called by philosophers,) and boiling water 212 degrees. As, however, Reaumur's scale is sometimes (though rarely) used, it may be proper to add, that its freezing point is 0, and boiling water at 80 degrees.

" From some very accurate tables constructed by the late Kirwan, it appears that January is the coldest month in every latitude; and that July is the warmest month in all latitudes above 48 degrees: in lower latitudes, August is generally the warmest. The difference between the hottest and coldest months increases in proportion to the distance from the equator. Every habitable latitude, he further remarks, enjoys a mean heat of 60 degrees for at least two months; which heat is necessary for the production of corn."

Most of the above remarks are taken from " The Complete Weather Guide," by Joseph Taylor; by much the best work extant on the subject, and which ought to be in the hands of every cultivator. Howard's *Climate of London* (1820), merits the attention of the scientific enquirer.

BOOK III.

MECHANICAL AGENTS EMPLOYED IN GARDENING.

615. Having considered the nature of vegetables, and the nature of the materials by which their culture or improvement is effected by art, the next step is to consider the means by which that art is applied in the practice of cultivation. In general it may be observed, that every change effected in the circumstances of materials, either consists in, or must be preceded by, a mechanical change in their position. To effect mechanical changes, the fundamental engine is the human frame; but its agency is essentially increased by the use of certain implements, utensils, machines, and buildings. The primary implements of gardening, as an art of culture, would necessarily be confined to a few tools for stirring the ground; and one or two instruments for pruning trees or gathering crops. But in the present state of the art, both the number and kind of agents are greatly extended and diversified. There are tools, instruments, and machines for culture, as the spade, knife, and water-engine; for beautifying scenery, as the broom, scythe, and roller; utensils for portable habitations of plants, or conveying materials, as pots and baskets; structures for culture, as glass frames, hot-houses, and awnings; and buildings for use, convenience, or decoration, as tool-houses, arbors, and obelisks. The whole may be included under implements, structures, and edifices.

Chap. I.

Implements of Gardening.

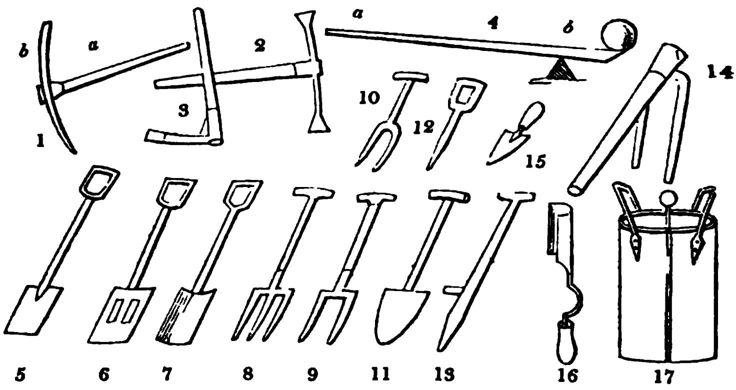
These may be classed as follows: — 1. *Tools,* or simple implements for performing operations on the soil, and other dead or mineral matters. 2. *Instruments* for performing operations on plants or living bodies, as insects and vermin. 3. *Utensils* for habitations of plants, or the deportation or retention of either dead or living materials; and 4. *Machines,* or compound implements for any of the above or other purposes.

Sect. I. *Tools.*

616. The common character of this class of implements is, that they are adapted for labour which requires more force than skill; they are generally large, and require the use of both hands and the muscular action of the whole frame, often aided by its gravity. Tools consist of two parts, the head, blade, or acting part; and the handle or lever, by which the power is communicated, and the tool put in action. As almost all tools operate by effecting a mechanical separation between the parts of bodies, they generally act on the principle of the wedge and lever, and consequently the wedge-shape ought to enter, more or less, into the shape of the head or blade of most of them, and the lever or handle ought to be of some length. Where the handle is intended to be grasped and held firm, its form may be adapted for that end, as in the upper termination of the handle of the shovel or the spade; but where the human hand is to slide along the handle, then it should be perfectly cylindrical, as producing least friction, as in the hoe and the mattock. The materials of which tools are composed, are almost exclusively iron and timber; and of the latter the ash is reckoned to combine most strength and toughness. The best quality of both materials should, if possible, be used, as *scrap-iron* and cast-steel, and root-cut young ash from rocky steeps. For light tools, such as the hoe and rake, the willow, or pine deal, may be used for the handles, but in scarcely any case can inferior iron or steel be admitted for the blades.

The *Pick* (*fig.* 1.) This instrument consists of the handle (*a*), which ought to be formed of sound ash timber, and the head (*b*), which ought to be made of the best iron, and pointed with steel. There are several varieties: the first, the pick with the ends of the head pointed, (*fig.* 1.) is used for loosening hard ground, gravel, &c.; the second, or pick-axe (*fig.* 2.), with both ends wedge-shaped, in reversed positions, and sharp, is used in felling timber, for cutting through the roots; the third, or mattock (*fig.* 3.), is used chiefly for loosening hard surfaces and for grubbing up roots of small trees or bushes. It is sometimes called a crow, and also a grubbing-axe, hoe-axe, &c.

The *Lever* (*fig.* 4.) is a straight, and generally cylindrical or polygonal bar of iron, somewhat tapered and wedge-shaped or flattened in the thick end; it is used for the removal of large stones or other heavy bodies, on which its advantage is as the distance of the power *a*, from the fulcrum *b*. &c.



The *Spade* (*fig.* 5.) consists of two parts; the blade, of plate iron, and the handle, of tough root-cut ash timber, rather longer than the handle of the pick, but generally about two feet nine inches. Spades are manufactured of different sizes, and generally with a flat blade; but perforated blades (*fig.* 6.) are sometimes prized, as cleaning or freeing themselves better from earth in adhesive soils; and semi-cylindrical blades (*fig.* 7.) or what canal-diggers call *grafting tools*, are preferred where the spitful is to be thrown from the spade to some distance. The spade is manufactured extensively at Gateshead, Newcastle, Redburn near Durham, Burton-upon-Trent, Ulverstone in Lancashire, Cramond near Edinburgh, and Dunnottar near Glasgow.

The *Fork*. (*Figs.* 8, 9, and 10.) Of this tool there are three principal varieties: — The first, (*fig.* 8.), for working with litter, haulm, or stable-dung: the second, (*fig.* 9.), for stirring the earth among numerous roots, as in fruit-trees and flower borders, or for taking up roots; and the third, (*fig.* 10.), for plunging pots in bark-pits, or for taking up asparagus or other roots. The prongs of the last are small, round, and should be kept clear or polished by use, or by friction with sand. In adhesive soils, a strong two-pronged fork (*fig.* 9.) is one of the most useful of garden tools, and is advantageously used on most occasions where the spade or even the hoe would be resorted to in free soils, but especially in stirring between crops.

The *Shovel* (*fig.* 11.) consists of two parts, the handle and the blade; the latter of plate-iron, and the former of ash timber. There are several varieties. 1st. Such as are turned up on the edges, and are used for shoveling mud; or when formed of wood, generally the beech, for turning grain, seeds, or potatoes. 2. Square-mouthed shovels, for gathering up dung in stables, and used by the gardener in the melon ground. 3. Heart-shaped or pointed-mouthed shovels, used for lifting earth out of trenches in ditch making, trenching, or in other excavations. 4. Long narrow-mouthed shovels, for cleaning out drains.

The *Dibber* (*figs.* 12. and 13.), is a short piece of cylindrical wood, obtusely pointed, and sometimes shod with iron on the one end, and formed into a convenient spade-like handle in the other. There are three varieties. The common garden dibber (*fig.* 12.); the potatoe dibber (*fig.* 13.); and the forest or planter's dibber.

The *Forester's Dibber* has a wedge-shaped blade, forked at the extremity, for the purpose of carrying down with it the tap root of seedling trees; it has been much used in planting extensive tracts, but may be considered as a barbarous mode of treating vegetables, and deserving reprobation.

The *Planter's Hack*, or double mattock (*fig.* 14.), is used for the same purpose as the forester's dibber, and is much to be preferred. See *Pontey's profitable Planter*.

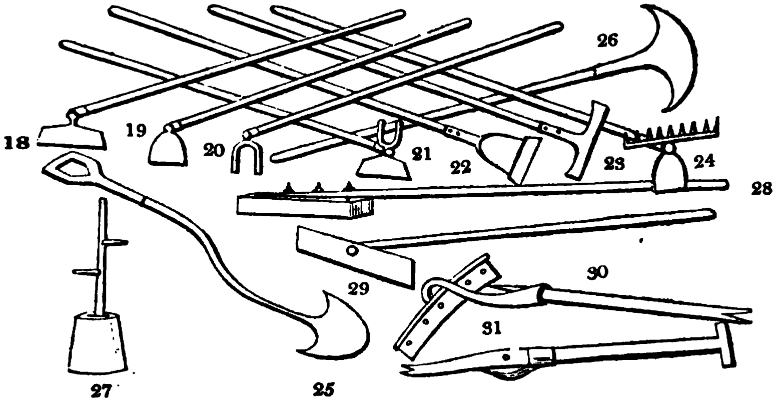
The *Planter's Trowel* is a triangular blade of iron joined to a short handle, used for planting young trees in free but unprepared soils, as heaths, moors, &c. *Sang's Planters' Kalendar*.

The *Planter's Pick-axe* is the tool of that name (*fig.* 2.) in miniature; or sometimes merely a small mattock (*fig.* 3.) used for planting in stoney uncultivated soils.

The *Garden-Trowel* is a tongue-shaped piece of iron, with a handle attached; the blade or tongue either flat (*fig.* 15.), or semi-cylindrical (*fig.* 16.) It is used to plant, or take up for transplanting, herbaceous plants and small trees. Trowels are also used for loosening the roots of weeds, and are then called weeding irons.

Sometimes they are used for stirring the soil among tender plants in confined situations.

The *Transplanter* (*fig.* 17.) consists of two semi-cylindrical pieces of iron with handles, and which are so inserted in the ground as to inclose a plant with a ball of earth between them. In this state they are attached to each other by two iron pins, and, being pulled up, bring with them the plant to be removed, surrounded with a ball of earth. This being set in a prepared excavation surrounded by loose earth, the transplanter is then separated as at first, and being withdrawn, one half at a time, the earth is gently pressed to the ball containing the plant, and the whole well watered. Tender plants so transplanted receive no check, even if in flower.



The *Draw-Hoe* (*figs.* 18. to 21.) is a plate of iron, six or seven inches long by two or three broad, attached to a handle about four feet long, at an angle less than a right angle. The blade is either broad for cutting weeds (*fig.* 18); deep and strong for drawing earth to the stems of plants (*fig.* 19.), formed into two strong broad prongs for stirring hard adhesive soils (*fig.* 20.); or it is formed to accomplish the first and last purposes, as in the double hoe (*fig.* 21).

The *Thrust-Hoe* (*figs.* 22. and 23.) consists of a plate of iron attached somewhat obliquely to the end of a handle, either by a bow (*fig.* 22.), or a straight piece (*fig.* 23.), These hoes, which are sometimes called *Dutch hoes*, are used only for killing weeds, or loosening ground which is to be afterwards raked. As the human animal can draw more than he can push, most heavy work will be easiest done by the draw-hoe.

The *Garden-Rake* consists of a range of teeth inserted in a straight iron bar of from six to eighteen inches in length, and attached at right angles across the end of a handle. Rakes vary in size, and in the length and strength of their teeth, and are used for covering seeds, or raking off weeds or cut grass. For the latter purpose, in highly-kept grounds however, a birch-broom is generally preferred.

The *Hoe-Rake* combines a hoe and rake, either at opposite ends of the same handle, as in France, or back to back at one end, as in England (*fig.* 24.) They are used for giving slight dressings to borders.

The *Turfing-Iron* (*fig.* 25.) consists of a reniform (or kidney-shaped) blade joined to a handle by a kneed, or bent iron shank. It is used for cutting turf from old sheep-pastures, with a view to its being employed either for turfing garden-grounds, or being thrown together in heaps to rot into mould. It is also used in removing ant-hills and other inequalities in sheep-pastures, in parks, or rough lawns. A thin section is first removed, then the protuberance of earth is taken out and the section replaced, which, cut thin, and especially on the edges, readily refits: and the operation is finished with gentle pressure by the foot, back of the spade, beetle, or roller.

The *Turf-racer* (*fig.* 26.) consists of a kidney-shaped blade fixed to a straight handle, and is used for paring the edges of verges or borders of turf; and for cutting the outlines of turves to be raised with the turfing-iron.

The *Turf-Beetle* (*fig.* 27.) is a cylindrical or conical piece of wood, of one hundred or two hundred pounds weight, with an upright handle and two cross-handlets attached; it is used chiefly for pressing down and levelling new-laid turf. There is a variety, consisting of a rectangular block with a handle placed obliquely (*fig.* 28.), which is used when only a gentle pressure is desirable.

The *Turf-Scraper* is a head or plate of wood (*fig.* 29.), or iron (*fig.* 30.), fixed at right angles across the end of a long handle, and is used chiefly to scrape off earth, or the exuviæ of worms, snails, &c. from lawns, grass verges, or walks, early in spring. In some cases, teeth, like those of a saw, are formed in the edge of the blade of such scrapers, in order to tear out the moss from lawns; in many situations, however, the moss is much to be preferred to grass, as softer, and requiring less frequent mowing.

Wire Brooms are used to good effect for this purpose, as well as for removing moss from walls or trunks of large trees.

The *Dock-Weeder* (*fig.* 31.) is composed of a narrow iron blade attached to a spade-like handle, with a protruding iron stay joined to the lower end of the handle, or to the iron shank of the blade, to act as a fulcrum. It is used for digging up long, conical roots of weeds in pastures or close crops, where the spade or two-pronged fork cannot be introduced; or for taking up crops of fusiform roots, as the parsnip, scorzonera, &c.

The *Besom* used in gardening is of two sorts. The spray broom, consisting of a small faggot of spray, generally that of the birch, or of spartium, with a handle inserted; or a brush of bristles with a similar handle: the former sort are used for the open air, the latter in hot-houses, seed-rooms, &c.

The *Wire Besom* consists of a bundle of iron or copper wires, of one-twentieth of an inch in diameter, fixed to a long handle. They are used for sweeping gravelled paths which have become mossy, mossy walls, mossy trunks of trees, &c. They require to be dipt in oil occasionally, to retard the progress of oxidation.

Of these tools the essential are the *spade*, the *dung-fork*, and the *rake;* for with these all the operations for which the others are employed may be performed, though with much less facility, expedition, and perfection. There are diminutive sizes of most of them to be had in the shops for infant gardeners; and portable and convertible sets for ladies and amateur practitioners.

Sect. II. *Instruments.*

The common character of this class of implements is, that they require in their use more skill than physical force: they may be divided into instruments for operations, as the knife, saw, &c.; instruments of action or direction, as the measuring-rod, level, &c.; and instruments of designation, as numbering tallies, name-pieces, &c.

Subsect. 1. *Instruments of Operation.*

617. This order of implements is used in labors of a comparatively light kind. They may be used in general with one hand, and commonly bring into action but a part of the muscular system; the scythe however is an exception.

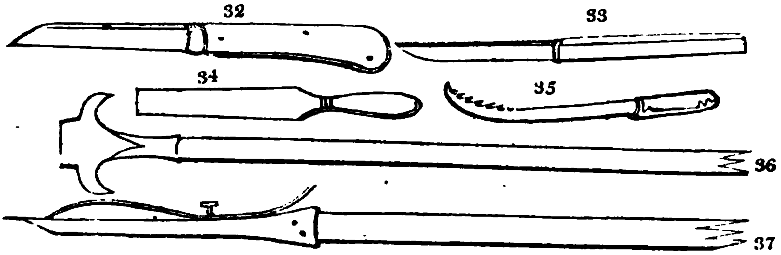
Instruments of operation are similarly composed to tools, and act on the same principles, differing from these only in being generally reducible to levers of the third kind, or those in which the power or hand is between the weight or matter to be cut or separated, and the fulcrum or arm, as in cutting off a shoot with a knife. But in clipping, the fulcrum is between the hand and the weight or object to be clipt off, and therefore shears act as wedges moved by levers of the second kind. The materials of instruments are in general the same as tools, but the handles of knives are of horn, bone, ivory, or ramose *fucus*, and the greatest attention is requisite as to the iron and steel of the blades.

The *Common Garden-Knife* consists of a blade of prepared steel, fixed without a joint in a handle of bone or horn, and kept in a sheath of leather or pasteboard. It varies in shape and size, and in the quality of the blade; the best in England are generally made in London, but the great mass disposed of in commerce are manufactured at Sheffield. Every working-gardener ought to carry one of these knives in a side-pocket on his thigh, that he may be ever ready to cut off pieces of dead, decayed, or injured plants, or gather crops, independently of other operations.

The *Common Pruning-Knife* is similar to the former, but less hooked at the point; for though the hook be useful in gathering some crops, and in cutting over or pruning herbaceous vegetables, yet as all knives cut on the same principle as the saw, it is injurious when the knife is used to cut woody shoots: wherever a clean section is of importance, the pruning-knife, with a straight edged blade, and not the common garden-knife, with a hooked blade, ought to be employed.

The *Folding Pruning Knife* differs from the other, in having the blade jointed in the handle, for the purpose of rendering it portable with greater ease and in any description of pockets; such knives are more especially used by master-gardeners. There are varieties of these, with saws, chisels, pen-knives, &c. the two latter more curious than useful.

The *Grafting-Knife* (*fig.* 32.) differs from the common pruning-knife, in having a thinner and more narrow blade fixed in a bone or horn handle. It is used for grafting, inarching, &c.

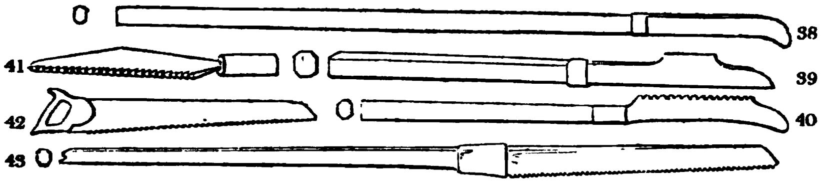


The *Budding-Knife* (*fig.* 33.) differs from the grafting-knife, in having the point of the sharp edge of the blade rounded off in the same manner as is the back or blunt edge of the grafting and pruning-knives. It has also a thin wedge-shaped ivory or bone handle for raising up the bark, &c. in the operation of inoculation.

The *Asparagus-Knife* consists of a strong blade, fixed in a handle, blunt on both edges, and straight (*fig.* 34.); or slightly hooked and serrated at one end (*fig.* 35.)

The *Grafting-Chisel* differs from the carpenter's-chisel, in being a narrow wedge tapering equally on both sides. It is used to split stocks where the common pruning-knife is not deemed sufficiently strong.

The *Forest-Chisel* (*fig.* 36.) is a sharp wedge of steel, with or without a sharp steel hook, or hooks generally called ears; this blade or wedge is attached to a handle, from six to ten feet long or upwards; or better to a handle capable of being lengthened by additional joints. It is used for cutting off small branches of forest-trees close by the bole or trunk; with one hand it is placed and adjusted under the branch, and with the other a smart blow is given by a wooden mallet, which either at once, or by repetition, effects separation, and leaves a smooth section. A variety of this instrument, used for pruning orchards, is furnished with a guard or plate behind the blade, to prevent its entering too far into the trunk or main branch (*fig.* 37.)



The *Pruning-Bill* is generally a hooked blade, sometimes sharpened on one and sometimes on both edges, attached to a handle of from one to four feet in length. There are several varieties; one is simply the pruning-knife on a larger scale (*fig.* 38.), having a handle four feet long, and is used for pruning hedges in the best hedge-districts, such as Northumberland and Berwickshire; another (*fig.* 39.) has a handle of only one, or one foot and a half long, and is sharpened in part on the back, forming a sort of of halbert-like blade, and is used where hedges are plashed, as in Middlesex and Hertfordshire; and the last we shall mention, contains a saw on one edge of the blade, and a knife on the other (*fig.* 40.): of this, and the first-mentioned sorts, are small portable varieties, with cases, &c. for amateur foresters.

The *Forest-Axe* is a steel wedge, fixed at right angles to the end of a handle of wood, from two and a half to four feet long, and is chiefly used for cutting roots or trunks at the ground's surface, where the saw cannot operate. Axes vary in dimension, and somewhat in the shape of the head or wedge, which, for the purposes of gardening, ought to be long and narrow.

Besides these cutting tools, there may be wanted in extraordinary cases, adzes, googes, carving-chisels, and peculiar-shaped instruments, which the intelligent gardener will procure to be made to answer his intentions.

The *Pruning-Saw* (*fig.* 41.) is a blade of steel, serrated in what is called the double manner on one side, and is either jointed like a folding pruning-knife; jointless as in the common knife; shaped like a capenter's saw (*fig.* 42.); or of some length, say with a handle of six or eight feet, as in the forest-saw (*fig.* 43.) The small saws are used for cutting off branches where the knife cannot easily act owing to want of room, and the forest-saw is used in cutting off large branches. In either case the section must be smoothed with the forest-chisel or pruning-knife, and, if possible, or at least in delicate cases, should always be covered with some tenacious air-excluding composition.

The *Averuncator* (*fig.* 44.) is a compound blade attached to a handle from five to eight feet in length, and operating by means of a lever moved by a cord and pulley. Its use is to enable a person standing on the ground to prune standard trees, which it readily does when the handle is eight feet long, to the height of fifteen feet, and, by using step-ladders, any greater height may be attained. Branches one inch and a half in diameter may readily be cut off with this instrument.

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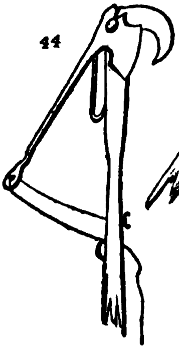

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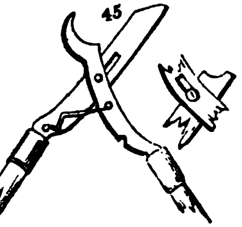

The *Pruning-Shears* (*fig.* 45.) differ from the common sort, in having a moveable centre (*a*) for the motion of one of the blades, by which means, instead of a crushing-cut, they make a draw-cut, leaving the section of the part attached to the tree as firm and smooth as if cut off by a knife. It is used in the same way as the common shears, and is very convenient in reducing the size of shrubs or bushes, and clipping hedges of roses or other select plants.

Ringing-Shears (*fig.* 46.) is an instrument of French invention for expediting the practice of ringing trees. A two-bladed knife, with both blades open at once, will give the best idea of its mode of operating, and is, in fact, a good substitute.

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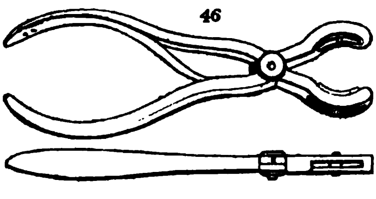

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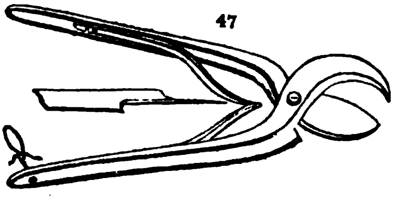

The *French Pruning-Shears* (*fig.* 47.); by the curvature of the cutting blade, cut in a sort of medium way between the common crushing and pruning-shears: they are expeditious implements for pruning the vine.

Hedge-Shears (*figs.* 48 *and* 49.) are composed of two blades, acting in unison by means of a pivot, on which they turn, on the principle of a lever of the second kind. They were formerly much used in gardening for hedges, fanciful figures, bowers, and even fruit-shrubs, which were then shorn or trimmed into globes, cones, and pyramids, by shears. At present the taste is different. Shears, however, are still wanted for hedges of privet and yew; but where the twigs or shoots are stronger, as in the holly, thorn, and beech, the hedge-bill or pruning-shears is preferable, as producing wounds more easily cicatrised, and not thickening the outer surface of the hedge, by which means the interior shoots rot for want of air, especially in thorn and other deciduous hedges.

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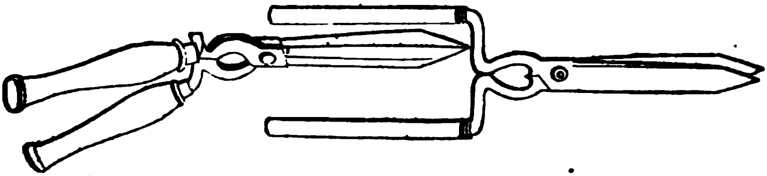

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Verge-Shears (*fig.* 50.) are a smaller variety, in which the blades are joined to the handles by kneed-shanks, to lessen stooping in the operator. They are chiefly used for trimming the sides of box-edgings.

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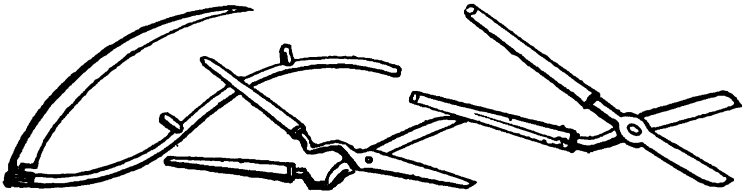

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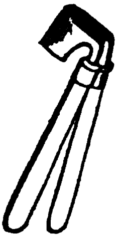
Turf-Shears (*fig.* 51.) are another variety, for cutting the tops of box-edgings and the tufts of grass at the roots of shrubs, not easily got at by the scythe.

The *Scythe* (*fig.* 52.) is a sharp blade of steel attached to the end of a crooked wooden handle. It varies somewhat in size and in the angle made by the plate or knife, which is so contrived as to be varied at the pleasure of the operator; and in mowing very short thick grass, is generally placed so as the plane of the blade may be parallel to the plane of the surface to be mown.

The *Garden-Scarifiers, or Bark-Scalers* (*figs.* 53, 54, 55.) are hooked edge-tools for removing the already scaling off external epidermis of the stem and branches of fruit-trees of some age. They vary in size and strength, in order to suit different sorts of trees, and different parts of the same tree. The two-handed instrument (*fig.* 53.) is for removing the bark from the axillæ of the branches, or other angular parts difficult to be got at. The small hook (*fig.* 54.) is for lateral branches of one and two inches in diameter: and the knife-hook (*fig.* 55.) for the trunks of the largest trees. This operation should be performed in the middle of winter; and to guard against accidents, the whole of a tree should seldom be done in one season.



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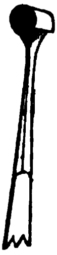

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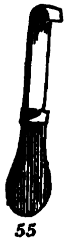

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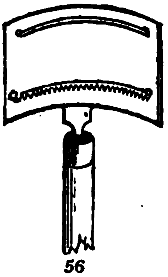

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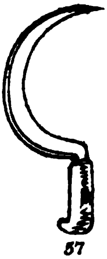

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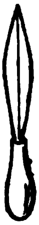

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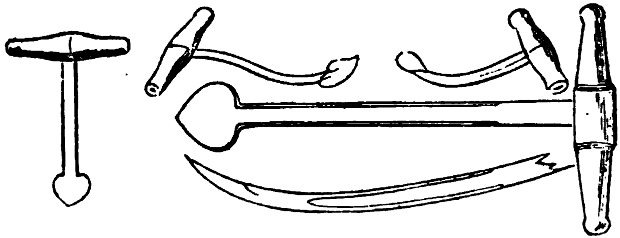
The *Moss Scraper*, for standards, is a sort of horse curry-comb, (*fig.* 56.); and for wall-trees, is a sickle-like instrument (*fig.* 57.) In either form it is used to remove moss from the branches, or woody parts of trees; the existence of which is a certain indication of the commencement of decay. It must be confessed, however, that such instruments seldom remove the moss completely, and that the scarifier, by removing a portion of the outer bark, does the business much more effectually, and is greatly to be preferred.

The *Blunt Knife* (*fig.* 58.) has a lanceolate, double-edged blade, somewhat obtuse on the edges, and is used for the removal of decayed wood from hollow wounds in old neglected trees. It can never be wanted where there has been any thing like good management.

The *Forest Barking-Irons* (*figs.* 59 to 63.) are used, not to scarify or remove the scaly decaying epidermis, but to remove the entire mass of cortical layers of the oak for the purposes of the tanner. The smaller instruments (*figs.* 59, 60, and 61.) are for undergrowth, or copse bark, or small branches; the largest (*fig.* 62.) for the larger branches and trunks: the long blade (*fig.* 63.) is for cross-cutting, &c.

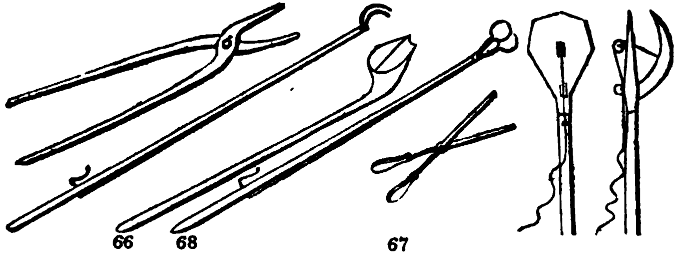


The *Garden-Hammer* consists of a head with a flat face and forked claw, and is generally lighter than the carpenter's hammer. It is used chiefly by gardeners for driving or drawing the nails in dressing wall-trees.

The *Garden-Pincers* do not differ from those used by carpenters, consisting of two hooked levers of iron, acting as levers of the first kind; they are used to draw out nails where the hammer cannot be so conveniently applied, or is insufficient.

The *Weeding-Pincers* (*fig.* 64.) are formed of wood pointed with plate-iron, and are used for pulling out large weeds, particularly thistles and other tuberous and fusiform-rooted plants. They are also sometimes used for common weeding to prevent stooping and treading beds and borders; but their chief use is to weed ponds, either reaching from the shores or from boats.

The *Grape-Gatherer* (*fig.* 65.) is a pair of scissars, combining also tweezers or pincers, attached to the end of a rod six or eight feet long, and worked by a cord and pulley, or lever and wire. The bunch of grapes to be gathered from the roof of a lofty vinery, or the sprig of myrtle to be culled from the summit of a green-house *stage*, is not only clipped cleanly off the plant by the sheers, but held fast by that part of them acting as pincers till it is brought down to the operator.



The *Peach-Gatherer* (*fig.* 66.) consists of a tin funnel, or inverted hollow cone, fixed on the end of a rod or handle at an obtuse angle. The funnel is first introduced under each fruit, and then gently raised or moved sideways; if ripe, the fruit will fall into the funnel. It is used for gathering the peach tribe, apricots, and plumbs.

The *Pear Gatherer* resembles the above, but the funnel is deeply notched or serrated, in order to act as hooks in gently drawing off ripe fruit. It is used in gathering the finer sorts of pears and apples from walls. This and the last instrument are also sometimes used for gathering mulberries.

The *Berry-Gatherer* (*fig.* 67.) is the combined scissars and pincers above-mentioned, worked by the hand like common scissars, and is used for gathering gooseberries, strawberries, raspberries, and such fruits as should be touched by no other hand than that which conveys them to the mouth. Some opulent proprietors have branches of fruit shrubs cut off and brought to table, as *bouquets*, in elegant china vases; or have their strawberries grown in pots, and thus served up to be gathered as used, &c.

Jerome Buonaparte, when king of Westphalia, passing through Warsaw, on his way to Moscow, in the campaign of 1812, had branches of cherry-trees laden with fruit held upright by soldiers round his table like a sort of grove, from the branches of which extending over their heads, he and his guests gathered the fruit. *He was sent back.*

The *Apple-Gatherer*, (*fig.* 68.) is similarly constructed to the grape-gatherer, but instead of shears has two cork holders for seizing the apple and pulling it off. This is an exceedingly useful instrument for gathering apples, pears, quinces; and even nuts and cones, where it is an object not to injure the trees.

The *Seed* and *Cherry-Gatherer* (*fig.* 69.) consists of a valvular pocket placed on the the end of a long rod. One valve or jaw of the mouth or pocket is fixed, and the other is kept open by a spring, and closed at pleasure, and made to bite or pinch off seeds of forest trees, or even fruits, especially cherries, by operating on it with a string and pulley, or wire and lever. It is peculiarly useful for gathering ash and sycamore keys, haws, and such like seeds.

The *Essential* operative instruments are, the *Knife*, *Saw*, *Shears*, *Scythe*, and *Hammer*.

Subsect. 2. *Instruments of Action.*

618. The common characteristic of this class of instruments is, that they are used in actions preparatory to operations, rather than in operations themselves, and depend on scientific knowledge more than on practical dexterity; this remark will apply also to their construction, which is founded on the doctrines of quantities, gravitation, &c.

The *Garden Line* is composed of three parts, the frame generally of iron, the cord which is wound upon the frame, and the pin which terminates the cord. The common use of the line is perfectly understood from the name; though generally used for straight lines, yet it is also applied, by means of pegs or small stakes, to curved lines.

The *Ground-Measure*. Of this there are at least three sorts used in gardening. A Gunter's chain of 100 links, or 66 feet, a rod of one-twelfth, or any equal part of the chain marked with links on one side, and feet on the other, and a common pocket rule. To these may be added a pocket measuring line, though it is not, from its contraction and expansion, to be much depended on. The chain is used to ascertain the contents, or to lay out and subdivide considerable plots; the rod for the detail of such plots, or for marking out rows, &c.; and the pocket-rule for taking smaller dimensions.

The *Timber-Measure* is an instrument for taking the dimensions of standing timber, without climbing the tree. It is either two compound rods, working on a pivot (*fig.* 70.); or a pair of calibers or exciseman's compasses, placed on the end of a jointed rod, capable of being extended to forty feet or upwards. By means of a cord and pulley, the diameter of the trunk of the tree may be taken at any height, and the same calibres can be used to take the diameter at the base; the rod exhibiting in the former operation the length of the trunk. Where the estimate of a contemplated fall of timber is to be made, or a territory containing trees is to be correctly valued, either of these instruments are of great use.

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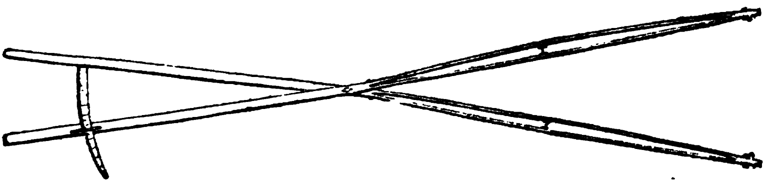

The *Ground Compasses* (*fig.* 71.) are generally made of hard wood, such as oak shod with iron, and with an iron gauge or segment (*a*); their length may be six feet; they are used chiefly for laying out parterres in the ancient manner; since, by a previous preparation of the soil, the curvilinear parts of such parterres can be described by them with perfect accuracy. The stationary foot is placed on a slip of board a few inches square, with a pin beneath to retain it in its place, and a lead cap above for the point of the foot.

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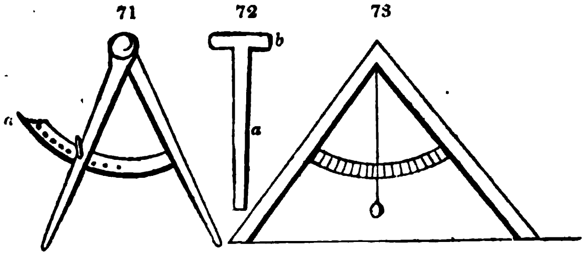

The *Borning-Piece* (*fig.* 72.) is composed of the body (*a*), commonly a thin slip of board, four inches wide, half an inch thick, and four feet two inches long; the head (*b*) of a similar slip of board placed across, but only eighteen inches long; and the foot is either of the same form as the head, or merely the squared end of the body (as in the figure). The upper and under edge of the head and foot must be perfectly straight, and form right angles with the edges of the body. Borning-pieces are used to prove, complete, and continue level lines, or lines on certain given slopes. One is placed at each end of a convenient length of the level or slope, and there held upright, and others, being placed in the interval, and in the same line or vertical plane, the ground under the feet of the borning-pieces is raised or lowered till it is brought to the proper level or slope, when all the heads will range. Where box-edgings are to be planted with accuracy and beauty, the use of these implements cannot be dispensed with.

Levels. (*figs.* 73. and 74.) Of these there are a variety of sorts; but the most convenient is half a square, with an iron index in the angle marked with ninety divisions or degrees. The use of these degrees is to facilitate the laying out of slopes; at a perfect level the plummet will hang at 45°, and for a slope it may be any lesser number in ascending, or any greater number in descending from a fixed point. This level may also be used as a square to set off right angles, or indeed angles of any description.

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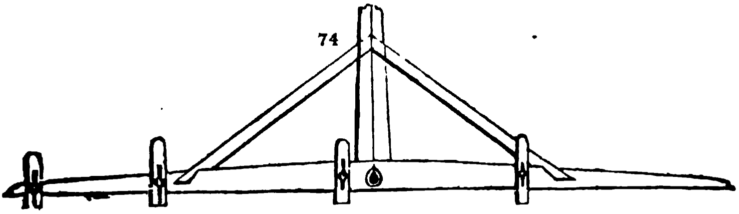

The *Adjusting Horizontal Level* (*fig.* 73.) is peculiarly useful in laying out roads, or regulating the slope of lawns or borders.

The *Spirit Level*, with a theodolite compass and telescope, is used for laying out extensive scenes. The most convenient are put together, and assume the form of a stout walking-stick. Smalcalder is the best London artist in this line.

The *Staff* is used in laying out straight lines. It may be a straight rod of six or eight feet long or upwards, and one inch in diameter; with the first six inches at the top painted white, the second black, and the third six inches red. Two points of the desired straight line being found or given, any greater number of points are found by placing other staffs or rods so as they shall range, and the first staff conceal from the eye, placed behind it, all the rest in the line; the use of the three different colors is to render their ends distinctly visible when the ground is fresh dug, white or covered with snow, and green, as in pastures. Where new ground, even of moderate extent is to be laid out, there should not be less than a dozen such staffs.

The *Straight Edge*, for a garden, may also serve for a plumb-rule. It is merely a slip of board with straight parallel edges and sides, of any length from four to ten feet, with the addition of a plummet for occasional use as a plumb-rule. It is used to form and prove smaller levels, between points settled, by the borning-pieces; or to prove beds or borders of even or plane surfaces. As a plumb-rule, this implement is also used to place espalier rails, temporary walls of boards, and even standard trees, upright.

The *Stake* is any straight piece of wood of an inch or two in diameter, and from one to four feet in length. There are two sorts, the one short and thick, of one foot or eighteen inches in lengh, and used by being driven into the ground, as resting-places for the level; the other, comparatively slender and long, may either be covered with white-wash, or the lower half dipped in white-wash, and the upper half in a black wash, or they may be painted as the staffs. The last kind are used for tracing out lines of any description, or for indicating the situations of trees, or other objects. Twigs and bits of lath are commonly used as substitutes, but wherever correctness is any object, the trifling expence of two or three hundred of such stakes, should not deter from procuring them.

Subsect. 3. *Instruments of Designation.*

619. The object of this order of instruments is to record and render ascertainable the individuality of objects and chiefly of plants, either as species genera, or varieties. A talley or stake driven into the soil and remaining fast, is mechanically considered a wedge held in equilibrium by the resistance of the earth.

Designators, or Naming Instruments. Wherever there is a variety of plants cultivated, it becomes necessary to be able to mark and distinguish them, as well when in a growing state, as when in a state of hyberration, or recent insertion in the soil.. — In sending plants to any distance, the same thing is requisite. For both purposes the name is either written on some instrument, and attached to or placed beside the plant; or a number is made use of instead of the name, from which reference is made to a written list. Of both these, a considerable variety are used in gardening.

The *Common Talley, or Number Stick* (*fig.* 75.), is a slip of lath, or piece of a rod, nine or twelve inches long, sharpened at one end and squared at the other. The numbers, to nine inclusive, are cut on the face with a knife in Roman numerals thus; I, II, III, IV, V, VI, VII, VIII, IX; reading always from the insertion, or sharpened end. Ten is formed by a notch or talley (from the French *tailler*, to cut, and hence the name), on the near angle, and placed behind the above numerals, extends the series from eleven to nineteen. Twenty is formed by two notches; thirty by three, and so on: the nine numerals above being placed after the notches, so as to form the intermediate terms of the series. Fifty, instead of five notches, is formed by a cross cut, or channel, like I, on the face, with a similar one on the right side joined to it. One hundred is formed by forming a similar cut on the other side, that is a channel continued on three sides; and one hundred and fifty, by a cut or channel continued on the four sides of the talley. Ninety may be more readily formed by using the mark for one hundred, and placing a notch behind it, to signify 100+10, than using the cuts for fifty, and adding four notches before. Other high numbers may be simplified in the same manner. A little reflection will show that this mode of numbering may be carried to almost any extent; and in some nurseries, particularly in Scotland, we have known it carried as far as five hundred, which is formed by only three rings for 3 x 150=450, and a half ring for 50. Particular attention must always be had to read from the root, or insertion end.

The *Botanic Talley* (*figs.* 76 to 80.) is a highly improved method of numbering, devised by Alexander and George, sons of the late Dr. Anderson, well known as one of our most eminent agricultural writers. It proceeds upon the same general principles as that above, but with different marks, the ten cyphers (see *fig.* 77,) being denoted by as many distinct cuts of easy and expeditious execution.

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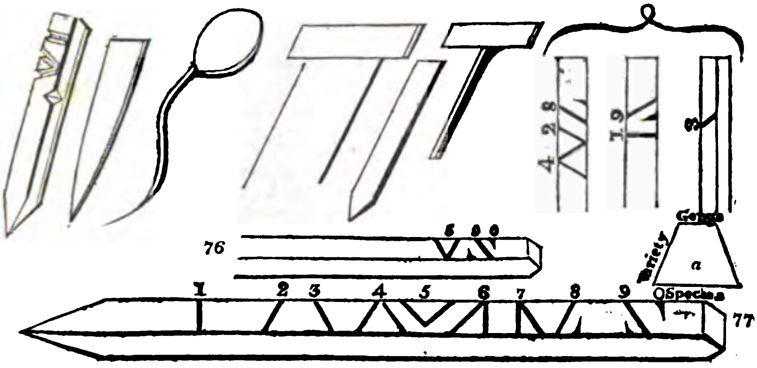

(As an example of application, the fig. 76 contains the number 590.) "The only way in which the memory is apt to misgive, in this scheme, is by confounding / & \, ∠ & ⊿ ∧ & ∨ with each other (as a child would confound the figures 6 and 9), but this slight inconvenience will be remedied by the following key, which may be easily borne in the mind. Let us recollect that, in writing, we naturally draw a stroke from the right, at top, to the left, at bottom, thus / , and not in the opposite direction, thus \ : now, in all the above numbers, which differ from each other in the direction of the diagonal line, that which is in the direction usual in writing, precedes the other; thus $\underset{2}{/}$ $\underset{3}{\backslash}$ $\underset{6}{\urcorner}$ $\underset{7}{\nwarrow}$ $\underset{8}{\angle}$ $\underset{9}{>}$ the other two, $\underset{4}{\wedge}$ & $\underset{5}{\vee}$, will not be confounded, on recollecting that ∨ is the usual numeral notation of five.

"In order to express more particularly the numbers, which refer to a botanical catalogue, a practice of great use to every cultivating botanist, we cut the stick in the form of a prism of four sides, whereof one is narrower than the rest; or of a triangle, with one of the angles cut off."

A transverse section of the talley should be a truncate triangle, (fig. 77. *a.*) On the narrowest side notch the number corresponding with that of the *genus*, in the catalogue. Its being rather more easy to cut the numbers on the smaller than on the larger surface, is the reason for preferring the former for the genus, the number of which is, in most cases, greater than that of the species. On the opposite and wider side, put the number of the *species;* and if there be a *variety*, put it on one of the intermediate sides."

By this simple method, in going over the garden with catalogue in our hand, we can see at once the genus, species, and variety of any plant we wish to look for; and in putting in plants, we have always the means ready at hand of placing the numbers with them, without the apparatus of whitened tallies, with ink, blacking, or any of those troublesome expedients in common use. The sticks themselves, which may be painted of a dark colour, and kept always at hand, are, besides, less conspicuous and unsightly than the usual large white marks with writing on them, and they are not so easily effaced." *Hort. Trans.* vol. ii. p. 348, 349.

The *Written Name-Stick* (fig. 81 to 85,) varies in form, size, and materials. The first sort (fig. 81,) is a flat piece of lath, smoothed and pointed with the knife, and either painted, or more commonly rubbed on the face with white lead at the time of using, and numbers corresponding with those of genus, species and varieties are written on it with a lead pencil. Sometimes types and printers' ink are used, which is found to answer: when the paint is dry, common ink, or black paint is also made use of; and in some cases the number is impressed by a cold type, or burnt in by one heated to redness. A litle white lead rubbed on with the finger, and the name immediately written with a hard black lead pencil, will last as long as the wood, and is on the whole the best mode. Various sizes are used from laths formed with the knife three inches long, and half an inch broad, to pieces sawed out of deal timber, two or three inches broad, and from eighteen inches to three feet long; the upper part painted white, and lower part pitched for durability. With respect to materials, fir deal is most commonly used, but oak boards, or old oak spokes are occasionally made use of in botanic gardens. Cast iron is also used, and found by nurserymen to be in the end the most economical. Earthenware and hoop iron have been tried, but not found to answer. The general form in all these cases, is a paralellogram pointed at the insertion end, and somewhat rounded at the other: but frequently the upper end or head is broader, square, round, or oblong, (figs. 82, 83, and 85,) and bevelled, that the number or name may be more readily observed by the spectator. To detect stealing, or mark appropriation, the name of the proprietor, or of the garden, may be cast on the back of all lead, or cast-iron, naming instruments. The stamped numbering instrument is formed in various ways; the simplest and most economical is that of triangular slips of lead clipt or stampt from sheet-lead of 4lbs. to a superficial foot; and for plants in pots, they need not be longer than three inches, nor broader at the head than half an inch. On these the number is stamped with a type, or the name at length may be stamped in the same manner. Such talleys are durable, unobtrusive, and not so readily driven out of pots as those of wood; for herbaceous plants they may be of double size and weight. Some are cast with a round or oval head, (82) and bent stem, and both more or less ornamented. In the Paris garden, the skeleton type is used for naming the plants; the classes, orders, and generic name being cut out of entire plates, and the specific name added in separate letters. A variety of other devices for numbering and naming planted plants might be mentioned: in the garden of the Ducal Palace Pitti, at Florence, the name, &c. is printed on slips of paper, and placed inside a small glass bottle, which is fixed on the end of an iron rod, a mode which can only succeed in climates like that of Italy.

The *Permanent Label*, is a small slip of wood, lead, or other metal, on which the number or the name is impressed or written, and it is then hung to trees or nailed on the wall or espalier rail to which trees are trained. The difficulty in the case of hanging labels on trees, is to find a durable tie, or thread, and for this purpose, untanned leathern thongs, or cat-gut, is preferred.

The *Temporary Label*, is a shred of paper or parchment, and sometimes of leather, with a string attached, and is used chiefly by nurserymen, to designate plants sold.

The mode of naming or *registering by series*, chiefly applies to fruit-trees in kitchen gardens or orchards, and is done by marking down the names in a book in the same order in which the trees or shrubs are planted in the garden. Thus, suppose the east side of an east wall is to be planted and registered without the use of naming instruments or labels. Begin at the south corner and write down under that title the sort of trees in the order in which they are planted, placing in the list a number against each name in regular series. Suppose that at any time afterwards, you wish to find which tree is the golden pippin; then looking in the list, that name is found opposite No. 9; counting nine, therefore, from the south corner, will give you the tree, &c. This mode of registering by series is always a very good check to any other mode of numbering or naming. Sometimes it is done on a general plan of the garden, but the plan must then be on a large scale to admit of writing down all the names of the trees in the spots where they are planted.

The essential instruments of action and designation, are the *line*, *rule*, *level*, and *talley*.

Sect. III. *Utensils.*

620. These may be characterized by their property of being adapted to hold or contain some material, either for deportation, as exemplified in baskets, or more permanent purposes, as in pots and boxes. Their construction and use embrace a variety of operations mechanical and chemical. The screen is an inclined plane; all weights carried by the hand are referable to weights moved by levers of the third kind. Flower-pots and bell-glasses are made on chemical principles. Gauze, oiled paper, or glass covers for plants, exclude or admit the rays of the sun on principles referable to optics. The pot-gauge is referable to a problem of Euclid (34); the cubic dimensions of plant-boxes, and the diameters and height of plant-tubs, are, with reference to their solid contents, explained by mensuration, arithmetic, &c.

The *Mould Screen*, (fig. 86.) is a wire frame with a jointed fulchrum, by which it can be placed sloping to any required degree; its use is to separate stones and coarser particles from mould, either in trenching over ground intended for bulbous, or other tender and succulent roots, or in turning over compost heaps. The soil must be well broken with the spade before thrown on the screen, and it is in vain attempting to use the utensil, unless the earth is dry. Screens are also useful for sifting gravel, for which purpose the wires are placed wider, according to the use to which the gravel is to be applied. In general, one quarter of an inch is the width for earth, and half an inch for garden gravel; but for gravel used in the highways, one inch is not too wide.

The *Mould Sieve*, is a piece of cloth of wire firmly attached to a circular rim, and the holes or interstices need not be above one-eighth of an inch in diameter. It is used for sifting mould, for small pots; similar sieves are also required in gardening, for cleaning seeds; and wood sieves of different kinds for airing or keeping fruit.

The *Mould Scuttle*, is a wooden box for carrying sifted earth in situations where the wheel-barrow cannot be brought into use. Sometimes they are made of iron, like the common coal scuttle.

The *Mould Basket*, is a strong rough basket or crate, used for the same purpose as the above utensil, and for carrying bark, leaves, or dung in hot-houses.

The *Flower Pot*, is a cylindrical tapering vessel of burnt clay, with a perforated bottom, and of which there are ten sorts distinguished by their sizes thus: the

						Inches.		*Inches.*
First size has	2	to the set or *cast*,	and are called		twos, being	18 in dia.	and	½ deep
Second	4	...	...	...	fours	12	...	1
Third	6	...	...	...	sixes	9	...	8
Fourth	8	...	...	...	eighths	8	...	7
Fifth	12	...	...	...	twelves	7	...	6
Sixth	16	...	...	...	sixteens	6	...	7
Seventh	24	...	...	...	twenty-fours	5	...	6
Eighth	32	...	...	...	thirty-twos	4	...	5
Ninth	48	...	...	...	forty-eighths	3	...	4
Tenth	60	...	...	...	sixties	2	...	2½
Eleventh	80	...	...	...	thumbs or eightys	1½	...	2

Pots are sold by the cast, and the price is generally the same for all the 10 sorts; two pots or a cast of No. 1, costing the same price as 80, or a cast of No. 11.

The *Store-Pot,* is a broad flat bottomed pot used for striking cuttings, or raising seedlings.

The *Pot for Bulbous Roots* is narrower and deeper than usual. This and the former variety are very desirable where propagation is much attended to, or Dutch flower roots grown.

The *Classic Pot* is the same sort of clay formed into vases, or particular shapes, for aloes and other plants which seldom require shifting, and which are destined to occupy particular spots in gardens or conservatories, or on the terraces and parapets of mansions in the summer season.

The *Stone-ware Pot* may be of any of the above shapes, but being made of clay, mixed with powdered stone of a certain quality, is much more durable.

The *Glazed Pot* is used by the Chinese for ornament; they are generally glazed green, but for superior occasions, are painted and sculptured.

Flower Pot Gauge, (fig. 87.) In order to form pots of different sizes of a regular ratio to each other, T. A. Knight has suggested a plan, of which this may be considered the substance. Assume as a convenient proportion as to width at top, bottom, and height, 8, 5, and 6; lay down the vertical section of a pot of this proportion on a board, or large paper; from its centre (*a*), draw two lines (*b* and *c*) passing through the bottom of the sides, and equal distances measured on these lines will give equal accretions and width to smaller or larger sized pots. Knight considers 2 inches as forming a proper difference in diameter in the scale of sizes of pots, which is nearly double that in common use.

The *Square Pot* is preferred by some for the three smallest sizes of pots, as containing more earth in a given surface of stage or basis; but they are more expensive at first, less convenient for shifting, and not admitting of such perfection of form as the circle, do not, in our opinion, merit adoption. They are used in different parts of Lombardy and at Paris.

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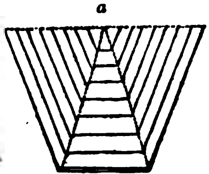

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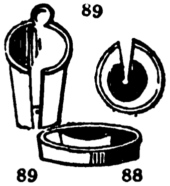

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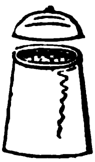

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The *Flower Pot-Saucer* is a flat, circular vessel, with a rim from one to two inches high, and is made to fit the bottoms of all the above sorts of pots. Its chief use is to prevent the water, which escapes by the bottom of the pot, from proving inconvenient on the shelves or stages in rooms or particular situations. In the gardens they are seldom wanted.

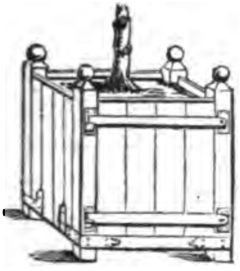
The *Carnation Saucer* (*fig.* 88.) is formed as much larger than the pot to be placed in it as to admit of surrounding its base with water, in order to prevent creeping insects from getting at the pot. In the centre of the saucer is raised a basement on which to place the pot, in order to keep it dry, &c.

The *Propagation Pot* (*fig.* 89.) has a slit in the side from the rim, to the hole in the bottom, the use of which is to admit a shoot of a tree for propagation in the Chinese manner. Opposite to the slit is an ear, or round appendage, with a hole for hanging the pot to a branch. To those who practise the mode of rooting shoots without laying them down to the ground, such pots will prove very convenient. In France and Italy they are formed in a similar manner, and for the same purpose, of tinned iron, and by such means they propagate the camellia, banksia, &c.

The *Blanching-Pot* (*fig*, 90.) is used for placing over sea-kale or rhubarb, when forced in the open air.

The qualities and durability of pots and saucers depends on the sort of clay and degree of burning, in which a knowledge can only be acquired by observation and experience. Pots too much burned, crack and fall in pieces; and those which are not burnt enough, splinter or scale off with the frost and continued moisture.

The *Plant-Box* (*figs.* 91, 92, 93.) is a substitute for a large pot; it is of a cubical figure, and generally formed of wood, though in some cases the frame is formed of cast-iron, and the sides of slates cut to fit, and moveable at pleasure. Such boxes are chiefly used for orange-trees. The construction of those of Versailles is reckoned the best; they have been imitated in this country by Sir A. Hume, whose gardener, J. Mean, thus describes them.



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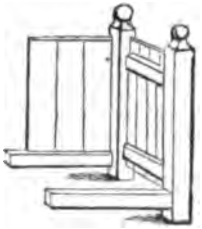

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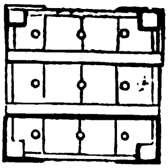


93

" Two of the opposite sides are fixed, the other two are moveable, but kept in their places by a couple of iron bars with hinges, which are fastened on one side, and on the other are hooks to catch in, (as in *fig.* 91.) that the state of the roots may be readily examined, the old earth taken out, and the fresh put in at pleasure. Another material advantage gained in these boxes is, that I am able to shift the plants by sliding them into others, while in shifting tubs the roots are generally materially injured, or the tubs destroyed in getting the plants out safe.

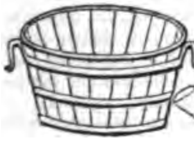
The *Plant Tub* (*fig.* 94.) is a circular utensil formed by the cooper for the same purpose as the plant-box.

The *Plant-Basket* is a vessel of wicker-work, and shaped like a large pot, not less than eighteen inches wide, by twenty inches deep, and is used by some nurserymen, and particularly by the Dutch, to grow large peach-trees, vines, &c. for deportation. By the means of these baskets, when new garden-walls or hot-houses are built, one, and often two years, may be saved in the fruit-trees; the mode is at present a good deal out of use, but deserves to be revived.

The *Planters'-Basket* is a flat, rectangular utensil of wicker-work, or boards, partitioned into three or more parts, for the purpose of carrying with the gardener when about to plant or remove plants. One division is for the plants taken up; another for the plants to be planted; and a third, for the tools which he uses, and for any decayed parts of plants, stones, weeds, or other refuse. By using such a basket the young gardener may proceed in his operations with order, accuracy, and neatness.

The *Watering-Pot* is a tinned, iron, or copper vessel, used for conveying water to plants. There are several varieties; but the principal are, 1st. the common large pot, with two roses of different sizes, the one pierced with small, and the other with large holes; 2d, the long spouted pot, for watering plants in pots, at a small distance, either with or without a rose; and 3d, the *Shelf Watering Pot*, which is a small cartouche-shaped pot for watering plants on shelves, or the back part of stoves, close under the glass, consequently above the eye of the gardener.

The *French Watering-Pots* (*figs.* 95, 96, and 97.) are generally formed of copper, and some (*fig.* 97.) have zig-zag spouts, to break the force of the water when pouring it on plants without the rose.



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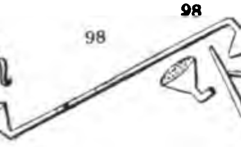

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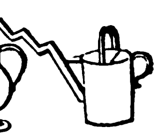

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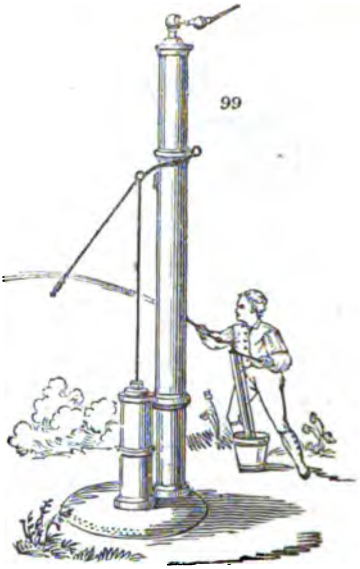
The *Watering Tube*, (*fig.* 98.) is a tin tube with a funnel joined to it at right angles at one end, and with or without a rose joined to it in an opposite direction at the other. It is used for watering pines, and other potted plants in pits or beds, not easily reached, and where it is desirable not to moisten the leaves.

The *Garden Syringe* is made of tinned iron, copper, or brass, generally about two feet in length, and two inches in diameter, it is used where the watering-engine, to be afterwards described, is not portable.

The *Hand Forcing-Pump* (*fig.* 99.) consists of a barrel-piston and directing-tube. The water is drawn up through a perforated base; and the advantage of this engine is, that it may be placed in any common watering-pot or bucket, and thus much room and some trouble and expense saved in small gardens.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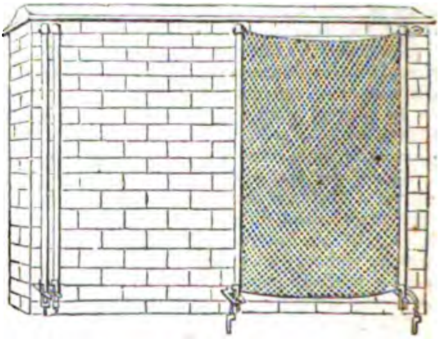
The *Portable Canvas*, or *Gauze Case*, consists of a frame of wicker-work, of any size, from that of a hand-glass, to six or eight feet high, which is covered with gauze, oiled canvas, matting, and sometimes entirely with wicker-work. It is used for protecting half-hardy shrubs and plants in the winter season, and when transplanted.

The *Oiled Paper-Shade* is a small frame like the skeleton of a hand-glass, covered with oil paper, and is used for protecting cauliflower-plants, striking cuttings, &c.

The *Straw Net* is reticulated from straw ropes, and has been found efficacious in protecting trees from frost, either thrown over an entire standard tree, or hung before fruit-walls. They are used at Dalkeith-gardens, near Edinburgh, and were formerly much resorted to in the Netherlands.

100



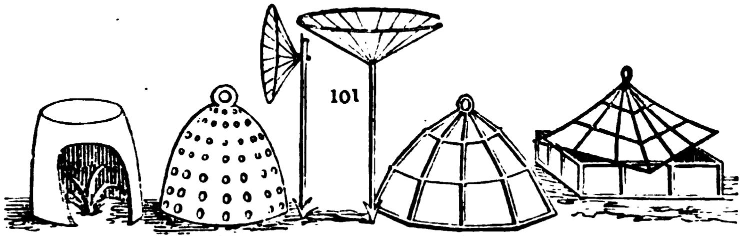
The *Garden Net* (*fig.* 100.) is similar to a common fishing-net, and is also used in the same way as the straw-net, being kept at a foot or eighteen inches from walls, and not removed from the time they are first put on, till the fruit is out of danger. In this respect they are preferable to oiled paper or gauzed coverings, which require daily removing and replacing.

The *Horizontal Shutter* is a board of eighteen inches broad, and of any convenient length. A number of such are placed horizontally, like shelves, about the middle and top of fruit-walls, to protect the blossom from perpendicular colds and frosts; they were first recommended by Lawrence, but are now seldom used.

The *Plant-Umbrella* (*fig.* 101.) resembles the domestic instrument of that name; but instead of the ordinary handle, has a pointed rod, shod with iron, for insertion in the ground. They are used for shading tender plants from the sun, or sheltering them from the rain. For both purposes it is convenient to have a joint in the stem, so as to incline the cover according to the situation of the sun and the direction of the rain. They are much used in the Paris garden, and at Monza, in Lombardy.

The *Screen Cage* is a bottomless cage of wire or wicker work, to place over tender plants, to protect them from excess of wind, sun, and rain. They are a good deal used in the botanic-gardens of the continent, for moderating the direct influence of the sun on plants of cold climates.

The *Earthenware Shelter* (*figs.* 102 and 103.) is in the form of a flower-pot, but with a section cut from one side to admit the air and light. This open side in the case of auriculas and Alpine plants, is placed to the north, and in the use of tender plants to the south, or other points. The sides shelter from two points; these utensils are exceedingly useful in transplanting tender plants, and in cultivating Alpine plants. One variety (*fig.* 103.) i entirely perforated with holes, for shading ferns, mosses, and fungi.

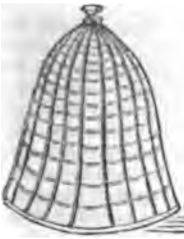


The *Leaden Hand-glass* is a small portable glazed case, formed by grooved strips of lead, and is either square or polygonal in the plan and roof. It is used for the protection of culinary and other plants, during the winter months; its first cost is less than that of any other hand glass.

The *Copper Hand-glass* (*fig.* 104.) is a very light and elegant variety of hand-glass, in which the bars are formed of copper, the sides bevelled, and the top or roof sometimes projects over the latter, with glass eaves. The lead hand-glass is the cheapest, but this is by far the most elegant; they are manufactured by Jorden, and others, in Birmingham, and constitute one of the most elegant utensils used in gardening.

The *Cast-iron Hand-glass* (*fig.* 105.) consists of two parts, the sides either square or polygonal, and the top of suitable shape. Each side is cast separate, with screws and nuts; the four sides are afterwards screwed together, and the top, which is always kept separable, is cast in one piece. When air is to be given to the plants enclosed, it is done by lifting up the top, and replacing it diagonally, by which means air is admitted in every direction; and one advantage of not being obliged to lift the bottom part is, that in severe weather, when it is frozen to the ground, air is admitted without danger of breaking the glass; and the leaves of large plants, as of cauliflower, are less liable to be injured in replacing it. A glass case may be composed from two or three of these hand-glasses, of any height, by placing two or three bottom frames one above the other. The relative prices, the size and shape being the same, is in the order of lead, copper, and cast-iron

The *Green Bell Glass* (*fig.* 106.) is one entire bell or cap of green glass, and is used for the different purposes of hand-glasses; but more especially for striking hardy plants, as pinks, dahlias, &c.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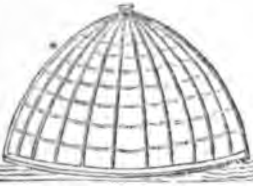
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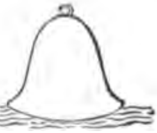
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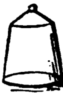
The *Wrought-iron Hand-glass* (*figs.* 107 and 108.) is composed of solid iron sash-bars, and may therefore be formed of any shape or height. It is particularly eligible for covering tender shrubs, fixed in the open air, as tree-pœony, some half-hardy mimosas, &c., and even geraniums and fuschias in the south of England.

The *Chrystal Bell* or *Receiver*, (*figs.* 109, 110, and 111.) used in gardening, is generally from three to eight inches in diameter, and from four inches to one foot in height; they are employed in sticking tender cuttings in the exotic departments, especially heaths.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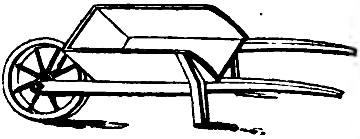
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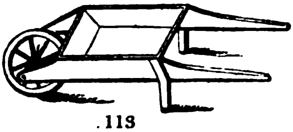
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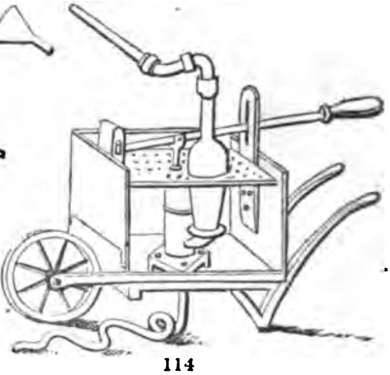


114

The essential utensils are the *sieve*, *flower-pot*, *watering pot*, and *hand-glass*.

Sect. IV. *Machines.*

All the operations of gardening may be performed by the simple tools, instruments, or utensils, already mentioned; but in practice some labours would be insufferably tedious, and others inconveniently cumbersome; and in many operations the ordinary force of man could not be conveniently brought into action.

Rollers, as opposed to the turf-beetle, is illustrative of the first case; the German devil, and Bramah's hydrostatic press, as opposed to a number of men with ropes or levers of the second, and the boat-scythe, as performing the operations of the pincers or common scythe, of the third case. But the machines of gardening are very few, and chiefly artificial contrivances for the defence of gardens or scientific machines for measurement or designation of temperature. In contriving either of these, simplicity ought to be attended to; for a complicated machine is not only more expensive, and more apt to be out of order, but there is also a greater degree of friction, according to the number of rubbing parts.

Subsect. 1. *Machines of Labour.*

621. In all machines, simple or compound, what is gained in power is lost in time, and the contrary. Thus: "Suppose that a man, by a fixed pulley, raises a beam or stone to the top of a house in two minutes, it is clear that he will be able to raise six beams in twelve minutes; but by means of a tackle, with three lower pulleys, he will raise the six beams at once, with the same ease as he before raised one; but then he will be six times as long about it, that is, twelve minutes; thus the work is performed in the same time, whether the mechanical power is used or not. But the convenience gained by the power is very great; for if the six beams be joined in one, they may be raised by the tackle, though it would be impossible to move them by the unassisted strength of one man. Consequently, if by any power you are able to raise a pound with a given velocity, it will be impossible, by the help of any machine, without increasing the power, to raise two pounds with the same velocity; yet, by the assistance of a machine, you may raise two pounds with half that velocity, or even one thousand with the thousandth part of that velocity; but still there is no greater quantity of motion produced, when a thousand pounds are moved, than when one pound is moved; the thousand pounds moving proportionally slower.

"No real gain of force is therefore obtained by mechanical contrivances; on the contrary, from friction and other causes, force is always lost; but by machines we are able to give a more convenient direction to the moving power, and to apply its action at some distance from the body to be moved, which is a circumstance of infinite importance. By machines also, we can so modify the energy of the moving power, as to obtain effects which it could not produce without this modification." *Adams.*

The *Common Garden Wheelbarrow* (*fig.* 112.) is a box, open at top, placed on two levers, terminating in a wheel and axle at one end, and in two handles at the other. They are commonly made of wood, the levers of ash or elm, and the sides and bottom of any soft wood. The wheel is either wholly of cast-iron, or of wood, shod with wrought-iron. Excellent garden wheelbarrows are now made of wrought iron; but wooden ones are better for new ground work.

The *Separating Barrow* is, in appearance, the same as the above, but the body being kept in its place by two iron bolts at opposite angles of the bottom, may be lifted off by two men, and thus tan, dung, and other articles are readily carried into hot-houses, where the wheel and levers could not be pushed along.

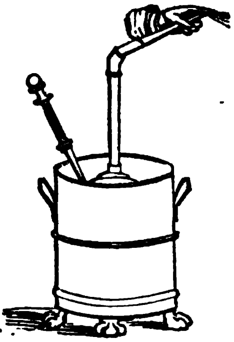
The *New Ground Work Barrow* (*fig.* 113.) differs from the first in having the sides and back very low, and a front of the same height. It is made much stronger, and is used chiefly for wheeling earth, clay, gravel, in extensive excavations, or removals of these materials. The garden barrow is used for conveying dung, weeds, and garden soils, litter, &c.

The Water-barrow, instead of a box, contains a barrel-tub or cistern, in which fluid-manure or mere water, is conveyed to different parts of the garden.

The Hand-Barrow, is a frame of wood terminating in four handles, and is used in gardening, for removing large pots or tubs of trees in blossom, or in fruit, and which wheeling might shake and otherwise injure.

The Barrow watering Engine (*fig.* 114.), is a portable forcing-pump so arranged as to throw the water forty or fifty feet distance, and either in the form of a spout or a fine shower. The cistern commonly contains from twenty to thirty gallons of water, and the frame which holds it, being fitted up as a wheel-barrow, it may be wheeled round the garden, and the walks, borders, or even the quarters to the extent of forty-five feet from the walk may be watered completely. In some cases, the most desirable variety of this machine is, that which is furnished with a sucking-pipe (*fig.* 114. *a*), like the fire-engines, by means of which, if there are ponds or regular supplies by pipes or wells in a garden, the labour of carrying the water is avoided.

115



The Curved Barrel-Engine (*fig.* 115.), has the barrel and piston-rods curved so as to form part of a circle, &c. By this construction, the bore of the barrels may be formed in the lathe, and consequently made perfectly true: the piston-rods move exactly in the direction of the axis of the barrels, and therefore operate with the least possible friction. For a portable engine this is one of the best.

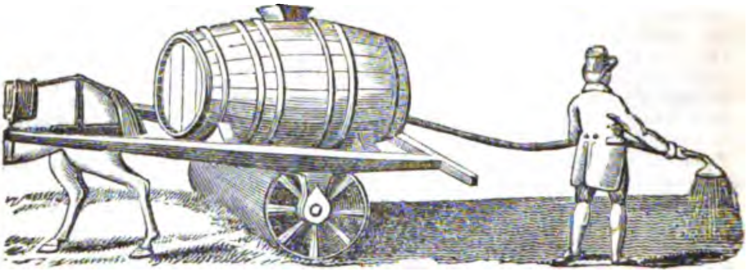
The Self-acting Green-house Engine is a small vessel of cast-iron, the upper part of which is filled with air, highly condensed by a piston, and the lower with water, which by turning the cock, is let out by a spout either as a shower or stream. The machine may be held in the hand, and the stream or shower directed against any particular plant. Instead of water, if ignited tobacco leaves are introduced, the smoke will be driven with great force to a considerable distance. This machine will throw the water from thirty to fifty feet, but its chief use is in green-houses, for the purposes of fumigation, as a plant on the upper part of a stage may thus be fumigated without touching it, or the operator being nearer it than the path. On the whole, it is more an instrument for the amateur than the practical gardener.

The *Roller* is formed either of wood, stone, or cast-iron. The first requires to be loaded; the second, from the smallness of its diameter, is heavy to draw; and therefore, the third, which may be formed of any diameter, weight, or breadth, is generally preferred for garden walks. The cylinder need not be above four feet wide, which will cover most walks at two or three breadths. For extensive lawns the horse-roller will be preferred.

The Carriage Water Barrel is used for watering lawns the first season after their formation, when the weather is dry; or for watering borders or other cultivated surfaces. In the former case, the water is delivered by a horizontal tube six or eight feet long, perforated at the lower angle so as to produce a series of horizontal jets; in the latter, a long leathern tube, terminating in a rose, is made use of. The barrel in the first case is drawn slowly along by a horse, in the latter, it is nearly stationary, and a man waters on each side as far as may be deemed advisable, or as the leathern tube admits.

The *Watering Roller* (*fig.* 116.) consists of a horse-frame, and wheels, on which is placed a water-barrel, and under it an iron roller. It is an excellent machine for lawns and roads, as they may be watered and rolled by the same operation. The person who directs the water, irrigating the space *to be* rolled, not that which has undergone the operation.

116

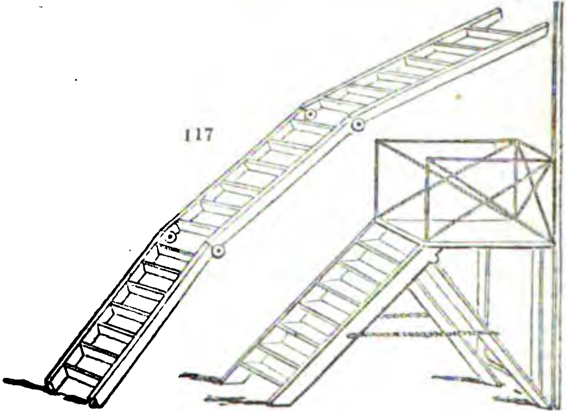


Hand-Spokes, are poles or levers, two of which are necessary to form a set or pair, terminating in each end in handles, and are used to put through the eyes or iron loops of orange or other plant boxes or tubs.

The Common Garden Ladder differs from those used in other arts, in having pieces of ten or twelve inches in length, projecting at right angles from the upper end, the use of which is to keep the ladder from injuring the trees, and admit of the operation of nailing, as well where it rests on the wall as elsewhere.

The Rule Joint Ladder (*fig.* 117.) is used for working on curvilinear roofs either of glass, or domes of lead, stone, &c. which require panes renewed or trees nailed. Each step or foot-board, has what is called a stop, to prevent the feet from breaking the glass, and at every joint is a moveable foot to project in the case of training trees on such surfaces, in order that their leaves, &c. may not be injured. Such ladders are particularly useful for repairing curvilinear hot-house roofs.

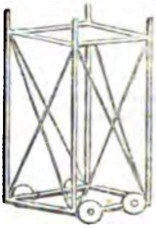
117



118

The Step-Ladder (*fig.* 118.), instead of round rods, on which to place the feet, has steps or boards, an improvement essentially necessary, where much work is to be done, because less fatiguing to the feet. Such ladders have a back or fulcrum by which they stand independently of any other object, and which is removeable at pleasure by drawing out an iron-bolt.

119

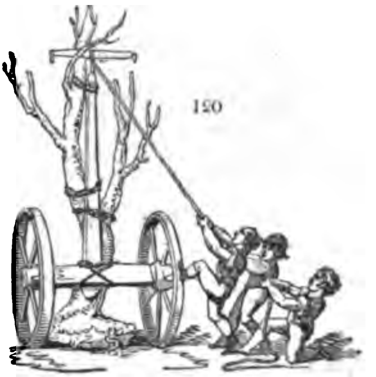


The Wheel Platform (*fig.* 119.), is a flat surface of boards generally five or six feet square, placed on the summit of a frame with wheels; it can thus be moved along lawns or walks, and is used chiefly in clipping lofty hedges. A variety of this used in some places, has folding-steps or boards on two sides, supported by brackets, by which with three men at different heights, and one on the ground, we can proceed with dressing the whole side of a hedge at once. Such a machine is used in shearing the magnificent hornbeam hedges in the imperial gardens at Schönbrunn, and those of spruce fir, at Petrowsky, Razumowsky, (85), near Moscow.

The Boat-Scythe, for mowing weeds in ponds, is a machine consisting of a boat with a system of wheels and pinions placed in the head, which give motion to a vertical shaft, containing on its lower end (which passes through the bottom of the boat into the water) three scythes; two men communicate motion to the machinery, and one man rows the boat; the upright shafts on which the scythes are placed, can be raised or lowered according to the depth of the weeds, &c. This machine has been improved by General Betencourt, but is capable of being further simplified.

The Grind-Stone, as well as *Whet-Stone*, *Scythe-Stone*, *Hone for Pen-Knives*, (the last used in making cuttings of heath and such like plants,) are necessary in every garden. Blunt spades, hoes, or knives, should never be used, as they cannot operate properly in the hands of the most expert gardener. It is a part of the duty of every master to see, that the implements of every description used by his journeymen are always clean and well-sharpened.

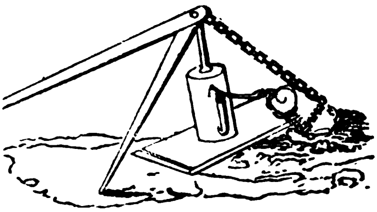
The Tree-Transplanter (*fig.* 120.), is a long beam or pole, attached to an axle and wheels. The tree being prepared for removal, and the pole placed in a vertical position against it, the stem or trunk is attached to it by ropes; thus attached, they are brought into a horizontal position, by men or horses, with the ball of earth attached to the tree. Horses may then be yoked to the axle at the opposite end of the pole, and root of the tree, and the tree drawn to any distance and planted. In favorable climates, and when a little expence is no object, astonishing effects may be produced by removing large trees, and no machine is better adapted for carrying them than this simple union of the pole and cart axle.


120

The *German Devil* is a frame of timber, with a cylinder moved by a winch, as in raising clay or earth from pits or mines by manual labour. But instead of the bucket of clay, a hook is attached to the end of the lifting rope, and this is employed to tear up the roots of trees, or stones, in clearing grounds. (See *Hunter's Evelyn's Sylva.*)

The Hydrostatic Press (*fig.* 121.) may be applied to the same purpose as the *German Devil*, with incomparably greater effect. The only difficulty is in finding a proper and convenient fulcrum; that done, this engine will root out the largest trees. It is successfully employed by engineers in drawing piles, gate-posts, raising stones, &c. (See *Nicholson's Arch. Dict.* art. *Hydrostatic Press.*)

211



The essential machines of labour may be considered the *wheel-barrow*, *roller*, and *hand forcing pump*.

Subsect. 2. *Machines of Defence.*

622. Of engines for destroying vermin, and for the defence of gardens there is a considerable variety agreeing only in their use; some are simple as the scare, others may be considered machines, as the man-trap, and spring-gun. All of them with their modes of operating, are referable to commonly understood mechanical and chemical principles, and to certain instincts and propensities of animated beings, which it is unnecessary to detail.

The *Scare*, is used to prevent birds from attacking fruits, or new sown seeds. Shreds of cloth dipt in a mixture of tar and gun-powder will often effect this by odour; dead birds, strings of feathers, mock human figures, are sometimes adopted. Two small windmills so contrived as to play a human puppet, is the scare sometimes used in Germany. Colored plaister figures of cats, dogs, eagles, hawks, and men, are all occasionally used. Nets are exceedingly useful to protect new sown seeds and ripe fruits from birds, as are branches, fern fronds, &c. &c.

The *Common Bird Trap*, (fig. 122) is a wicker case, with a furnel, through which the bird having descended in quest of the food, or bait, cannot ascend. It is successfully employed to catch young sparrows.

The *Bird Net*, is a net fixed to a hoop of four or five feet diameter, and which being set, a man concealed at a little distance, works by a cord so as to entrap the prey, while alighted beside it by the attraction of food or other birds.

The *Garden Mouse Trap*, is generally composed of a slate and a brick, supported by a combination of three slips of wood, forming the figure 4, and baited by a pea or bean. A few cats domiciled in the back sheds of hot-houses, will generally keep a walled garden clear of this enemy; but the above trap is good for open grounds.

The *Garden Rat Trap* (fig. 123), should generally be a box, or snare of some sort, rather than a toothed iron trap; because unless there is a great scarcity of food, which is seldom the case as to the field rat, it will not be allured by the bait of the former; whereas a trap may be so disguised by straw, or moss, or leaves, as not to be recognised by them till they are taken.

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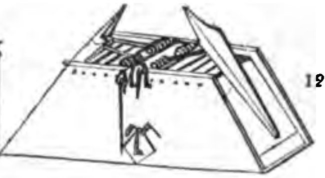
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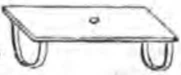
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The *Mole Trap*, (figs. 124 and 125) is of various forms, and either made of wood or iron, or of both materials. There are several varieties to be obtained in the shops; none of which appear superior to the original bow trap, though this sort any labourer may form for himself.

The *Earwig and Beetle Trap*, (fig. 126) is often only a hollow cylinder, but from this, if not taken regularly at certain seasons, the insects escape. A close box, with an inverted cone of glass in the centre as a hopper, is better; because when earwigs, beetles, wood-lice, or such insects enter, they cannot escape, and may be drowned or scalded, or suffered to die there. The common bait is crumbs of bread.

The *Wasp and Fly Trap*, is merely a bottle half full of water honied at the mouth to entice their entrance. Some assert that the plant boya carnosa, whilst in bloom, will attract wasps and all other insects from the fruit in the house in which it grows, (*Maher in Hort. Trans.* vol. i. 197.) and others that boiled carrots will have the same effect.

The *Man Trap*, is a rat trap on a large scale, differing from it only in the mode of setting; the former being baited and left loose, and the latter not being baited, but fixed to the ground by a chain. This is a barbarous contrivance, though rendered absolutely necessary in the exposed gardens around great towns. Its defect is, that its severity defeats its own purpose; for though kept and exposed to view in many places in the day time, yet few venture to set them at night, and hence intruders, calculating on this humanity, enter and commit their depredations in spite of these machines.

The *Humane Man Trap*, instead of breaking the leg by crushing, and consequently by the worst of all descriptions of compound fractures, simply breaks the leg, and therefore is comparatively entitled to the appellation of humane. It is not unfrequently set in market gardens near the metropolis.

The *Spring Gun*, is a variety of blunderbuss, mounted on a post and swivel, or pivot, and acted on by wires stretched from it in all or many directions. It is more dreaded than the man trap, and is found extremely useful in gardens and nurseries in the neighbourhood of London.

The *Concealed Alarm*, is a system of wires spread over a garden or orchard, like those of the spring gun, and terminating in an alarm which goes off when any of the wires are disturbed. This alarm may be in or near to the gardener's room, watch tower, or other suitable place, though at a considerable distance from the wires. This is, perhaps, on the whole, the best way of detecting intruders. In addition to setting off an alarm, it may let loose a watch dog, discharge a gun, &c. &c.

The *Common Gun, or Musket*, is essentially necessary for the gardener, in order to kill birds, or deter many of the enemies which the above traps and devices may still permit to escape.

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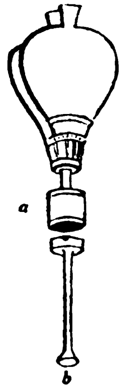

The *Fumigating Bellows*, (*fig.* 127.) differs from the common domestic bellows in having a receptacle (*a*) for leaves of damaged foreign or of home-grown tobacco, which being ignited, and the blast sent through it, a powerful issue of smoke is produced by the rose (*b*), which can either be directed against insects on particular plants, or used to fill the atmosphere of a hand glass, frame, or hot-house.

Various means. The ferret is useful for detecting rabbits, squirrels, and ground rats; the *terrier* for eradicating foxes; and *bird-lime, arsenic, corrosive sublimate of mercury, nux vomica*, and the *fly powder* of the shops may require occasionally to be used. The fly powder is useful for destroying wasps and flies in hot-houses; and by steeping seeds in a solution of corrosive sublimate, and then spreading them on the copings of walls, or the roofs of houses, so as to be out of the reach of domestic fowls, — pigeons, sparrows, and other birds, may be destroyed. Ducks and gulls eat snails, worms, frogs, &c. A great point is to assail vermin in the breeding season, and destroy their nests, eggs, young, and spawn.

The essential instruments of this class, are the *net, mole and mouse traps, fumigating bellows*, and *gun*.

Subsect. 3. *Machines of Designation.*

623. These refer chiefly to the state of the atmosphere, and mark either its temperature, density, humidity, or motion; their operations, &c. depend on that part of mechanics called statics, including pneumatics and hydrostatics, and on that part of chemistry which treats of heat. The use of these machines in forming estimates of the approaching weather, has been already noticed (611).

The *Barometer, Hydrometer, Rain Gauge*, and *Vane* or Eolian Index, may all be usefully employed in gardening, (see 612.) and should be fitted up in and about the gardener's office. The rain gauge and vane may be placed on the roof of his office, and should communicate with the interior by means of tubes and machinery, the detail of which is perfectly known to opticians, and such as fit up apparatus of this kind. The barometer is of great use in ascertaining the heights of places above the level of the sea, which, as now constructed by the best makers, they are found to do with great accuracy. (See *Dr. Woolaston's Measurement of Snowden*, by the Thermometrical Barometer, *Trans. R. Soc.* 1820, No. xviii.)

The *Thermometer* is of various sorts, generally designated by the subdivision of the scale. In that of Fahrenheit, which is almost in universal use in Britain, the point at which water freezes is marked 32° and the boiling point 212°. In that of Reaumur, which is the most generally used in Germany and Russia, the freezing point is 0, and the boiling point 80°. The centigrade thermometer, most generally used in France, as that of Celsus, which is nearly the same is, in Sweden, has the most philosophic division of all; the freezing point is 0, and the boiling point 100°. As a rule for comparing or reducing these scales, it may be stated, that 1 degree of Reaumur's scale contains $2\frac{1}{4}$° of Fahrenheit, and to convert the degrees of the one to the other, the rule is to multiply by 9, divide by 34, and add 32. One degree of the centigrade scale is equal to $1\frac{8}{10}$° of Fahrenheit, and the rule here is to multiply by 9, divide by 5, and add 32. Any of these thermometers may be proved by immersing it in pounded ice for the freezing point, and in boiling water for the boiling point, and if the space between these points is equally divided, the thermometer is correct.

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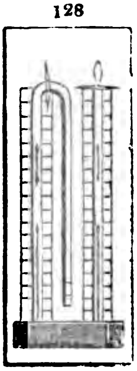

Six's Registering Thermometer, (fig. 128.) is so contrived as to indicate the extreme points to which it falls or rises in the course of the day or night, and is, therefore, particularly useful as a check upon the working gardeners, who have to attend to the fires, or steam, &c. of hot-houses in the winter time. In the open air, it is also a very useful instrument by pointing out the extremes of temperature. (See the article Thermometer in *Nicholson's Encyclopædia.*

Keuley's Alarm Thermometer (*fig.* 129.) consists of a glass tube (*aa*), about ten inches in length, hermetically sealed at one end, and united at the other to a capillary tube (*bb*), with an intervening and also a terminating ball (*c* and *d*). Imagine this double tube placed in a horizontal position, the largest tube, and half the intervening ball, filled with spirits of wine; and the smaller, and half of both of the balls, with mercury. If the tube is now fixed by its centre in a brass frame (*e*), and nicely balanced, it is evident that every change in the temperature of the atmosphere will produce a change in the position of the centre of gravity of the tubes. One degree of heat, by expanding the spirit, will press on the mercury in the intervening ball (*c*), and drive part of it over to the terminating tube (*d*), which end will, in consequence, descend like the beam of a pair of scales, or of a steam-engine. Hence a moving power of great nicety and certainty is obtained, the details for the application of which, to the ringing of a bell at any distance, but communicating by a wire (*f*), need not be here entered into. Suffice it to say, that by means of a scale (*g*), it may be set to any required temperature, and will give the alarm at a difference of even the fourth of a degree, either of depression or elevation. A perfect specimen has been exhibited in W. and D. Bailey's, 272. Holborn, since 1818, and the details of construction will be found in the Patent-office, 1816, or Repertory of Arts for January 1821. It may be occasionally used in gardening, to convey some idea of the changes taking place in the temperature of particular hot-houses, to the head gardener's-room, in the night time; but its most important uses are in domestic economy, hospitals, &c. This balance-thermometer, as it may be called, has been also applied, by its ingenious inventor, to the opening and shutting of windows or sashes, valves of chimneys, or flues, and steam-cocks, and either to all of these purposes at once, or to any one of them.

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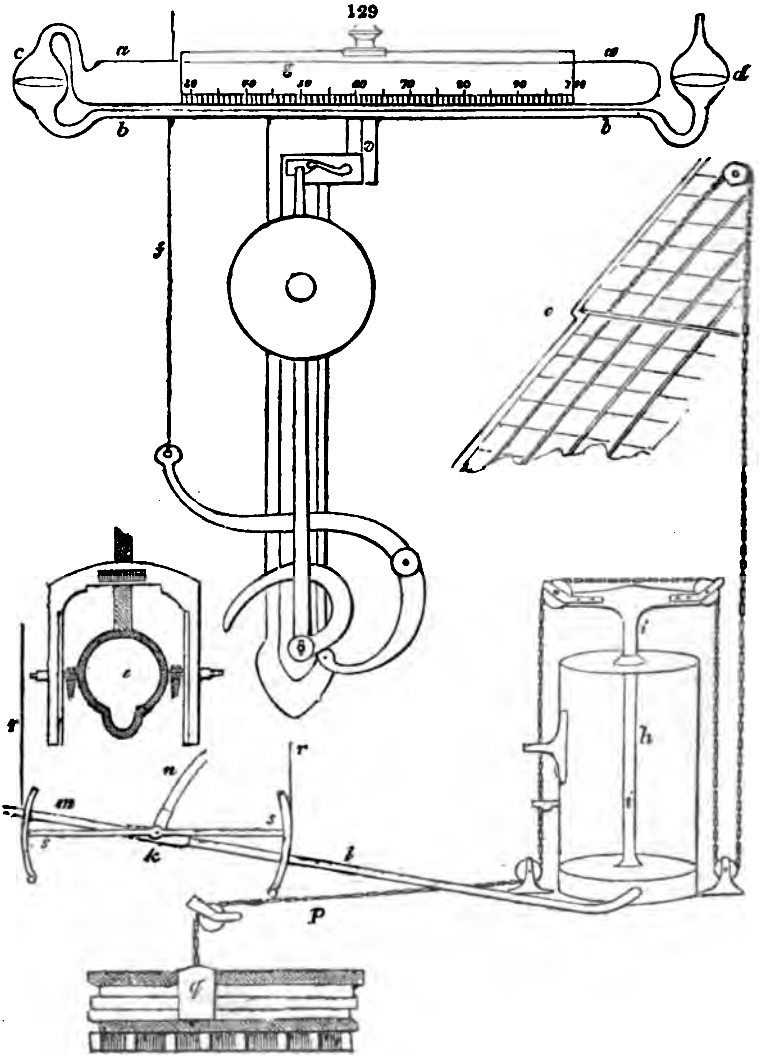

The Automaton Gardener, or Regulating Thermometer. For this purpose, the thermometer is made from two to three feet in length, and the same principle may be extended to any length, as ten or twelve feet, with a proportionate increase in the diameter. The apparatus which J. Kewley applies to the thermometer, and which enables him to get the power requisite for opening the sashes or windows of hot-houses or buildings of any magnitude, is a metal cylinder (*h*), generally of rolled copper, as being cheapest, from seven to fourteen inches in diameter, and from eighteen inches to two feet in length, with an accurately fitted piston (*i*). This cylinder is placed either within or without the hot-house or room in any convenient situation, and a cistern, or a barrel of ordinary dimensions, filled with water, is placed on an elevated situation, say on a level with the chimney-tops; or the deeper the cylinder is sunk, the less the cistern requires to be raised above the level of the floor of the house. If, as is often the case, a pipe of water is conducted through the house from a distant reservoir of ordinary elevation, then nothing more is necessary than attaching a branch-pipe. It is requisite that this pipe pass directly to the point where the thermometer is placed, and at any convenient distance under it, not higher than the bottom of the cylinder. Here it is joined to a tripartite cock (*k*), whence proceed two other pipes, one (*l*) to the cylinder, and the other (*m*) to a waste drain. The stopper to this cock turns only to the extent of about one-fifth of a circle; and when turned to this extent to the right, it opens a communication between the supply-pipe (*n*), and cylinder (*h*), when the pressure of the water in the reservoir, whether a barrel on the top of a house or a distant cistern, raises the piston, and by a communication of cords and pulleys with the sashes (*o*), they will be raised or opened; and by another chain (*p*), the fire or steam-damper (*q*), will be opened also. When the cock is turned to the left, this communication is stopped, and one opened between the cylinder and waste-pipe (*m*), by which the water escaping the piston descends, and the sashes and dampers are shut. The equilibrium of the balance-thermometer restored by the temperature, being reduced or elevated to the proper degree, the plug is neither turned to the right nor left, and every communication is closed. The cock is worked by two wires (*r r*) fastened to two short levers fixed on each side of the thermometer-frame, and the other ends of the cross or handle of the cock (*s s*). To set the machine at work, it is only necessary to place the scale to a degree at which it is desirable air should be given, taking care that the cistern is not without water. A small cask of water, regularly supplied, will answer as well as a large cistern, as the power is not as the body of water, but as its height. As a hot-house seldom remains many minutes at the same degree of heat in the day-time, it is evident the sashes would be in almost continual motion, which, in houses where the sashes open outwards, and especially the *polyprosopic*, to be afterwards described, would have a singular and animated effect in a flower-garden, or on a lawn. Where light valves or ventilators are used, the balance-thermometer of this size has sufficient power to open them without the aid of machinery; and by lengthening the tube, sufficient power may be obtained to open balanced windows in dwelling-houses, churches, or hospitals. This machine was originally contrived for the use of the inventor's own garden in Douglas, (Isle of Man,) and successfully employed to give air to pits and frames there for two seasons. Having come to London, he employed it, with the addition of more machinery (see the patent, 1816) than he now uses, to ventilate a part of a house in the New Kent Road, from 1816 to 1817. In 1818, he greatly simplified it, and thus improved, it was in operation on a hot-house in Colville's nursery, King's-road, during the summer of 1819. In both cases the success was perfect and undisputed. The price of the alarm-thermometer is from two to three guineas; and of the regulator, from six to ten pounds complete.

These machines were exhibited to Sir J. Banks, and to the Horticultural Society. But the president, and other individuals of this body, thought such a machine not wanted in gardening. We cannot but regret, however, that some mark of approbation was not bestowed on the author of so ingenious an attempt to render a service to our art, and who, like other inventors, had devoted a great part of his time, and the greater part of his fortune, to bringing the invention to its present state. We are glad to see that it has been noticed by the Caledonian Horticultural Society, (vol. iii. p. 170.) and we trust the inventor may yet obtain, at least, credit for his genius in mechanics.

Sect. V. *Miscellaneous Articles used in Gardening.*

624. These, though they partake more or less of the different classes of objects which have been enumerated, yet, according to the common use of language, could not properly have been included under either of them.

The *Flower Stand* (*fig.* 130.) is a connected series of steps or shelves, assuming, as a whole, various shapes, as circular, semicircular, conical, pyramidal, &c. The material of which it is constructed may be wood or iron, or both. Flower-stands formed of cast and wrought-iron united, have, within these few years, been brought to a very high degree of perfection.

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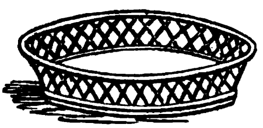

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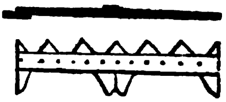


The *Basket Flower Border* (*fig.* 131.) is a rim or fret of wire, or plate-iron, and sometimes of wood, formed, when small, in entire pieces, and when large, in segments. The use of the flower-border is to enclose dug spots on lawns, so that when the flowers and shrubs cover the surface, they appear to grow from, or give some allusion to, a basket. These articles are now formed in cast-iron, and are used sometimes as edgings to flower-borders, or beds and plots, in pineries and conservatories.

Parterre Edgings are sometimes formed as above, and sometimes wrought in wire, and attached to wooden or cast-iron plinths. Basket-work of laths or willow-shoots is sometimes resorted to; the latter is cheap and neat, but requires renewal annually.

The *Earthenware Border* (*fig.* 132.) is composed of long narrow plates, of common tyle clay, with the upper edge cut into such shapes as may be deemed ornamental. They form neat and permanent edgings to parterres; and are used more especially in Holland, as casings, or borderings to beds of florists' flowers. Sometimes boards, cut in imitation of fret-work, are used, and occasionally even glazed earthenware, blue glass, &c.

Garden or *Bass Mats* are sheets of cloth, woven or matted from the *bast* (Russ.) or inner bark of trees, and generally of the lime. They are manufactured in the inland parts of Poland and Russia, of different sizes, from which they are sent to other countries. They are used in gardening for a great variety of purposes; for protecting wall-trees, by being hung before them, and removed in mild weather; for protecting espaliers and standards, by being thrown over them; for protecting more delicate shrubs, by being thrown over an envelope of hay or straw, in which way most American trees and standard roses are protected in the neighbourhood of Petersburg; for protecting tender plants coming through the ground, by being spread on its surface, and such as are of a larger size, by being supported on hooped framing. They are used to cover hot-beds, hot-houses, hand-glasses, and every sort of glass-case; to shelter plants from wind, shade them from the sun, &c. &c.

Prepared Coverings are double mats, with a layer of hay or straw within, like mattresses; they are used for covering hot-beds in mid-winter, but are readily rendered injurious by heavy rains. A mode which would answer the same effect, is to use three thicknesses of mats, keeping them apart by small frames of lath or hollow rollers; the object being to preserve vacuities or stratums of air between the glass and first mat, between the first and second mat, and between the second and third mat, which, if attended to, would resist any external cold whatever without cumbrous loads of hay, straw, &c. (See Dr. *Wells on Dew*, and *Remarks on Hot-houses*, &c. 39.)

Straw Coverings are formed of straight long wheat, or rye straw, tied in handfuls in the middle, so as each handful may be nearly of the length of two straws, and the handfuls are connected together by packthread. They are thus formed into rolls, and were formerly much used, especially in the culture of early sallading, and in covering glass cases. Melons were formerly protected by nothing more than loose wheat straw, and this mode by rolls seems merely a more economical and neat mode of practice. Loose wheat straw is used by the market-gardeners, to protect early crops of radishes and other salladings.

Reed Coverings are formed exactly like those of straw, and are used chiefly for protecting glass, or forming protecting cones round tender shrubs, or bee-hives of the common kind.

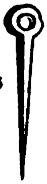
Protecting Bags, for guarding ripening fruits from insects, are formed of gauze, oiled-paper, or muslin-paper; gauze is preferable, as it admits the air. They are used with advantage, in the case of grapes and stone-fruits, on walls in the open air, and in some cases are required even in hot-houses.

The *Feet* or *Shoe Scraper* is a plate of iron, fixed vertically, either in a portable or fixed frame; and to render it complete, should always have a rigid brush and dust-box attached, both of which may be taken out and cleaned; their use in gardening is considerable, portable ones being placed at the entrances to every description of garden-building, and fixed ones at the exits from quarters to the main walks. They ought to abound, and their use be effectually insisted on wherever clean and pure gravel or turf walks are desired objects.

Props for Plants are of two kinds, rods or poles, and spray. Rods vary from six inches to six feet in length or upwards, tapering to a point, and thick in proportion. For small plants in pots, and for delicate bulbous roots, as hyacinths, small splinters of lath, dressed with a knife or small plane, are the best; and for hyacinths and florists' flowers, in general, they should be painted green; for botanical plants, however, this may, in some cases, appear too formal. For hardy plants and climbing shrubs, young shoots or poles of hazel or ash from copse-woods are the most suitable; they should, in general, be straight and tapering to a point, and as delicate as the weight of the plant, and the exposure of the situation will admit The side shoots of these props should, in most cases, be cut off; but in others, as in propping the dahlia, it is desirable to have some lateral studs, from three to eight inches long, near the top, so as to spread out the head. In lieu of this, several props are sometimes used, placed in form of an inverted pyramid, or cone, or of a regular prism. One prop, however, judiciously managed, will generally be found sufficient. In no case should the bark be removed, because its natural tint is less glaring, and therefore preferable to that of peeled wood, and also because it preserves better the texture of the wood. In order that they may last several years, they should be cut in mid-winter, and the thick end pointed and charred by burning, or dipped in boiling pitch. The elegant propping of plants deserves the particular attention of the young gardener, as it is frequently done in so slovenly a manner as greatly to detract from the order and neatness which ought to reign in most descriptions of gardens. In pleasure grounds or picturesque scenes, trees and shrubs should, in general, prop themselves, or each other; but in flower and botanic-gardens, flower-borders and green-houses, &c. the greatest degree of art and high keeping, and a sort of *drilled polish*, easier felt than described, ought always to prevail. In all that respects this part of gardening, the French and Germans greatly excel the English, who are herein too apt to look at the end, without regarding the means.

Spray or *Branches* are used as props for plants furnished with tendrils, as the common pea, and many of the leguminous tribe. Spreading, frond-like, and yet thin spray, such as that of the beech, hazel, or Scotch elm, is generally preferable; but for early crops the spray of the resinous tribe, and especially of the spruce and silver firs, is valuable, as producing warmth and shelter, by its numerous chaffy leaves, which are non-conductors.

Wall Tree-nails are of several sorts, but the principal are, first, the small cast-iron nail, in most common use with lists; second, the flat-headed wrought iron nail, used either with lists, loops of cord, or mat; and third, the eyed cast-iron nail, (*fig.* 133.) used with small pieces of spray, dried willow twigs, or mat-ties, as in trellis training. Its chief advantage is the not being so liable to lodge the larvæ of insects as the nails which are used with lists; and once driven, they never require removal, as the branches may be loosened, or altered, by merely taking out the slips of spray, or cutting the mat-ties. *Caled. Mem.* vol. iii.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Wall Tree-lists are marginal ends or shreds of broad cloth, cut into lengths of from two and a half to four inches, and from one-half to one inch in breadth, according to the size of the shoots, &c. Their grand disadvantage is the harbouring of insects, for which some have substituted shreds of leather with advantage, and others recommend steeping the shreds in a mixture of sulphur and soap-suds, or better, that of corrosive sublimate, recommended for preserving specimens of plants (272). The colors of black, scarlet, and reddish-brown, are the best for lists, as contrasting well with vegetation.

Bass-mat Ties are formed from the ligular threads of bass-mats, drawn out and separated into thin ribbons, and to be dipped in water, and twisted, before being used.

Osier Twigs are generally used for tying espaliers, especially where the branches are large; or for tying raspberries and standard vines.

Boards and *Planks* are used in gardening, for wheeling up declivities, over steps and hollows, across borders, walks, &c. The *notched* or *bridge plank* is used to protect edgings, serving as a bridge across borders. *Tressels* are used for raising planks in extensive operations on the soil, in forming pieces of water, new gardens or garden scenery.

Besides these articles, there are a variety of others, such as *Scoria*, from a forge, used for forming a platform for pots, impervious to worms; *gravel, sand, lime, oyster-shells*, &c. which need not be enumerated.

CHAP. II.

Structures used in Gardening.

BY this term, we mean to designate a class of buildings which differ from all other architectural productions, in being applied to the culture, or used exclusively as the habitation of plants. As edifices, the principles of their construction belong to architecture; but as habitations for plants, their form, dimensions, exposition, and, in many respects, the materials of which they are composed, are, or ought to be, guided by the principles of culture, and therefore under the control of the gardener. They may be arranged into the *moveable*, as the hot-bed frame; *fixed*, as the wall, trellis, &c.; and *permanent*, as the hot-house.

SECT. I. *Temporary or Moveable Structures.*

Of these, some are for protecting plants in fixed places, as against walls or trellisses, and exemplified in the different methods of covering by canvass, netting, or glass-frames; others constitute habitations for plants, as the hot-bed frame, pit, &c.

SUBSECT. 1. *Structures Portable, or entirely Moveable.*

625. These include opaque, semi-transparent, and transparent framed coverings to plants.

The *Canvass Screen* is a sheet of canvass in a moveable frame, to be placed against blossoming wall-trees during nights, and removed during temperate weather. Bunting, rendered more transparent by oiling, is considered by Nicol as preferable to canvass. Others recommend Osnaburgh or Scotch gauze, a Dundee and Arbroath linen manufacture well-known.

The screens should have hooks, to hook into projecting eyes at the top of the wall, from which, as well as at bottom, they should be kept distant one or two feet. "Canvass screens in frames may be fitted to move in the manner of a common sash, between rafters, and may be double, as in a window, to go either up or down, in order to admit air. The rafters being made moveable, by being fixed with hooks to stretchers at top and bottom, the whole could easily be removed, or be replaced at pleasure. Thus, a frame might be made of ten, fifteen, twenty, or more feet in length, to answer for one or more trees, as may be required; and if the whole be packed and laid up in a dry loft, garret, or shed, each season after using, it may last for many years." *Nicol.*

The *Canvass Curtain* is so arranged by means of pulleys and weights, as to be drawn up over a wall of a hundred feet in length in a few seconds, and let down and spread out to dry in as short a time. It is kept at a distance from the trees by cords stretched from the coping to the ground in a sloping direction. A fine example of this occurs at Dalmeney Park garden, near Edinburgh, erected under the inspection of J. Hay of Edinburgh, a meritorious designer of kitchen-gardens. "If screens be made in sheets," Nicol observes, "they are best to hoist up and lower with pulleys and cords, (which pulleys may be fixed to the coping, as above-mentioned, or to a beam or stretcher fixed at the top of the wall), they should be suspended over small rafters or spars, of an inch and a half to two inches square, according to their lengths, placed so closely as to prevent the canvass from dashing against the trees, as above hinted. Sheets of this kind may be of any convenient size, and made to cover one or more trees, as may be required. I have had one sheet 200 feet in length, which I could join or unjoin at two or three different places, and could unclew and hoist, or lower and clew up, in fifteen or twenty minutes. I first contrived it to clew at the top of the wall, but afterwards found it safer to do it at bottom, as a gust of wind had once nearly torn it away altogether. In the clew it was hung by loops to the bottom part of the upright spars, (which were placed at four feet asunder,) so as to be a few inches clear of the ground. These rafters were fastened with hooks and eyes to the coping at top; and at bottom to stakes drove fast into the earth, eighteen inches clear of the wall." *Kalendar.*

The *Oiled Paper-Frame* consists of a light frame of timber, with cross bars morticed into the sides, and intersected by packthread, forming meshes about nine inches square. Common printing-paper is then pasted on, and, when quite dry, painted over with boiled linseed oil. These frames are then fitted to the wall, or subject of protection, according to circumstances.

The *Netting-Screen* (*fig.* 100. p. 330.) "consists of two deal poles, on which is nailed thin canvass, previously dipped in a tanner's bark-pit, to prevent its being mildewed when rolled up wet. At the top, the ends of the poles fit into double iron loops, projecting a few inches from the wall, immediately under the coping; and at the bottom they are fixed by a hole at the end of each pole upon a forked iron coupling, which projects about fourteen inches from the wall, thereby giving the screen a sufficient inclination to clear the branches. When it is wished to uncover the trees, one of the poles is disengaged and rolled back to the side of the other, where it is fastened as before. The most violent winds have no injurious effects upon shades of this kind; a wall is very expeditiously covered and uncovered, and there is not any danger of damaging the blossoms in using them; they occupy very little space when rolled up, are not liable to be out of order, and although rather expensive at first, seem to be very durable. From the facility with which the screen is put up, it may be beneficially used in the seasons when fruit ripens, to secure a succession, by retarding the crop of any particular tree. The lower ends of the poles are advantageously retained in their place, by means of a small iron spring key attached to the coupling by a short chain." *Hort. Trans.* vol. iv.

The *Common Glass Case* is a glazed wooden frame or frames, so contrived as to fit together, and cover either single trees, espaliers, or shrubs too large for the hand-glass. The flavour of plumbs and cherries on espaliers in bad seasons is much improved by the use of this structure. In France it is chiefly used for peaches.

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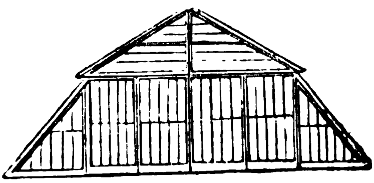
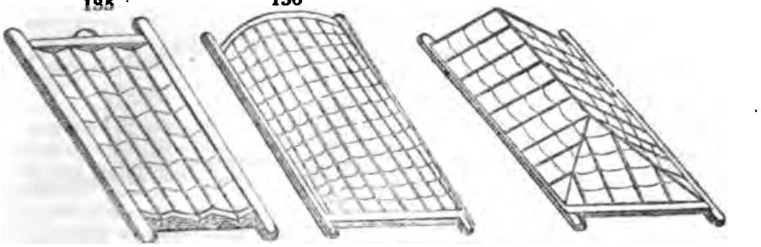


The *Glass Tent* (*fig.* 134.) for orange-trees, consists of a number of frames, chiefly parallelograms, but partly truncated triangles, easily put together and taken asunder, to be used in the summer months in growing melons, or covering walls or espalier rails; and in winter in protecting orange-trees in situations where they are planted in rows against walls, or groves in the open air, and in which mode they always prosper the best; or for other obvious purposes.

The *Common Hot-Bed Frame* is a rectangular box of wood, bottomless and highest at the side to be placed to the north, subdivided by cross bars dove-tailed into the outer frame, and each subdivision covered by a glazed sash. T. A. Knight, instead of having the north side of the frame highest, has all the four sides of equal height, but forms the basement of the dung-bed, and builds the dung-bed itself of that slope which he thinks most suitable for the sashes of hot-beds. These sashes are commonly framed of timber; but they are sometimes formed of wooden cases, or styles and rails, as the carpenters' phrase is, and filled in with cast or wrought-iron sash bars, or copper bars. In general they are flat on the surface, but in some cases the surface is in angular ridges, or ridge and furrow-work (*fig.* 135.), cuniform (*fig.* 136.), or trigonal (*fig.* 137.), in order, in each of these cases, to admit more of the rays of the sun in the morning and afternoon, and to moderate it in the middle hours of the day. Such frames are used for placing over beds of hot dung, for growing cucumbers, forcing roots or flowers, and for a great variety of purposes.

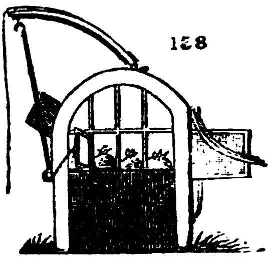
135 136 137



The *Separating Frame* is similar to the common frame in form; but the four sides, instead of being morticed into one another, are fastened by keyed iron bolts, which easily admit of their being taken asunder and put under cover, when not wanted for use; these frames may, consequently, be preserved longer from decay, and are also more portable than the common sort.

The *Moveable Bottomed Frame*, is either of the two last with a moveable bottom, to be raised or lowered by a power composed of a pinion and screw, or any other equally convenient power. The bottom is composed of perforated boards, and has boarded sides to keep in the earth. The object is to prevent plants from being burned when the dung is very hot, by raising them; to raise them close to the glass when young, and to lower them in cold nights. The chief difficulty in managing it is, to keep the earth of uniform moisture. Lawrence, in the last edition of his *Kalendar* (1715), suggests the idea of putting a bottom of wire to the frames of hot-beds, and of covering it with flat tiles, and over these the earth, &c. so as to admit of the whole being lifted, and the dung below stirred or renewed at pleasure. He says he has not seen it done, but merely suggests it as a hint to the ingenious. A century afterwards, J. Weeks invented his patent forcing-frame, which is that just described.

Mallet's Frame (*fig.* 138.) is the invention of a French horticulturist of that name, and the advantages it possesses are, 1. The admission of more light and solar heat from the elevated angle of the curvilinear roof; and, 2. The direct admission of the sun's rays when air is given. Professor Thouin (*Cours d'Agriculture*, &c. art. *Chassis*) says they have not been much used, owing to the cost of their first construction.


138

Of these structures, the *common hot-bed frame* with flat sashes can alone be reckoned essential; and next in order, the *canvass-curtain* or *netting-screen*.

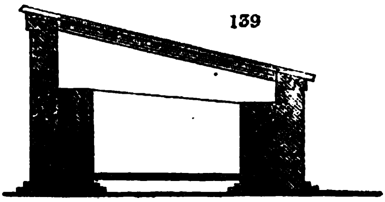
Subsect. 2. *Structures partly Moveable.*

626. These include glass frames, placed on masonry, or other fixed foundations of timber or iron.

Pits form an intermediate building between the frame or hot-bed, and the hot-house. There are several varieties, the chief of which are, the earth-pit, bark-pit, the flued-pit, M'Phail's pit, the dung-pit, the pit with rising frame, and the pit with fixed roof.

The *Earth Pit* is in part sunk in the earth, and in part raised above it by walls of loam or turf. On these walls, glass-frames are sometimes placed, and at other times only mats. Such pits are used by nurserymen and market-gardeners, and answer perfectly for the preservation of half hardy plants.

The *Bark Pit* is also partly sunk in the ground, and in part raised above it; but instead of earth or turf-walls, they are formed of brick or stone, finished with a wooden coping the width of the wall, in which cross rafters are morticed to contain the sashes. For ordinary purposes, such as growing melons or young pines, or half-hardy plants, such pits need not be above five feet deep, and if only one sash between each rafter is to be used, they should not be above six or eight feet wide. Where double sashes, one lapping over the other are to be used, the width of the pit may be from eight to twelve feet. Artificial heat is supplied to such pits entirely from the tan or leaves in their bottom; consequently they are better fitted for growing summer crops, as melons, cucumbers, &c. and nursery articles, as cuttings of vines, &c., than kitchen crops.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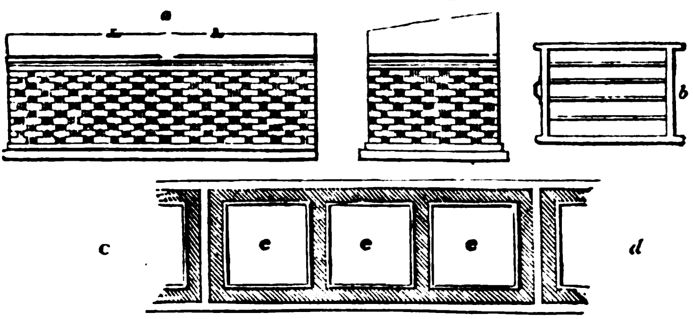
The *Flued Pit* (*fig.* 139.) is the same as the last described, with the addition of a flue, which either makes the circuit of the pit, or runs along and returns by the back wall of the pit. This is the most generally useful description of this class of buildings, as, whenever the heat of the bark or other fermentable matter subsides, or whenever the air in the pit is too moist, and in danger of generating damps, a fire can be lighted which will remove both evils. Pines are now grown and fruited in such pits, and even in pots and frames, without flues, heated entirely by linings of dung, and to greater advantage than in large stoves. Pits are also, in many cases, heated by steam, which is found a very important saving of fuel, and improvement of the climate. Andrews, of Vauxhall, and Gunter, of Earl's Court, the two most extensive pine growers near London, have both adopted pits, and the method of heating them by steam.

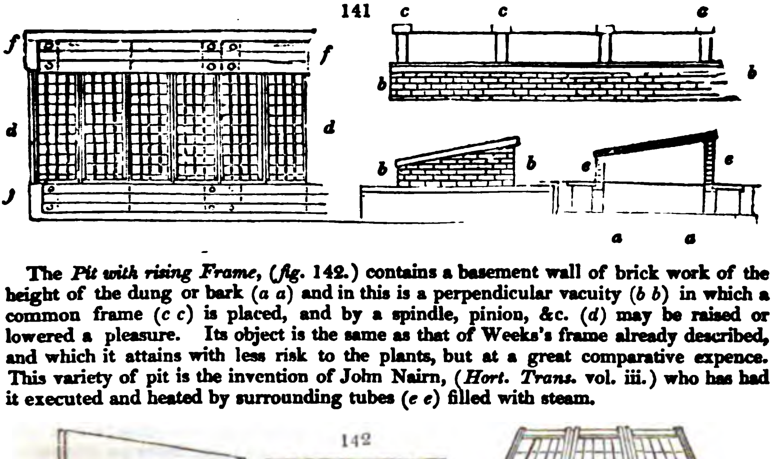
M'Phail's Pit (*fig.* 140.) consists of two parts, the frame (*a*), and lights (*b*), which are of wood, and not different from those used for growing cucumbers, and the basement (*c d*) on which the frame is placed, which is flues of brick work, with the outer wall uniformly perforated. Against these perforated flues, linings of dung are formed, the steam of which enters the flue and heats the earth (*e e*) in the centre of each light. The chief objections to this plan are the first cost, and the greater consumption of dung, which some allege is required to keep up the proper heat. Its advantages are, that hot dung may be used without any preparation, by which much heat is gained; and in the winter months, when a powerful artificial heat is required, and (in the case of common hot-beds) is apt to burn the plants, they are here in the coldest part of the soil, and cannot possibly be injured by any degree of heat which can be communicated by dung.

140



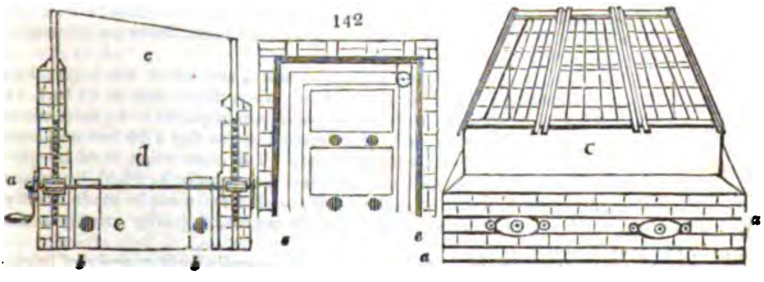
The *Alderstone Hot-bed or Pit*, (*fig.* 141.) consists of cast-iron pillars of 3 feet in height, (*a a*) which being joined by plates of that metal, form a support to the wall on which the sashes rest. Above ground, this wall (*b b*), of four or nine inches in thickness, is built on the iron plates, and carried the usual height of a cucumber frame. On this, a coping, or plate, either of wood or iron, is placed, to which is fixed cross rafters either of wood or iron, (*c c*), to hold the sashes (*d d*). Around the pit is a trench, (*e e*), of the same depth as the cast-iron pillars, and its exterior sides supported by a brick wall. The centre of the bed under the sashes, is filled with dung or bark in the usual manner, and the surrounding trench is destined for linings, which being protected by the wall and covered by boards (*f f*), supported on cross pieces of iron, retain their heat longer, and are less influenced by changes in the atmosphere. The chief advantage alleged in favour of this frame, is the greater durability of the brick walls, than frames of wood, and its more elegant appearance in a garden.

141



The *Pit with rising Frame*, (*fig.* 142.) contains a basement wall of brick work of the height of the dung or bark (*a a*) and in this is a perpendicular vacuity (*b b*) in which a common frame (*c c*) is placed, and by a spindle, pinion, &c. (*d*) may be raised or lowered a pleasure. Its object is the same as that of Weeks's frame already described, and which it attains with less risk to the plants, but at a great comparative expence. This variety of pit is the invention of John Nairn, (*Hort. Trans.* vol. iii.) who has had it executed and heated by surrounding tubes (*e e*) filled with steam.

142



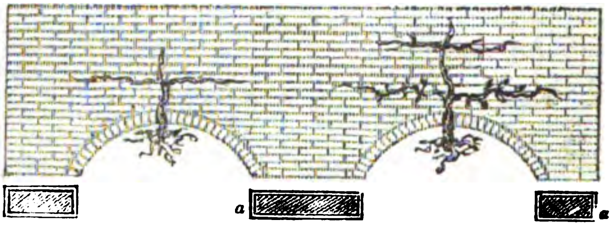
Sect. II. *Fixed Structures.*

627. This class of edifices consists chiefly of erections for the purpose of improving the climate of plants by shelter, and by exposing them to the influence of the sun.

Garden Walls are formed either of brick, wood, stone, or earth, or brick and stone together; and they are either solid or hollow, upright or sloping, straight or angular.

Brick, Stone, or Mud Walls consist of three parts, the foundation, the body of the wall, and the coping. The foundation should be somewhat broader than the body of the wall, and of depth proportionate to the quality of the sub-soil, or intended plan of culture. In some cases where it is intended the roots should have free access to both sides of the wall, it should be placed on arches (*fig.* 143.), or piers, with plank stones, the soffit or under-crown of the arch being within 6 inches, or 1 foot of the surface, and the arches or openings, smaller or larger, according to the power of the materials to resist the pressure of the wall. The arch should be a segment of a circle, or an ellipsis, and the piers (*a a*) proportioned to the qualities of the foundation and the superstructure. Where the body of the wall commences, there will be a set-off or rebate (from *rebattre*,) of one or two inches on each side, which should be commenced below the height of the ground surface, both for the sake of appearance, and to prevent the alternate action of the air and rain from rotting the mortar in the rebate. The body is generally carried up of the same width to the coping; but where the walls are high, say 18 feet, it may taper equally on both sides to 14 inches; in doing which, great care must be taken by the bricklayer to make good joints. To facilitate this, some architects have bricks formed of a smaller size for the upper part of the wall. It is not settled among gardeners whether the coping should project at all; or if it projects, how much, and what proportion on each side. Nicol is of opinion it need not project at all, and that there is no occasion, as is generally done, to level the coping stones to the north, or less useful side of the wall, to throw off the rain in that direction. Walls without copings have two advantages in their favour; the first is, that no insects are harboured in the angle, as is generally the case; and the second, that trees are more readily trained over from one part of the wall to the other, a practice which has been found to induce a fruitful state in trees, which had never produced fruit. There is also some saving in extent of coping. On the other hand, copings which have a considerable projection are known to protect wall-trees from spring frosts. We prefer for this purpose the moveable copings recommended by Miller. (See 620. and *Hort. Trans.* vol. iv.)

143

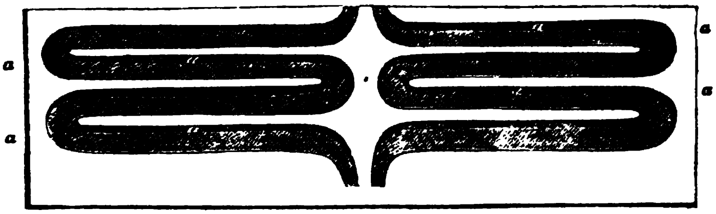


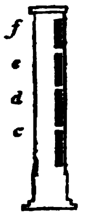
The *Brick and Stone Wall*, is a stone wall faced with four inches of brick work, or what is called *brick and bed*, on the side most exposed to the sun, as on the south sides of east and west walls, and on the insides for the sake of appearance of the two end, or north and south walls of enclosed gardens. Where free working stone abounds on the spot, such walls are erected at much less expense than walls entirely of brick. Whether they are as dry, durable and warm, depends on the sort of stone; some schistous, and other argillaceous stones are apt to be damp, but compact lime stones may be accounted as good as brick, and if they are of a dark grey or blue color, better on account of their absorption and refraction of heat.

The *Solid Brick Wall*, is the simplest of all garden walls, and where the height does not exceed 6 feet, 9 inches in thickness will suffice; when above that to 13 feet, 14 inches, and when from 13 to 20 feet, 18 inches in width are requisite. In most cases, such walls may be contracted in width as they are carried up, so that a 20 feet wall may begin with 18, and terminate in 9 inches in breadth. The contraction must be gradual from bottom to top; or if accomplished by rebates, they must be bevelled, by means of a course of sloping edged bricks at each set off; and these must be made exactly alike on both sides of the wall, in order to preserve its centre of gravity exactly in the centre of the foundation.

The *Flued-wall, or Hot-wall*, (figs. 144 and 145.) is generally built entirely of brick, though where the stone is abundant and more economical, the back or north side may be of that material. A flued wall may be termed a hollow wall, in which the vacuity is thrown into compartments (*a*, *a*, *a*, *a*,) to facilitate the circulation of smoke and heat from the base or surface of the ground, to within one or two feet of the coping. They are generally arranged with hooks inserted under the coping, to admit of fastening some of the description of protecting covers already mentioned, and sometimes for temporary glass frames. A length of 40 feet, and from 10 to 15 feet high, may be heated by one fire, the furnace of which (*b*), being placed 1 or 2 feet below the surface of the ground, the first course or flue (*c*) will commence 1 foot above it, and be 2 feet 6, or 3 feet high, and the 2d, 3d, and 4th courses, (*d*, *e*, *f*,) narrower as they ascend. The thickness of that side of the flue, next the south or preferable side, should for the first course be 4 inches, or brick and bed; and for the other courses it were desirable to have bricks cast in a smaller mould; say for the second course 3, for the third 2¾, and for the fourth, 2½ inches in breadth. This will give an opportunity of bevelling the wall, and the bricks beng all of the same thickness, though of different widths, the external appearance will be every where the same.

144





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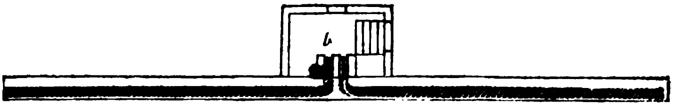
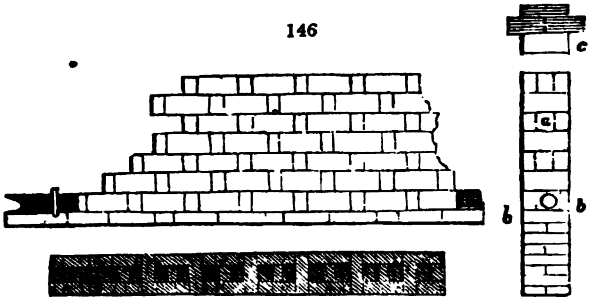


Sometimes a vacuity is formed between the flue, and the south or valuable side of the wall (*Hort. Trans.* iv. 139.); but this, we think, may be considered an extravagant refinement. It cannot be carried into execution without employing a great quantity of materials and much labor. A wooden or wire trellis is also occasionally placed before flued-walls; but both modes suppose a degree of forcing which does not appear advisable unless the wall is kept constantly covered with glass, in which case, without this precaution, constant fires might injure, by occasioning the partial growth of the trees, or even burning those parts of them immediately opposite the furnace. To prevent accidents of this kind, the furnace must always be placed at some distance, say from eighteen inches to three feet from the back of the wall.

The *Cellular Wall*, (*fig.* 146.) is a recent invention, (*Hort. Trans.* vol. iv.) the essential part of the construction of which is, that the wall is built hollow, or at least with communicating vacuities (*a*), equally distributed from the surface of the ground (*b*), to the coping (*c*). The steam tube of cast-iron (at *b b*) is introduced in the lower part, and conducted along the foundation, and the vapour allowed to ascend through the cells to the top. It condenses on the masonry, and heats uniformly the whole material of the wall. If the height does not exceed 10 or 12 feet, these walls may be formed of bricks set on edge, each course or layer consisting of an alternate series of two bricks set edgeways, and one set across, forming a thickness of nine inches, and a series of cells, nine inches in the length of the wall, by three inches broad. The second course being laid in the same way, but the bricks alternating or breaking joint with the first. The advantages of this wall are obviously considerable in the saving of material, and in the simple and efficacious mode of heating; but the bricks must be of the best quality, and the mortar such as will not be injured by alternate drought and moisture. For this purpose, Stourbridge or London bricks will be found the best, and either common mortar mixed with powdered ferruginous stones, pozzolana (*decomposed lava*), tarras (*decomposed basalt*), or pure lime and clean coarse sand used in a recent state. This wall has been tried in several places near Chichester, and at Twickenham, (by F. G. Charmichael,) and found to succeed perfectly as a hot wall, and at 10 feet high to be sufficiently strong as a common garden wall, with a saving of one brick in three. As a whole, indeed, it is stronger than a solid nine-inch wall, on the same principle that a hollow tube is less flexible than a solid one. It is evident, that the same general plan might be adopted in forming cellular walls of greater height, by increasing their width. A very high wall might have two systems of cells divided vertically, one or both of which might be heated at pleasure. The same idea may be advantageously applied to flues, for heating hot-houses by steam, and for other purposes.

146



Where wall-fruit is an object of consideration, the whole of the walls should be flued or cellular, in order that in any wet or cold autumn, the fruit and wood may be ripened by the application of gentle fires, night and day in the month of September. It is an error to light the fires of hot walls only in the evenings, the effect of heat in the process of maturition being much greater when accompanied by light. In all hot walls one precaution must not be neglected, the building in on the inferior or outer side, small cast iron doors, or framed stones, which may be opened with ease, in order to withdraw the soot. They must be made perfectly air-tight, which is readily accomplished by having double cast-iron doors, in what is called Count Rumford's manner.

The Mud or Earth-Wall (*fig.* 147.), is formed of clay, or better of brick earth, in a state between moist and dry, compactly rammed and pressed together between two moveable boarded sides (*a a*), retained in their position by a frame of timber (*b b*), which form between them the section of the wall (*c c*): these boarded sides are placed, inclining to each other, so as to form the wall tapering as it ascends; one layer of the length of twelve or twenty feet being completed, another layer is formed on that, and so on, till the wall attains the limited height, which in the Netherlands, and some parts of Germany, where these walls prevail, is seldom above ten feet. At Lyons they are often fifteen and eighteen feet. Sometimes a trellis is placed before them, but in general the branches of the trees are fastened by means of wooden hooks of six or seven inches long, which are driven into the walls, and from these twigs are stretched across, as in the case of the eye-hole wall-tree nail (*fig.* 133.), already described. These walls are generally covered with a projecting coping of thatch, or boards; the latter is much the neatest, and least liable to harbor insects. Peaches are grown on them in France and Germany, but in this country, where the weather is more variable, and the atmosphere more generally charged with vapour, particular attention requires to be paid to the coping. This attended to, these *en pisé*, or mud-walls, may be useful as shelters to cottagers' gardens, but rarely of much service as sources of wall-fruit. For a more particular account of their construction, see *Communications to the Board of Agriculture*, vol. ii.; or *Nicholson's Arch. Dict.* art. *Wall.*

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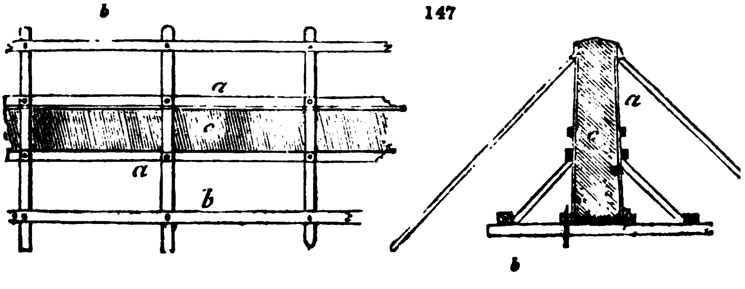

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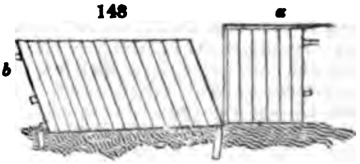
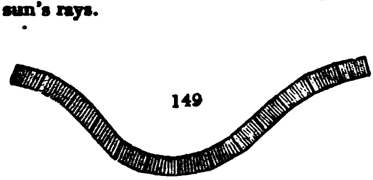


Boarded or Wooden Walls (*fig.* 148. *a*), are variously constructed. One general rule is, that the boards of which they are composed, should either be imbricated or close jointed, in order to prevent a current of air from passing through the seams, and in either case well nailed to the battens behind, in order to prevent warping from the sun. When well tarred and afterwards pitched, such walls may last many years. They require a slight head as a coping, and must be set on stone posts, or the main parts or supports formed of cast iron. Nicol informs us (*Kalendar*, p. 149.) "that he has constructed many hundred lineal feet of wooden walls, which recline considerably towards the north (*fig.* 148, *b*), presenting a surface at a better angle with the sun than if they were upright. They are placed on sloping ground, and range in five ranges or lines, due east and west, at the distance of seven yards from each other, the southmost being five feet high, and the northmost seven, composed of imbricated boarding, pitched over to give them durability; the supports are set on (not in) blocks of stone, which are sunk in the earth, and firmly laid on solid foundations, three feet under the ground level."

Inclined fruit-walls seem to have been first suggested about the beginning of the eighteenth century, by N. F. de Douillier, F. R. S. an able mathematician, author of a work entitled "Fruit Walls improved by inclining them to the Horizon, &c." Some walls were formed at Belvoir Castle on this plan, which Switzer informs us he went to see, but found them damp, and the trees liable to be injured by perpendicular frosts. De Douillier's work, as being the production of a speculative theorist (he was tutor to the Marquis of Tavistock) appears to have been rejected by Miller, Switzer, Lawrence, and the designers of gardens, of that day, but it is replete with ingenuity and mathematical demonstration, and well illustrates the importance of sloping walls where they are to be protected by glass or gauze. For exposed walls, it does not appear that this form will ever be adopted, chiefly on account of the difficulty of building them, the inutility of the northern or inferior side, and because, if formed in the most economical manner, they would not serve as fences. In particular situations, as in the case of terrace slopes, they certainly merit trial, and if covered in severe weather, there can be no doubt that their surface, by being more perpendicular to the sun's rays in summer, would receive a greater accession of light and heat. See the mode of constructing inclined surfaces as the back-walls of hot-houses, in "*Remarks on Hot-houses*," quarto, 1817.

In a communication to the Horticultural Society, (vol. iv. p. 140.) by Stoffels, gardener at Mechlin, he states, "that he had an opportunity of comparing the effect of a sloping and perpendicular wall in the same garden, and for the growth of peach-trees, and that the result was greatly in favour of the former." It appears to us, that for this and other fruit-trees that do not grow very rigid at the root or main stem, a boarded wall which might be inclined at pleasure, to an angle of 45° to both sides of the perpendicular, might be advantageously adopted. In the day-time, or at least when the sun shone in the beginning of summer, it might be inclined to the north, (the trees being planted on the south side,) to give the trees the advantage of the sun; and during severe weather in autumn, or at any time when it was either desired to protect or retard the trees, it could be inclined to the south to protect them from dews, and shade them from the sun's rays.



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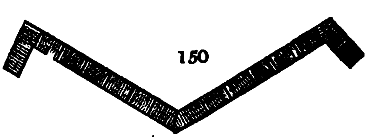

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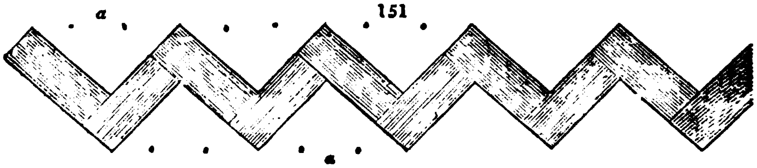
The Wavy or Serpentine Wall (*fig.* 149.) has two avowed objects; first, the saving of bricks, as a wall in which the centres of the segments composing the line are fifteen feet apart, may be safely carried fifteen feet high, and only nine inches in thickness from the foundations; and a four inch wall may be built seven feet high on the same plan. The next proposed advantage is, shelter from all winds in the direction of the wall; but this advantage seems generally denied by practical men. Miller says, he saw them tried at Le Cour's in Holland, and that the trees which grew on them were in no respect superior to those on straight walls. They have been tried at different places in the northern and southern provinces of Britain, and at Dunkeld, were held to be injurious by creating eddies, &c.

The Angular Wall (*fig.* 150.), is recommended on the same general principles of shelter and economy as the above; it has been tried nearly as frequently, and as generally condemned on the same grounds.

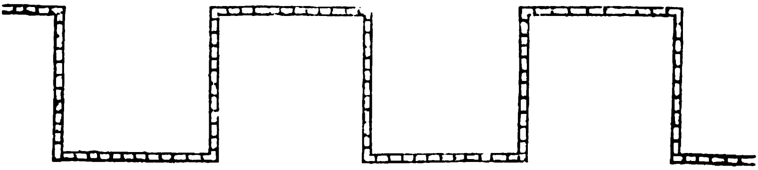
The Zig-zag Wall (*fig.* 151.) is an angular wall in which the angles are all right angles, and the length of their external sides one brick or nine inches. This wall is built on a solid foundation, one foot six inches high, and fourteen inches wide. It is then commenced as in the figure, and may be carried up to the height of fifteen or sixteen feet of one brick in thickness, and additional heights may be given by adding three or four feet of brick on edge. The limits to the height of this wall is exactly that of a solid wall of fourteen inches thick; that being the width of the space traversed by the angles or zig-zag. That as a whole it is sufficiently strong for all purposes of shelter, or a fence against cattle, may be proved by applying to it the first problem in dynamics; the two diagonal lines formed by the zig-zag producing an equal resistance to one line directly across a fourteen inch wall. In training on these walls, wires are stretched horizontally from angle to angle, and either four and a half, or nine inches apart, or upright rods of wood (*a a*) may be employed; they are, however, better adapted for fences, or walls of botanic, flower, or nursery gardens, than for fruit-walls.

151



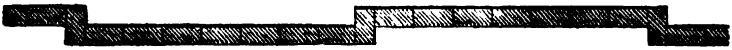
The Square Fret Wall (*fig.* 152.), is a four inch wall like the former, and the ground-plan is formed by joining a series of half-squares, the sides of which are each of the proper length for training one tree during two or three years.

152



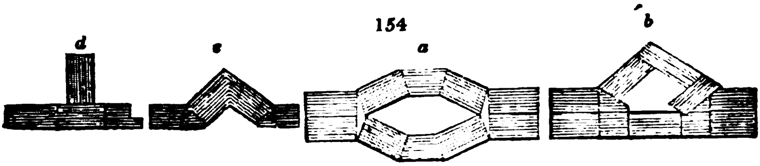
The Nurseryman's, or Self-Supported Four-Inch Wall (*fig.* 153.) is formed in lengths of from five to eight feet, and of one brick in breadth, in alternate planes, so that the points of junction form in effect piers nine by four and a half inches. This wall is the invention of J. Lee, of the Hammersmith Nursery, and is well calculated for training peaches and other fruit-trees for public sale. It seems to be the most economical wall that can be devised, as the parts forming piers are as useful as any other part of the wall, which is not the case with piered walls of the common sort.

153



The *Piered Wall* (*fig.* 154.) may be of any thickness with piers generally of double that thickness, placed at regular distances, and seldom exceeding the wall in height, unless for ornament. These piers are generally made square in the plan; but they have been found to be less obstructive to the training of trees, when rounded at the angles (*a*); or angular, and either hollow (*b*), or deviating (*c*), or solid. The same remark will apply to piers formed partly to support the wall, but principally as in the gardens laid out by London and Wise, Bridgeman, &c. for sheltering the fruit-trees.

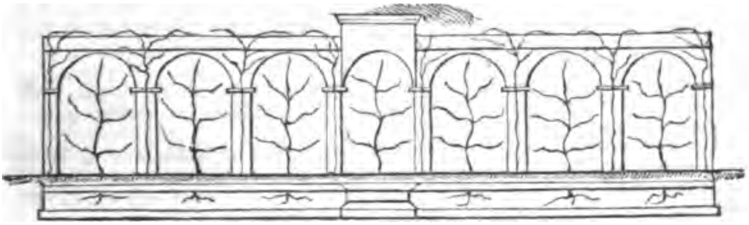
154



Where training is not a leading object, a thin deep projection (*d*) is much stronger as a whole, than the clumsy square piers generally formed by routine practitioners.

Sheltering Piers were formerly, in some cases, made of such a width and depth as to contain a niche for training a vine, and, in that case, they were frequently raised above the coping of the wall. Examples of such piers exist in the walls of the kitchen-garden at Claremont, built from the designs of Brown, and at Hatton in Scotland, built after a design by London and Wise.

155



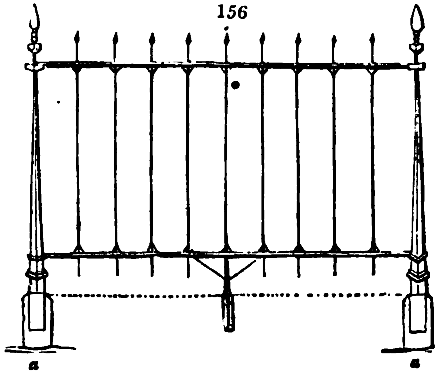
Arched, Niched, or Recessed Walls, (*fig.* 155.), were contrived for the same purpose by Switzer, which, at least, had a massive imposing effect to the eye. Such walls were generally heated by flues, and formed in fact the intermediate link in the progress of improvement between hot-walls and forcing-houses.

Espalier Rails are substitutes for walls, and which they so far resemble, that trees are regularly spread and trained along them. They are formed of wood, cast-iron, or wire and wood.

The *Wooden Espalier*, of the simplest kind, is merely a straight row of stakes driven in the ground at six or eight inches asunder, and four or five feet high, and joined and kept in a line at top by a rail of wood, or iron hoop, through which one nail is driven into the heart of each stake. If the lower ends of the stakes are charred, and the sort of wood be larch, oak, ash, or birch, with the bark adhering, they will last for many years; but stakes of young Scotch firs or poplars lose their barks and soon decay. Young larch-trees are much the most durable.

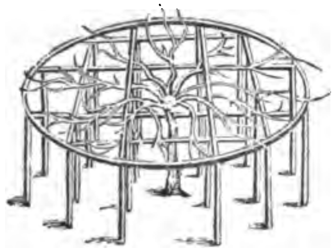
The *Framed Wooden Espalier Rail* is composed of frames fitted with vertical bars at six or eight inches asunder, which are nailed on in preference to morticing, in order to preserve entire the strength of the upper and lower rails. The end styles or uprights of the frame are set on stone piers, and attached and kept upright by irons leaded into the stone. This is the most frequent mode of construction, but sometimes the frame is fitted-in with lattice-work, or wire, or stout laths; and instead of stones, oak posts, or posts of fir charred, are driven into the ground, to which to attach the styles of the frames.

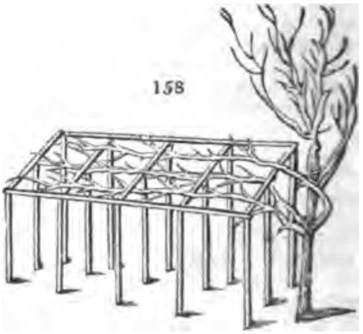
156



The *Cast-Iron Espalier Rail*, (*fig.* 156.) necessarily very much resembles a common street railing, but it is made lighter. The columns or styles may either be fixed in oak or stone (*a, a*); or, when this mode is not adopted, to form their base in the shape of a reversed ⊥, setting them on a foundation of four-inch brickwork. Such espalier rails have been tried in Scotland (*Caled. Mem.* i.483.) and found to come somewhat cheaper than wooden ones; but their great advantage must be their durability, (especially when well painted, or oiled, whilst the iron is hot,) and the elegance of their appearance.

157





158

The *Horizontal Espalier Rail* (*figs.* 157. and 158.) is a frame of wood or iron, of any form or magnitude, and either detached or united, fitted in with bars, and placed horizontally, at any convenient distance from the ground. For dwarf trees the common height is three feet, and for standards, six feet. In the latter case, the frames may be arched, and the trees trained so as to form a bower, covered way, &c. These have not been much used, nor, from the loss of ground, and the too violent constraint on the tree, is it likely they will ever become general.

The *Oblique Espalier Rail* is composed of frames of bars, lattice-work, or of boards placed obliquely. (*Hort. Trans. App. to Vol. II.*) Trees will no doubt thrive well, trained on such surfaces, but, unless they run north and south, one side will be of little use; and even running north and south, they can only enjoy half the day's sun. The ground too under them, unless used as a walk, must be in a great degree lost, so that these rails are on the whole inferior to the common sort. A portable glass case, (*fig.* 134.) the sashes of which are calculated for covering these or any description of espalier rails, has been already described.

Of these structures, the common *brick wall*, both as a fence, and retainer of heat, may be reckoned essential to every kitchen-garden.

SECT. III. *Permanent Horticultural Structures.*

628. Here we place hot-houses and mushroom-houses. Buildings with glass roofs, or artificial habitations for plants, constitute by far the most important part of garden structures, whether we regard the expence of their first erection, the skill required to manage them, or the interesting nature of their products.

We have already seen, (117.) that green-houses were known in this country in the seventeenth century. They were then, and continued to be, in all probability, till the beginning of the 18th century, mere chambers distinguished by more glass windows in front than were usual in dwelling rooms. Such was the house in the apothecarys' garden at Chelsea, mentioned by Ray in 1684, (*Letters, p.* 174,) as being heated by hot embers put in a hole in the floor; a practice still extant in some parts of Normandy, and to which, as is well known, the curfew, or *couvrefeu* bell refers. The same general form of house is given by Evelyn in the different editions of his *Kalendarium* up to 1700, with the addition of a furnace or oven; but there does not appear to have been any deviations from it in point of form till about the year 1717, when Switzer published a plan for a forcing-house, suggested by the Duke of Rutland's graperies at Belvoir Castle. This may be considered as the first æra of improvement in hot-houses. Miller, Bradley, and others, now published designs, in which glass roofs were introduced; and between the middle and the end of the last century, Speechley and Abercrombie in England, and Kyle and Nicol in Scotland, made various improvements in forcing-houses, as to general form, internal arrangements, and mode of heating. The largest plant stoves were the joint productions of the late W. Aiton, and Sir W. Chambers at Kew, and the largest pineries were erected at Wellbeck by Speechley.

A second æra of improvement may be dated from the time when Dr. Anderson published a treatise on his Patent Hot-house, and from the publication of T. A. Knight's papers in the Horticultural Society's Transactions, both of which happened about 1809. Not that the scheme of Dr. Anderson ever succeeded, or is at all likely to answer to the extent imagined by its inventor; but the philosophical discussion connected with its description and uses, excited the attention of some gardeners, as did the remarks of T. A. Knight on the proper slope of glass roofs (*Hort. Trans.* vol. 1.); and both contributed, there can be no doubt, to produce the patent hot-houses of Stewart and Jorden, and other less known improvements. These, though they may now be considered as reduced *au merite historique*, yet were really beneficial in their day. Knight's improvements chiefly respected the angle of the glass roof, a subject first taken up by Boerhaave a century before, adopted by Linneus, (*Amen. Acad.* 1. 44.) and subsequently enlarged on by Faccio in 1699, Adanson, (*Familles des Plantes*, tom. i.) in 1763, by Miller in 1768, Speechley in 1789, by John Williams of New York (*Tr. Ag. Soc. New York*, 2d edit.) in 1801, by T. A. Knight in 1806, and by some intermediate authors whom it is needless to name.

The last and most important æra is marked by the fortunate discovery of Sir G. Mackenzie in 1815, "that the form of glass roofs best calculated for the admission of the sun's rays is a hemispherical figure." This may be considered as the ultimatum in regard to the principle and perfection of form; and it is remarkable that a few years before the introduction of steam as a vehicle for conveying heat in hot-houses, which had been attempted by Wakefield of Liverpool, in 1788, and Butler, gardener to the Earl of Derby in 1792, now attracted notice, and has become very general in extensive forcing and exotic departments near the metropolis.

Considerable emulation seems now to exist as to this department of Horticulture; great exertions are making in the erecting of curvilinear roofs on Sir G. Mackenzie's principle; one house for growing palms and scitamenese, by Messrs. Loddige, is 45 feet high and 60 feet wide, and another by the same nurserymen for green-house plants, is 23 feet wide, 18 feet high, and upwards of 100 feet long, without a single rafter or standard: and these spirited cultivators, and also Messrs. Gunter, Grange, Wilmot, and others, have heated the whole of their extensive ranges of glass by steam. T. A. Knight has also erected an extensive house with a curvilinear roof for the growth of pines.

One grand cause of the improvements which have been made in hot-houses, may be traced to their being no longer as formerly under the control of mansion architects. To civil architecture, as far as respects mechanical and chemical principles, or the laws of the strength and durability of materials, they are certainly subject in common with every description of edifice; but in respect to the principles of design or beauty, the foundation of which we consider, in works of utility at least, to be "fitness for the end in view," they are no more subject to the rules of civil architecture, than is a ship or a fortress; for those forms and combinations of forms, and that composition of solids and openings which are very fitting and beautiful in a habitation for man or domestic animals, are by no means fitting, and consequently not beautiful in a habitation for plants. Such, however, is the force of habit and professional bias, that it is not easy to convince architects of this truth; for structures for plants are considered by them no further beautiful than as displaying not only something of architectural forms, but even of opaque materials. Utility, however, we repeat, is the basis of all beauty in works of use, and, therefore, the taste of architects so applied, may safely be pronounced as radically wrong.

We shall consider the subject of hot-houses as to the principles of construction, external forms, and interior details.

Subsect. 1. *Principles of Design in Hot-houses.*

629. To ascertain principles of action, it is always necessary to begin by considering the end in view. The object or end of hot-houses is to form habitations for vegetables, and either for such exotic plants as will not grow in the open air of the country where the habitation is to be erected; or for such indigenous or acclimated plants as it is desired to force or excite into a state of vegetation, or accelerate in their progress to maturity, at extraordinary seasons. The former description are generally denominated green-houses or botanic-stoves, in which the object is to imitate the native climate and soil of the plants cultivated; the latter comprehend forcing-houses and culinary-stoves, in which the object is, in the first case, to form an exciting climate and soil, on general principles; and in the second, to imitate particular climates.

The chief agents of vegetable life and growth in their natural habitations are *heat*, *light*, *air*, *soil*, and *water*; and the merit of artificial climates consists in the perfection with which these are imitated.

630. Such *heat* as is required in addition to that of the sun is most generally produced by the ignition of carbonaceous materials, which heat the air of the house, either directly when hot embers of wood are left in a furnace or stove, placed within the house, as in Sweden and Russia; mediately, as when smoke and heated air, from, or passing through ignited fuel is made to circulate in flues; or indirectly, when ignited fuel is applied to boil water, and the hot vapour, or the water itself, is impelled through tubes of metal or other conductors, and either to heat the air of the house at once, as in most cases, or to heat masses of brick work, sand, gravel, ruble or earth, tan, or even water, (*Hort. Trans.* vol. iii.) which materials may afterwards give out the heat so acquired slowly to the atmosphere of the house. But heat is also occasionally supplied from fermenting

vegetable substances, as dung, tan, leaves, weeds, &c., applied either beneath or around the whole or a part of the house, or placed in a body within it.

In particular situations heat may be obtained from anomalous sources, as in Iceland, Tœplitz, and Matlock, from hot springs; and perhaps in some cases, especially in coal districts, from a basement composed of certain compounds of sulphur and iron, &c. Dr. Anderson (*Treatise on the Patent Hot-house,*) proposed to preserve the superfluous heat generated by the sun in clear days, and to retain it in reservoirs placed under, above, or at one side of the house, re-admitting it as wanted to keep up the temperature; but the plan, though ingenious and philosophical, required too much nicety of execution, and the clear days in this country are too few to admit of its answering as a substitute for artificial heat. Heat must not only be produced, but its waste avoided, by forming as large a portion of the cover as possible of materials through which it escapes with difficulty, as far as this is consistent with other objects. Hence, in certain classes of houses, the side to the north is formed of opaque and non-conducting materials.

631. *Light* is admitted by constructing the roof, or rather cover of the soil, of transparent matter, as oiled paper, talc or glass, (the last being found much the best material,) joined to as small a proportion of opaque substances, as timber or metal, as is found consistent with the strength requisite to bear the weight of the glass, resist the accidents of weather, &c. All plants require perpendicular light, but some, as many succulents and others, which throw out, or are allowed to radiate their branches on all sides, require the direct influence of light on all sides; others naturally, as creepers or climbers, or artificially, when rendered creepers or climbers, by the art of training on walls or trellis, require direct light on one side only; and hence it is, that for certain purposes of culture, hot-houses answer perfectly well when the transparent covering forms only a segment of their transverse section, provided that segment meets the sun's rays at a large angle the greater portion of the growing season. This, of course, is subject to limitations and variations according to circumstances, and has given rise to a great variety in the external forms of hot-houses, and the angles of their roofs. It decides, however, the necessity of placing all houses whose envelope is not entirely transparent, with their glazed side to the south.

The introduction and management of light is the most important point to attend to in the construction of hot-houses. Every gardener knows, that plants will not only not thrive without much light, but will not thrive unless they receive its direct influence by being placed near or at no great distance from the glass. The cause of this last fact has never been satisfactorily explained (See *Sowerby on Light and Colors,* quarto, 1816.) It seems probable, that the glass acting in some degree like the triangular prism, partially decomposes or deranges the order of the rays. It is an important fact also, that light in nature is always accompanied by heat; and, therefore, it should not only be an object to admit the sun's direct rays in clear weather when he is visible, but even when the rays are refracted and deranged by clouds and vapours, when he is invisible. Some recent experiments made (at Rooksnest, Surrey) on the influence of reflected light in raising the temperature of houses with light iron roofs as compared with heavy wooden ones, which, of course, exclude much light, place this matter in a striking point of view; but as these experiments have not yet been made public, it would be unsuitable to the nature of this work to detail them.

The theory of the transmission of light through transparent bodies, is derived from a well-known law in optics, that the influence of the sun's rays on any surface, both in respect to light and heat, is directly as the sign of the sun's altitude, or in other words, directly as his perpendicularity to that surface. If the surface is transparent, the number of rays which pass through the substance, is governed by the same laws. Thus, if 1000 rays fall perpendicularly upon a surface of the best crown-glass, the whole will pass through, excepting about a fortieth part, which the impurities of even the finest crystal, according to Bouguer, will exclude; but if these rays fall at an incidental angle of 75°, 299 rays, according to the same author, will be reflected. The incidental angle, it will be recollected, is that contained between the plane of the falling, or impinging ray, and a perpendicular to the surface on which it falls.

The benefit derived from the sun's influence on the roofs of hot-houses depends, as far as respects form of surface, entirely on this principle. Boerhaave applied it to houses for preserving plants through the winter, and of course required that the glass surface should be perpendicular to the sun's rays at the shortest day, when most heat and light were required. Miller (*Dict.* art. *Sun,*) applied it to plant-stoves, and prefers two angles in the roof; one, as the upright glass, to meet the winter's sun nearly at right angles, and the other, as the sloping glass, to meet him at an angle of 45° for summer use, and "the better to admit the sun's rays in spring and autumn." Williamson (*Hort. Trans.* vol. i. p. 161.) prefers this angle (45°) in all houses, as do most gardeners, probably from habit; but T. A. Knight prefers, in forcing-houses at least, such a slope of roof as shall be at right angles to the sun's rays, at whatever season it is intended to ripen the fruit. In one of the examples given (*Hort. Trans.* vol. i. p. 99.), his object was to produce a large and highly flavored crop, rather than a very early crop of grapes; and he accordingly fixed upon such a slope of roof as that the sun's rays might be perpendicular to it about the beginning of July, the period about which he wished the crop to ripen. The slope required to effect this purpose in latitude 52°, he found to form an angle of 34° with the plane of the horizon. In the application of the same principle to the peach house (*Hort. Trans.* vol. i. p. 206.) in order to ripen the fruit about midsummer, the roof was made to form an angle with the horizon of 28°. Both these houses, Knight assures us, produced abundant crops perfectly ripened.

On this subject, the Rev. T. Wilkinson has the following observations. "Although it is probable, that more depends on the management, than on the inclination of the roof, in any *forcing-house* whatever, yet as it is satisfactory to proceed on something like principles, I endeavoured to ascertain why an angle of 34° was preferable to any other; which has led me to take a general view of the subject. By pointing out the times when the sun's rays will be perpendicular to any construction, and the reflexion at the different angles of incidence, we shall be enabled to compare, with some accuracy, the effects of the sun on different degrees of inclination, abstractedly of internal arrangement, stoves, flues, and culture. Now the angle contained between the back wall of the *forcing-house*, and the inclined plane of the glass-roof, always equals the sun's altitude, when his rays fall perpendicularly on that plane, provided that the inclination of the plane to the horizon be at an angle not less than 28° 2′, nor greater than 75°. The former is the case with most cucumber-frames, the latter with many vineries. It also follows, that within the above limits, the sun's rays are perpendicular twice in the year, once in going to, and once in returning from, the tropic. Hence then, having determined in what season we wish to have the most powerful effects from the sun, we may construct our houses accordingly by the following rule. Make the angle contained between the back wall of the house and its roof, = to the complement of latitude of the place, ± the sun's declination for that day on which we wish his rays to fall perpendicularly. From the vernal to the autumnal equinox, the declination is to be added, and the contrary.

"To apply these principles to the construction recommended by Knight, we have the inclination of roof, = 34°. Therefore the sun's altitude, when his rays fall perpendicularly, is 56°, which, taking the latitude of London to be 51° 29′, will happen when his declination is 17° 31′, about May 20, and July 21. Now we want the genial warmth of the sun most in spring, and therefore, for general purposes, that construction would perhaps be best which gives us the greatest quantity of perpendicular rays then. If the inclination were 45°, the sun's rays would be perpendicular about April 6th, and September 4th. This construction has the following limit: the height of the back wall must not exceed the width of the house, + the height of the front wall. And as the rays would vary very little from the perpendicular for several days before and after the 6th of April and September 4th, the loss of rays arising from reflexion, would, as appears from the annexed table, be nearly a minimum. Even at the winter solstice, the loss by the obliquity of the angle of incidence would be only two in 1000 more than when the rays fall perpendicularly, as appears by the following table.

"*Bouguer's Table of Rays reflected from Glass.*

Of 1000 incidental rays when the angle of incidence is

87° 30′	584 are reflected.	60°	112 are reflected.
85	543	50	57
82 30	474	40	34
80	412	30	27
77 30	356	20	25
75	299	10	25
70	222	1	25"
65	157		

Hort. Trans. vol. ii. p. 237.

632. A portion of the atmosphere being inclosed by the tegument, the plants within are necessarily supplied with *air*, which may be raised in temperature, charged with vapours, or renewed at the will of the operator. It might also be put in motion by art, for the sake of obtaining strength of stem in ramose or tree-like plants; but the motion communicated to plants, by opening the cover, and exposing them to the direct influence of the air in fine weather, is deemed sufficient, either for this purpose, or giving flavor to fruits when advancing to maturity. A very fit machine for putting air in motion, or for extracting air, was invented by B. Deacon (see *Patent-office*, 1812, and *Remarks on Hot-houses*, Part II.) It is impelled by manual labour or clock or jack machinery, and has been successfully used for ventilating public rooms and churches.

633. *Soil*, it must be obvious, is perfectly within the control of art, which, in fact, can far

surpass nature, when increased dimensions of the parts of plants and improved quality of fruit are objects.

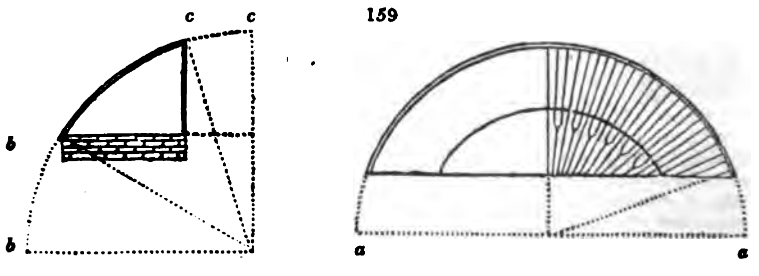
634. *Water* is equally at our command with soil: it may be made to pass through the house in a surface-rill; or under the soil in subterraneous channels; may be retained in a cistern or bason; or introduced in tubes, either to throw up innumerable jets from the floor; or pour them down from the roof to serve as rain. It may be supplied directly to the roots of plants, without wetting their leaves in the manner of irrigation (572.); be stagnated round them, as in natural marshes, or made to ascend as vapour from steam-pipes, by pouring it on flues or hot bodies, or even watering the floor or interior surface of the house. Having ascended and filled the air, it parts with its caloric, and is precipitated on the plants in the form of dew.

SUBSECT. 2. *Forms of Hot-house Roofs.*

635. Till very lately, as we have seen (628.) the general form and appearance of the roofs of hot-houses, was that of a glazed shed or lean-to; differing only in the display of lighter or heavier frame-work or sashes, which were generally moveable in grooves. But Sir Geo. Mackenzie's paper on this subject, and his plan and elevation of a semi-dome (*Hort. Trans.* vol. ii. p. 175.), have materially altered the opinion of scientific gardeners. T. A. Knight made the first observations on this figure. Sir George Mackenzie's plan for forcing-houses, he observes, is extremely interesting; but contains "some defects which cannot be obviated without deviating from the spherical to the spheroidal form, which Sir George states to be objectionable, on account of the great nicety requisite in the workmanship. On making a few trials, to ascertain the varieties of forms which might be given to forcing-houses, by taking different segments of a sphere, I, however, soon became perfectly satisfied that forcing-houses, of excellent forms, for almost every purpose, and of any convenient extent, might be constructed without deviating from the spherical form; and I am now perfectly confident, that such houses will be erected, and kept in repair at less expence, will possess the important advantage of admitting greatly more light, and will be found much more durable than such as are constructed according to any of the forms which have been hitherto recommended."

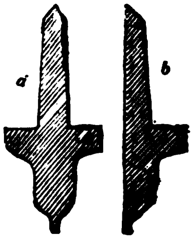
The objections to the proportions given in Sir George Makenzie's plan, considered with reference to culinary houses, is, that the house would be much too high relative to its width and length, "that the too close approximation of the bars at top would give too much shade, and that the vapour condensed into water would necessarily drop upon and injure the fruits and plants, owing to the want of sufficient declivity in the upper part of the roof; there is also a large portion of the glass towards the bottom of the roof, which stands much too nearly upright. But the whole of these defects may be readily removed by employing a small segment (*fig.* 159. *b c*) of a much larger sphere, (*fig.* 159. *a, a,*) as Sir G. S. Mackenzie has suggested, and as low and as wide a forcing-house as can be wanted for any purpose, may be readily obtained. Instead of the half of a hemisphere of thirty feet diameter, let the half of one of fifty feet (*a a*) be chosen, and from the base of this, cut off thirty-five degrees (*b, b,*), and from the summit fifteen degrees (*c, c,*); and the following proportions for a forcing-house (*fig.* 159. *b, c,*) will be given." "Its height," including eighteen inches of upright opaque front, opening as shutters, "will be twelve feet; its width in the centre fourteen feet, and its length very nearly forty feet; and there are very few purposes for which a house, constructed according to some of the intermediate forms, between that above-mentioned and the acuminated semi-dome, will not be found extremely well adapted."

159

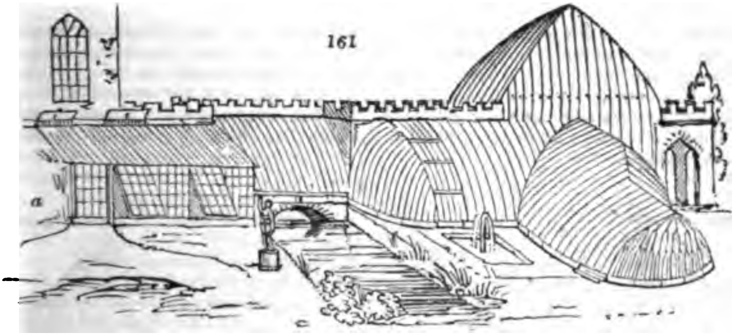


A few observations on Sir G. Mackenzie's plan, and the improvements on it, proposed by T. A. Knight, were made by P. Niel (*Edin. Encyc.* art. *Hort.*) and the next in order by us in *Remarks on the construction of hot-houses, &c.* 1817. A year

160

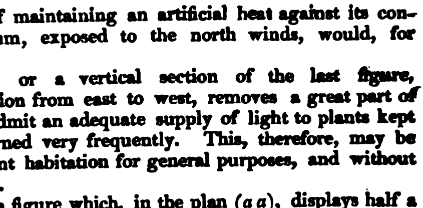


before we had invented a wrought-iron sash-bar, the section of which (*fig.* 160. *a*) is not more than half an inch wide, and a half bar (160. *b*) equally light (a specimen of both of which was presented to the Hort. Soc. in May 1816.); and in 1818 we completed a considerable erection of glass roofs at Bayswater (*fig.* 161.), on the curvilinear principle, the first, we believe, attempted in Britain. The object of such a junction of different curvatures in the Bayswater example is to show, that, in regard to form, the strength and tenacity of the iron bar, and the proper choice of shape in the panes of glass, admits of every conceivable variety of glazed surface. In this we have completely succeeded, without in the least interfering with the objects of culture. To render all these improvements available by the public, as matters of trade, we transferred, in 1818, our right in the invention of the bar to efficient tradesmen, (W. and D. Bailey, 272, Holborn, London), who have since, from our plans, constructed a number of curvilinear houses in different parts of the country. Some of these will be afterwards referred to.


161

We shall now submit a few forms of houses on the curvilinear principle, and afterwards some specimens of the forms in common use; for these forms, it is to be observed, are not recommended to be laid aside in cases where ordinary objects are to be attained in the easiest manner; and they are, besides the forms of roofs, the most convenient for pits, frames, and glass-tents, as already exemplified in treating of these structures.

a 162

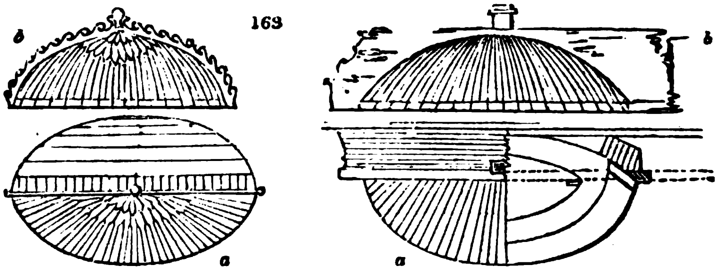


636. The *Acuminated Semi-Globe.* (*fig.* 162.) The most perfect form of a hot-house is indisputably that of a glazed semi-globe. Here plants, as far as respects light, would be nearly in the same situation as if in the open air; and art, as already observed (631.) can add heat, and all the other agents of vegetation, nearly to perfection. But in respect to excluding the rain, this form is too flat at top, and requires to be acuminated; and in regard to economy, the first cost and expence of maintaining an artificial heat against its constant abduction through a thin medium, exposed to the north winds, would, for most purposes, be a great objection.

637. An *Acuminated Semi-Dome,* or a vertical section of the last figure, placed against a wall built in a direction from east to west, removes a great part of the objection as to heat, and will still admit an adequate supply of light to plants kept constantly in the same position, or turned very frequently. This, therefore, may be reckoned the second best form for a plant habitation for general purposes, and without reference to particular modes of culture.

638. The *Semi-Ellipse* (*fig.* 163.) is a figure which, in the plan (*a a*), displays half a superficial ellipsis, or oval, and the superstructure (*b b*) one-fourth part of the solid figure. Its advantage over a semi-dome is, that, whether the trees are to be trained on a trellis parallel to the glass, or against the back-wall, a greater surface for training is obtained in proportion to the volume of cubic air to be heated. On the other hand, its glass surface is less perfect in respect to perpendicularity to the sun's rays; though in this

respect the difference is not of great consequence. Houses of this sort are of Dutch invention. As the sun retired from them in the afternoon, the eastern parts of the ellipse, as they fell successively into shade, were covered with reeds or mats; and, in like manner, in the morning the east end was uncovered first, and the west end only as the sun came round on it. *Adanson.*


163

639. The *Parallelogram with curved Roof and Ends* (*fig.* 164.) is one of the most convenient forms of curvilinear roofs for the common purposes of culture, as it admits of more regular figures of beds, paths, trellisses, &c. within, and of every variety of dimension. In regard to light, heat, and beauty, they do not differ materially from the semi-ellipse. Of this form houses have been erected from our plans in Messrs. Loddige's nursery, Hackney; in the garden of S. Chilver, Esq. Finchley; and for V. Stukey, Esq. Langport.

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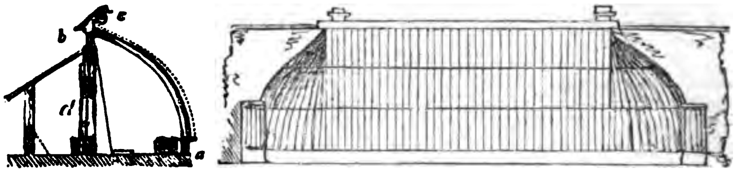
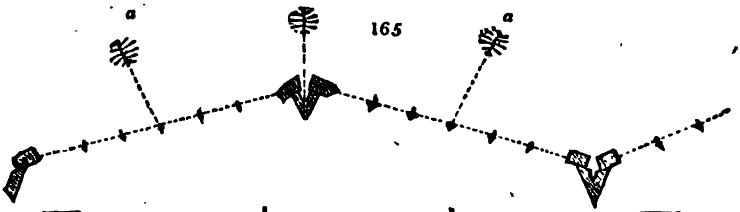


640. The *Ridge and Furrow Roof* may be effected either in curvilinear or right-lined hot-houses; and consists of placing the bars in the rebates of which the glass is put, in such a manner as that the section of the roof may always be a zig-zag line, in which the space traversed by each side or zig may either contain several bars (*fig.* 165.), or merely one pane of glass (*fig.* 166.).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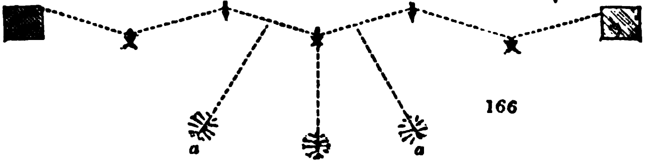
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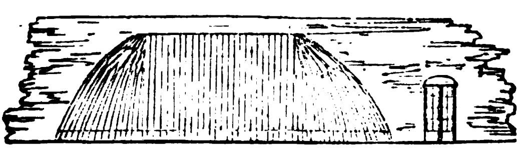
In both modes it is generally desirable, that the ends of all the bars should terminate in one horizontal line on the top of the parapet; which need not, however, be the case in their termination against the back wall. Some apparent difficulty of glazing is thus occasioned in the lower part of the roof; but the difficulty is only apparent, for as smaller and only triangular pieces of glass can be used there, it becomes, in fact, more economical, by occasioning the use of pieces of glass which would otherwise be thrown away. The advantages of ridge and furrow-roofing are chiefly obtainable in countries liable to heavy falls of snow or hail, and in houses which are parallelograms in plan. Almost any weight of snow may be carried by such roofs, especially when the furrow is small, as the pressure will evidently be almost entirely on the upper bars, and not on the glass. Any one may prove this, by heaping snow upon a sash so glazed. As to hail, as it will always meet the surface of the glass in a ridge and furrow roof at an angle of 45°, it can never do it any harm. This mode is, therefore, peculiarly suitable for the north of Europe, and especially for Russia.

The advantage in houses with triangular and straight-lined roofs is, that the sun (*a*, *figs.* 166. and 167.) will be perpendicular to half the roof (by being so to half each ridge) at that period which forms half the time between his rising and mid-day, and perpendicular to the other half, at half the period of time between mid-day and sunset. For this purpose, the sides of the ridges must form right angles with each other.

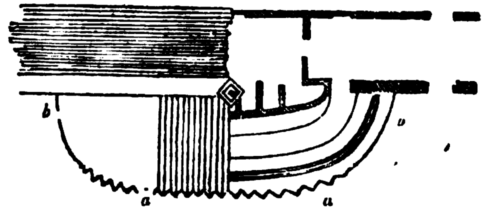
Another advantage of ridge and furrow-roofs, especially of the last description, must not be forgotten, which is, that the laps between the panes, unless very broad or puttied, are always kept free from accumulations of dust. This takes place in consequence of their angle of inclination, which, being about 45°, the gravity of the column of water between the laps is found to counterbalance the attraction of cohesion.

167



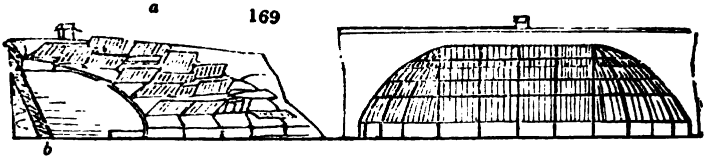
The general form and appearance of a ridge and furrow-house (*fig.* 167.) is not materially different from that of others. Where the curved end is adopted, it will not be necessary to deviate from the common mode of glazing in these parts of the roof, unless with a view to resist a weight of snow. While the parallelogram part of the roof, therefore, is ridged (*fig.* 168. *a a.*), the ends will present a smooth surface (*fig.* 168. *b b*).

168



641. The *Polyprosopic Hot-house* (*fig.* 169.), resembles a curvilinear house, but differs in having the surface thrown into a number of faces, the chief advantages of which are, 1. That by hinging all the different faces at their upper angles, and by having rods connecting the lower outside corners of the faces terminating in chains, which go over pulleys in the top or above the back wall, the whole roof, including the ends, may be opened or raised sympathetically, like Venetian blinds (*fig.* 169. *a.*), either so as each sash or face may be placed in the plane of the angle of the sun's rays at the time, or to the perpendicular, to admit a shower of rain.

169



In consequence of this arrangement, the plants in a polyprosopic house may, at any time, and in a few minutes, be placed in effect, or as far as respects light, air, wind, rain, dew, &c. in the open air; and being so placed, may, whenever desired, be as speedily restored again to their proper climate. The arrangement by which this is effected, and which is perfectly simple, and not liable to go out of repair, is applicable to every form of hot-house, whether of glass on all sides, on two, or on three sides; or whether the roof is formed of curved or straight lines. We consider it, indeed, to be the *ne plus ultra* of improvement, as far as air and light are concerned. One objection to all curvilinear forms in this respect is, that the roof, unless a considerable expence is incurred, must be fixed, and air admitted by horizontal wooden or glazed shutters in the parapets, or between the props, and allowed to escape by sky-lights or shutters at the top of the back wall; but here the air is equally admitted in every part of the house, in the most natural manner, without the creation of currents or eddies, and without excluding any more sun than will be obstructed by the thickness or edge of the faces or sashes.

In like manner, a great objection to straight-lined roofs with sliding sashes is, that air can only be partially admitted, and that while this is being done, one glazed frame being slid over the other in all those parts where there is a double portion of glass, a double portion of light must be excluded; and as opticians are aware, the light so transmitted will be doubly decomposed by passing through two surfaces of glass. The frames for polyprosopic houses may be cast in one piece, and thus the expence of roofs of this sort be rendered less than those of fixed roofs of wrought iron or other metals, or even of wood, when much labour is required. Another advantage is, that they may be glazed before being put up, which, not being practicable in curvilinear roofs, adds considerably to their expence.

With respect to the sun's rays, this roof may be considered as exactly equivalent to a curvilinear figure whose curve lines shall touch all the angles of the faces, so that the sun in general would be nearly perpendicular to some one face every hour in the day, and every day in the year. A specimen of glass roof, constructed on this principle, forms a part of the erection at Bayswater (*fig.* 162.), already referred to.

Notwithstanding the ridicule which it has become fashionable to throw on the serpentine line as the line of beauty, there are few who will not acknowledge that a range of hot-houses (*fig.* 170.) of any, or of all the different varieties of curvilinear surfaces, will have a better effect than the common glazed sheds or lean-to hot-houses of kitchen-gardens.

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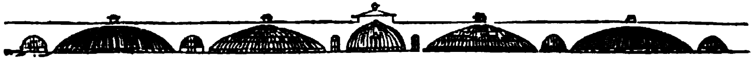

642. *Lean-to or Shed Roofs* are of various sorts. The simplest and most economical hot-house of this description may be compared to a large pit. The back and front wall and ends being of masonry, and a sloping side above of glass, and either fixed or moveable; if fixed, then air is admitted by openings in the front wall and top of the back wall; if moveable, the sashes slide, or are moved in grooves, the lower one being drawn up, and the upper sash let down. Such a house will succeed perfectly well for grapes and pines. The first improvement on this form consists in forming moving glass frames in front, instead of the opaque wall of masonry and shutters; a second consists in adding glass ends; a third, in forming the roof into two slopes; and a fourth, in bevelling the positions of the front sashes, and forming the whole roof into three different slopes, the lower for receiving the sun's rays in winter; the second for spring and autumn; and the third, for midsummer.

Besides these fundamental forms, a variety of others will afterwards be given, both regular and anomalous, adapted to specific purposes of culture, particular situations, as conservatories or cabinet appendages to mansions, or for variety in flower-gardens.

Subsect. 3. *Details of the Construction of Roofs, or the glazed Part of Hot-houses.*

643. The glazed tegument, or cover, may either be wholly fixed, wholly moveable, or partake of both modes. Each of these varieties may be considered in respect to component parts and materials.

Fixed Roofs are either formed of a series of bars of iron or wood, proceeding at once from the front parapet to the back wall, (as in *fig.* 164.); or from the base to the centre, (as in *fig.* 162. *a*); or they may be composed of sashes placed beside each other, (as in *fig.* 161. *a*), or between rafters, as in common lean-to houses. Roofs of the fixed kind have been approved of by T. A. Knight for vines; by Beattie, of Scone, for peaches; and by most cultivators for the culture of pines and palms; but, excepting for the two latter purposes, the general experience of gardeners is (in our opinion, very justly,) against them. It is to be observed, that in all cases of fixed roofs, shutters for ventilation are formed in the parapet (*fig.* 164. *a*), and in the upper part of the back wall (*fig.* 164. *b*) immediately under the roof. Economy in first cost, and less breakage of glass afterwards, are the chief arguments in their favor; the latter advantage, however, is generally denied, it being improper glazing rather than the moving of the sashes, which occasions the breakage of glass.

644. *Moveable Roofs* are generally composed of sashes, six or eight feet long, and three or four feet wide, which slide over each other, and are moved by cords and pulleys, and sometimes balanced by weights, to facilitate their motion; but they are also occasionally formed of sashes which open outwards by means of iron levers at their lower extremities, and hinges at their upper angles (*fig.* 171.), in the manner of the polyprosopic house (*fig.* 169.)

645. *Roofs partaking of both Characters* generally have a few sashes, which let down or rise up in the roof or front glass; or in the case of domes or acuminated roofs, the top part rises in the manner of a skylight.

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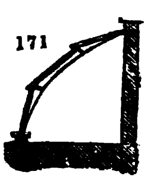

646. The *Materials of fixed Roofs* are generally wrought or cast-iron, as being lightest and most durable, and admitting, in the case of curvilinear roofs, a curvature to be formed at less expence than it could be of timber. In these roofs, in general, no other bars or opaque bearers are required than those for receiving the glass; and hence their simplicity and unity with regard to component parts, and the equal degree of transparency in every part of the surface.

647. The *Materials of moveable Roofs* are most commonly timber; but frequently also timber and iron, or timber and copper joined together. Thus cast iron and wrought iron rafters are frequently used; and in these are placed sashes with styles and rails of timber, and bars of copper, and of cast or wrought iron. Two of the lightest-roofed shed-houses, yet built with sliding sashes, are, one by Timmins, of Birmingham, in 1811, at Loddige's nursery, in which the rafters are of wrought iron, cased in copper, to which are screwed pulleys, on which the sashes, composed of copper bars and timber styles, slide without grooves; and the other is at the Union nursery, King's Road, erected by J. S. Jorden, in 1815, in which the upper part of the roof only moves; the rafters are trusses of wrought iron, supporting bars of cast iron; and the entire sash is formed of hollow sheet copper. The use of sheet copper, however, may now be considered as exploded in hot-house building, wrought-iron being a much more economical, wholesome, durable, and equally elegant substitute.

In general it may be observed, that where sashes and rafters are used in the formation of moveable roofs, a mixture of timber and metal is better than timber alone, the former in extremes of temperature being liable to expansion and contraction. Thus sashes with iron bars, and the outer frame or the styles and rails of timber, move readily in the grooves of cast iron rafters, because when the metal expands with great heat, the timber in a slight degree contracts. The reverse is also the case, and cast-iron sashes slide readily in timber rafters. In both cases small rollers should be inserted, either into the sides of the sash or the fillet or groove of the rafters. Cast-iron rafters need not, for general purposes, be more than half an inch thick, and six or eight inches deep; where the house is wide, they require to be supported by slender pillars. Wrought-iron rafters may be rolled out of broad bar iron (*fig.* 172.) so as to present as light and elegant an appearance as our moulded wrought iron sash-bar, (*fig.* 160.)

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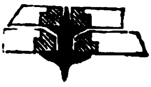


648. In the case of the polyprosopic house, curved rafters are requisite; and these may be either cast in segments and screwed together, or the lower ends, which enter the ground, formed of cast iron, to lessen rust, and the upper part of wrought-iron to insure lightness.

Arrangements for covering the roofs of hot-houses by boarded canvass or mats to be rolled up or down (*fig.* 164, *c*), might be easily contrived and advantageously used; but excepting in pits and low hot-houses, they are not thought worth attending to, it being considered better to gain the admittance of all the light possible, than lose it for the sake of a little economy in fuel.

649. *Uprights* are the pillars or props which are placed on the parapet, and support the rafters; whether of timber or iron, they are generally formed of the same thickness as the rafters, because similar sashes are placed between them. In some cases, where cast-iron uprights are used, they are made hollow, thus serving as conduits from the gutter-plates, which gutter-plates are so constructed as at the same time to form the imposts or horizontal plates, which connect the tops of the uprights, and form the points of union between the upper rails of the upright sashes and the lower rails of the sloping ones. As front sashes, somewhat inclined, will always be found preferable to such as are perfectly upright, the future use of imposts and gutter-plates, whether in wooden or metal houses, seems to be quite unnecessary, and no doubt, as horticultural science begins to spread, will be entirely left off. One gutter on the basement (*fig.* 175. *a*) will answer every purpose much better,

Interior Uprights to support wide roofs are almost always of iron, either wrought metal or small cast-iron columns, sometimes forming intersecting arches, or treillaged capitals, or connecting imposts for training creepers.

The Wall-Plate, or Coping of the Parapet, is sometimes a plate of timber, sometimes of stone, and occasionally of cast iron. Wherever upright glass is not employed, it must of necessity form also the guttering for the water of the roof, as above suggested, and at the same time for the water which condenses on the glass inside of the house. (See 175. *a b*).

650. *Objections to Metallic Roofs.* In general it may be observed, that gardeners have a prejudice against metallic roofs. Of authors, who have avowed this, Abercrombie, Mean, and Nicol, may be mentioned; others have adopted a cautious neutrality, as M'Phail, Forsyth, Aiton, &c. Philosophical and amateur gardeners have generally approved of their introduction; among which may be named Knight, Sir George Mackenzie, Loddige, Sabine, and others. We shall here, as briefly as possible, enumerate

the objections to metallic roofs, which are expense, rust, breakage of glass, abduction of heat, and attraction of electricity.

Expense. Metallic houses are, in general, rather more expensive than wooden ones; but they admit more light and are more durable and elegant.

Rust. That all ordinary metals are liable to rust is undeniable. This objection cannot be got rid of. The reply is, balance against it the advantages of light and durability; and take into consideration that careful painting will in a great degree prevent it.

Breakage of Glass. This is altogether denied, as respects cast or wrought iron, at least, and if applicable at all, can only be so to copper or compound metallic roofs, where weakness produces a bending of the sash; or where corrosion or unequal expansion of improper mixtures of metals, as iron cased with copper, occasions a twisting of the bar. Cast-iron, or solid wrought-iron frames, have never been known to occasion the breakage of more glass than wood. The grand cause of the breakage of glass, as has already been hinted, arises in almost every case (see 652.) from glazing with broad laps.

The expansibility of copper is greater than that of brass, and that of brass greater than the expansion of iron in the proportion of 95, 89. 60. (*Young's Lect.*) Consequently copper is above one-third part more likely to break glass than iron; but when it is considered, that a rod of copper expands only $\frac{1}{104000}$th part of its length, with every degree of heat, and that iron only expands $\frac{1}{164666}$th part, the practical effects of our climate on these metals, can never amount to a sum equal to the breakage of glass.

Abduction of Heat. The power of metals to conduct heat, is an objection, which, like those of rusting and additional expense, cannot be denied. The reply is, the smaller the bars, the less their power of conducting; and a thick coat of paint, and the covering of half the bar by the putty requisite to retain the glass, also lessens this power; it is added, heat may be supplied by art, but solar light, the grand advantage gained by metallic bars, cannot, by any human means, be supplied otherwise than by the transparency of the roof.

Attraction of Electricity. To this objection it is replied, that if metallic hot-houses attract electricity, they also conduct it to the ground, so that it cannot do any harm. Also that no instance can be produced of iron hot-houses having been injured by the effects of this fluid.

Subsect. 4. *Glazing of Hot-house Roofs.*

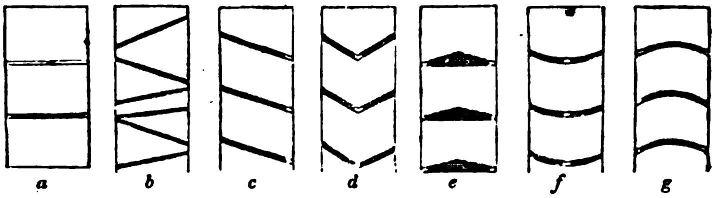
651. Glazing was formerly performed with the very worst description of glass, called green glass; and accordingly, Adanson, in 1710, recommends the adoption of Bohemian glass, then the best in Europe, but now equalled by our best *crown* or *patent crown* tables. If, as Bouguier has shown, one-fortieth part of the light which falls perpendicularly on the purest crystal, is reflected off, or does not pass through it, it may safely be asserted, that green glass reflects off more than three-fourths. Œconomy, as to the quality of glass, therefore, is defeating the intention of building hot-houses, which is to imitate a natural climate in all the qualities of light, heat, air, water, earth, &c. as perfectly as possible. Without a free influx of light, the sickly pale etiolated appearance of plants is more painful than agreeable to the eye of any one who takes an interest in the vegetable kingdom.

As the panes or pieces of glass employed in hot-house roofs lap over each other, the air which enters by the lap when uneven glass is employed, or careless glazing performed, no doubt, suggested the idea of closing the lap with lead or putty. But both these modes being found to prevent the water which collects on the inner surface of glass roofs, from escaping by the outside surface, gave rise, first, to partially closing the lap; and subsequently to various forms of panes, and descriptions of laps, of which the principal are as follow.

652. *Common Sash glazing* is performed by even the best hot-house builders with a lap of from one fourth to three-fourths of an inch; but by the great majority of glaziers, with a full inch lap. The objection to this mode is, that the broader the lap, the greater the quantity of water retained in it by capillary attraction; and when such water, through a deficiency of heat in the house, is frozen, the glass is certain of being split in the direction of the bars. But supposing this not to take place, the broader the lap, the sooner it fills up with earthy matter, forming an opaque space, both injurious by excluding light, and unpleasing, because imperfect: or if the lap is to be puttied, the opacity is the same. The accidental filling up of such spaces (when not puttied by art) with dust and earthy matter, is what prevents them from being broken, by excluding in a great degree the water. Where the lap is not more than one-fourth of an inch, it may be puttied without a very disagreeable effect. The rectangular pane is the only form which can with propriety be admitted in curvilinear roofs; and the most approved practice as to the lap, whether in roofs or common sashes, is never to make the lap greater than the thickness of the glass, and not to close it with putty. It is extremely difficult to get glaziers to attend to this; but by employing superior workmen, and obliging

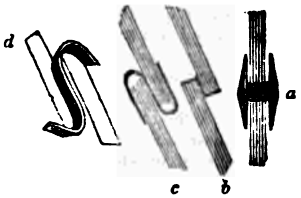
them to remove every pane which shall project over the other more than one-sixteenth of an inch, the thing may be accomplished. This is not only the most elegant of all modes for a curved roof, or indeed for any other, but the safest for the glass, which is, we repeat, seldom broken by any other natural means than the expansion of frozen water retained between the laps. It must not be forgotten that this form is also by far the easiest to repair, and that no mode of puttying or closing a narrow lap with lead is of long duration.

173



653. *Glazing with a Leaden Lap* (173. *a*), was formerly practised with a view of excluding the air by a more permanent material than putty. The sort of lap made use of, is that used by glaziers in lattice-work windows (*fig.* 174. *a*). The panes being inserted in the grooves, formed in the edges of the lap, are of course all in one plane, and the water in running down either the outside or inside of the roof, must accumulate on the upper edge of each ribband or cross-string, or lap of lead, and so penetrate between it and the glass, and drop on the plants in the house. This indeed forms the chief objection to the leaden lap, which is now deservedly exploded.

174



654. *An Improved Form of Lead Lap* (*fig.* 174. *b*) consists in using slips of lead rolled so thin as not to be thicker than fine drawing paper, in connection with putty, and for the sole purpose of retaining it in its place. It is never allowed to project beyond the exterior edges of the glass, so that it readily permits the descent of the water. Its thinness renders it easily manageable, and the time employed in filling up such laps, when one man is stationed outside the glass and another within, is not much more than that occupied in glazing a roof with the common putty lap. Such lead laps may either have a small opening in the middle, or at the angles, and are equally applicable to any of the modes of glazing to be described. The lead is rolled to any width, and clipt or cut to the size wanted as used.

655. *The Copper Lap* (*fig.* 174. *c*) is the invention of D. Stewart, and its origin may be recognized in the ess-shaped shred of lead introduced by glaziers between newly glazed panes, to retain them in their places (*fig.* 174. *d*). The lap is drawn through graduated moulds till at last it is brought into the shape of the letter *ess* compressed. It adds greatly to the strength of glazing, by giving each pane a solid firm bearing on the upper and lower edges, and by preventing water from lodging between the panes. Where the sashes are flat, however, it occasions droppings of condensed water on the plants, against which there is a general prejudice among gardeners; and it has been alleged, that the drip from copper becomes in a few years poisonous from the partial oxidation of the metal. In steep roofs, however, this objection does not hold, and there remains in such cases only the objection of the opacity produced by the lap. It has been used in the large conservatories at East Sheen and Woodlands; but appears to us much too opaque for hot-house roofs, and only adapted for sky-lights in common buildings. If so much light can be spared as is lost by these laps, it were better to increase the number of sash bars, by which the panes would be smaller, and consequently less likely to be broken, and no metallic lap would be wanting. It is now entirely or nearly out of use.

656. *Fragment Glazing* (*fig.* 173. *b*). This is the primitive mode adopted by nurserymen and market-gardeners, before it was supposed, that the productions raised under glass would pay for any thing better. In steep roofs, it answers nearly as well as any other mode in respect to keeping out rain and air, and admitting light; but as a somewhat greater lap is required in these crooked or undulated pieces of glass, a flat roof is liable to be covered by dark lines, formed by the lodging of earthy matter in the laps or interstices. Where the bars are not placed more than six or seven inches asunder, centre from centre, this method, even if the panes are reduced to a rectangular shape, is much more œconomical than any other; and is therefore useful for such country nurserymen as have not, like the nurserymen of London, the opportunity of

purchasing the hot-houses of decayed gentlemen or bankrupt tradesmen; and consequently are obliged to build and construct every part *ab origine*.

In *Rhomboidal Glazing* (*fig.* 173. *c*), the panes are in the form of rhomboids, the advantage of which is, that the water runs rapidly to the lower angle, and passes off both inside and outside along the bar; and what is retained by capillary attraction, is alleged to be so small as not to have the power of breaking the glass.

657. *Perforated Shield Glazing* (*fig.* 173. *d*). This is a supposed improvement on the last described mode, which it would be, were it not that by the perforation in the upper part of the shield as it is called, the dexter and sinister chiefs are liable to be broken off; and by the prolonged accumination of its base, it is rendered obnoxious to the same casualty in the nombril point.

658. *Entire Shield Glazing* (*fig.* 173. *e*). This plan has been used by Butler, a London hot-house builder; but it does not seem either to merit or obtain general adoption. It is difficult, indeed, to conceive what are the arguments in its favor beyond that of strength, with a very great loss of light, which may surely be better obtained by Stewart's lap.

659. *Curvilinear Lap Glazing* (*fig.* 173. *f*). This mode appears, unless the lap is on flat surfaces, preferable to the common square mode, because the curve has a tendency to conduct the water to the centre of the pane. If the lap is broad, however, the globule retained there by attraction is situated precisely in the point where it is calculated to do most mischief, being in fact as a power on the end of two levers of the second kind. When the lap is not more than one-sixteenth of an inch, no evil of this sort can happen; it also happens less frequently for the first few years after puttying the lap, and leaving a small opening in the centre for the water to escape. In time, however, according as the house has been used, the putty begins to decay, it becomes saturated with water, and during frost, whenever the temperature of the house is inadequate to prevent this water from freezing, the panes are certain of being broken. It can hardly be too often impressed on the mind of the gardener, that puttying or otherwise filling up the lap is in no case requisite, if care be taken in the glazing to use flat glass, and never to let the lap exceed one-fourth, or fall short of one-sixteenth of an inch. This is now rendered the more easily practicable since the invention of a variety of glass, called patent crown glass, and which, purchased in panes fit for hot-houses, is hardly more expensive than the other. It may be added, that taking all circumstances into consideration, and especially that of repairs, the common rectangular pane of a small size is decidedly the best.

660. *Reversed Curvilinear Glazing* (*fig.* 173. *g*), is a method of throwing the water of condensation to the bars, so as to carry it off by their means, and, if possible, prevent it from dropping in the house.

661. *Glazing Ridge and Furrow Roofs* is as simple as the common mode, when the ridge is equal throughout; but where the ridge terminates in the furrow at either or both ends, then recourse must be had to triangular panes or truncated triangles, where the variation commences. In this way, as already hinted at when describing *Ridge and Furrow Roofs* (640.), this mode of glazing becomes more economical than the commonest mode, by using angles and odd pieces of glass; while at the same time the water in the laps always passing off on a declivity of forty-five degrees, or one in one, is certain of keeping any moderate lap free from accumulations of dust and mud.

662. *Anomalous Surfaces* may be glazed by throwing the panes into triangles in the above manner, and by no other manner, unless by annealing and bending the glass. All such triangles have always more or less the advantages of rhomboidal glazing. Hence the most singular shaped roofs may be glazed as perfectly as the simplest forms and at nearly the same expence.

663. Though the making of *putty* be hardly within the gardener's province, yet it is fitting he should know, that there are several sorts, of which the following are the principal.

Soft Putty, being a well-wrought paste of flour, of whitening, and raw linseed oil.

Hard Putty, composed of whitening and boiled linseed oil.

Harder Putty, in which a portion of turpentine, or what is called, drying, is introduced; and, the

Hardest Putty, composed of oil, red or white lead, and sand. The first is the most durable of all, because it forms an oleagenous coat on the surface, but it requires a longer time of drying. The hard sorts are apt to crack, if not soon well painted, and the hardest of all, though it appears to be impenetrable, and of the greatest durability, yet renders it difficult to replace a pane when broken. It seems, therefore, quite unfit for hot-houses. Much depends on well working the putty some days before it is to be used; and in general, that putty which has been ground and wrought in a putty-mill is to be preferred.

664. The best sort of *paint* for hot-houses is that which, for the last twenty years, has been known by the name of Le Souff's *anti-corrosion*, which is composed chiefly of the

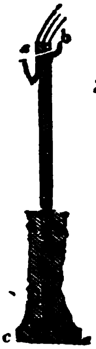
powdered scoriæ of the lead-mines of Col. Beaumont, near Hexham. There are other sorts, which are called *anti-corrosive* and *impenetrable* paints; but they have not been long enough in use to enable us to recommend them. It may be a sufficient recommendation of the anti-corrosion to state, that it is used in government works, and especially on all cast iron erections, by Messrs. Rennie, Telford, and others. As to the colour of paint, or washes of any sort, for the walls or interior of hot-houses, it is almost unnecessary to observe, that as light is the grand object, white is to be preferred.

Subsect. 5. *Walls and Sheds of Hot-houses.*

665. Walls of some sort are necessary for almost every description of hot-house, for even those which are formed of glass on all sides are generally placed on a basis of masonry. But as by far the greater number are erected for culinary purposes, they are placed in the kitchen-garden, with the upper part of their roof leaning against a wall, which forms their northern side or boundary and is commonly called the back-wall, and the lower part resting on a low range of supports of iron or masonry, commonly called the front-wall. Behind the back wall a shed is commonly formed, and under this is placed the furnace, the fuel to be used therein, and other materials or implements connected with the culture or management of the hot-house.

666. *The Parapet, or Front-Wall,* of hot-houses comes first in order. Where upright sashes are used, there are generally brick walls, either carried up solid from the foundation, or built on piers, according as it may be desirable to have the roots of the plants within pass through to the soil without, or not. In the case of fixed roofs, instead of a solid wall, it is formed with horizontal openings, to which opaque or glazed shutters are fixed, opening outwards for the purpose of admitting air.

A recent improvement on parapets consists in forming them of cast iron props or pillars (*fig.* 175.), which are placed on a basis of two or three bricks (*c, c*), three or four feet under the surface: to these props, top and bottom rails are fitted, which are rebated to receive a shutter (*fig.* 176). The wall-plate (*a, b, figs.* 175, *and* 176.), which receives the ends (*d*) of the rafters or sash-bars, forms also a gutter for carrying off the water of the roof, externally (*a*), and the condensed water internally (*figs.* 175 *and* 176, *b*).



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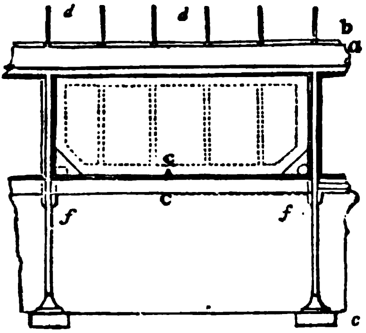

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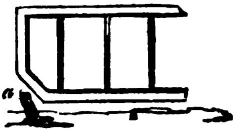

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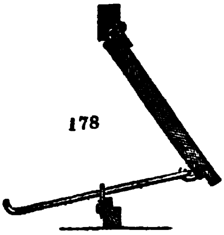
Where the roof is moveable on the polyprosopic plan, no such shutters are required, and therefore the ends of the rafters may go at once three or four feet into the soil, according to the nature of the foundations, and rest on brick-work; the surface of the ground, and the lower edge of the lowest sash being united by a moveable plate, forming at once a gutter and a rest for the lower rail of the sash.

667. *Holes for Vine-Stems* (*fig.* 176. *f, f*). In all parapets or front arrangements where vines are to be introduced from without, particular care must be had to provide for the withdrawing of the vines, even when their wood is of a considerable age and thickness. For this reason, where horizontal shutters are used, the lower styles or pieces against which they shut, should always be moveable; and, in general, it may be stated, that of the various modes for the introduction of the vine from without which have been adopted, that by cutting off an angle, say six inches in its widest part of the lower corner of the sloping or front sash, is the best; by this means, when the sash is opened, a vine of almost any size (*fig.* 177. *a*) may be taken out with ease.

A piece of thin board or cork cut every year to fit the increasing diameter of the shoot is screwed to the wall-plate or lower style, as the case may be, and the vacuity, which must necessarily be left around the stem, is closed up with moss. When the vine is to be taken out by unscrewing the triangular board, and opening the sash, or shutter, a more than sufficient space for drawing out any ordinary sized plant is obtained without the least trouble or chance of fracturing the shoots.

It may be added, that in curvilinear ground plans, some exertion of design and nicety of workmanship is required in framing the horizontal shutters, so as they shall not twist, and also that they require in such cases to be hinged with what are called coach-hinges.

Instead of an opaque pannel, some prefer these shutters glazed (*fig.* 177.), the utility of which must, of course, depend on the relative height of the pots or plants immediately within. The mode of opening them, and keeping them open, (*fig.* 178.) is perfectly simple.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668. *The Back-Wall* is in general straight or perpendicular, and carried up one or two feet higher than the glass, to shelter it from the north (*fig.* 171.)

Sometimes, however, it is bevelled or curved to meet the sun's rays (*fig.* 169, *b.*)

669. *The Back Shed* (*fig.* 164. *d*) is naturally connected with the back wall, and in form and extent, is generally regulated more by its uses as a working shed, than by the mere enclosure and covering of the fire places and fuel, its original and legitimate object. The width may be varied at pleasure, but seldom exceeds ten or twelve feet, and the height is generally seven or eight feet in the lower wall, and nearly of the same height as the back-wall; but where opening shutters are formed in the back-wall, for the purposes of ventilation, the upper angle of the shed-roof must be kept under the level of the shutters to save intricacy of contrivance. But as these shutters frequently do not communicate directly with the open air, but with passages under the shed-roof, or channels in the top of the back-wall, the height of the shed may in such cases be made higher. In some cases, instead of shutters (*fig.* 178.) boards sliding in grooves, or a sort of Venetian blind, or which is best, flaps held close by a cord, pulley, and weight, is used; but the great heat of hot-houses is apt to warp and derange some of these contrivances. The essential part of the back-shed, as respects the hot-house, is the situation for the furnace and fuel, or steam-apparatus, with which no other use to which it may be applied must be allowed to interfere. Sometimes back-sheds are not inclosed, but supported on pillars, in which case they are used for fermenting tan, leaves, or dung, growing mushrooms on ridges of dung, holding pots, pease sticks, and other similar purposes. Where the range of hot-houses are situated in the middle of the garden, great care must be taken, that they present nothing offensive, and that the sheds behind neither resemble a row of work-shops, alms-houses, bricklayers' sheds, or cattle-hovels.

Subsect. 6. *Furnaces and Flues.*

670. The most general mode of heating hot-houses, is by fires and smoke-flues, and on a small scale, this will probably long remain so. Heat is the same material, however produced; and a given quantity of fuel will produce no more heat when burning under a boiler than when burning in a common furnace. Hence, with good air-tight flues, formed of well burnt bricks and tiles accurately cemented with lime putty, and arranged so as the smoke and hot air may circulate freely, every thing in culture, as far as respects heat, may be perfectly accomplished.

The Hot-house Fire-place or Furnace consists of several parts; a chamber, or oven, to contain the fuel, surrounded by brick-work, in which fire-brick (a sort containing a large proportion of sand, and thus calculated by their hardness and tenacity, not to crumble by heat, &c.) is used; a hearth or iron grating, on which the fuel is laid; a pit or chamber in which the ashes drop from this grating, and iron doors to the fuel-chamber and ash-pit.

The Iron-Doors admit of several varieties; but it does not appear that there is any great difference in the effect produced by the different plans of Nicol, Hay, Stewart, and others. A double door has the advantage of *durability*, preserving heat, and of not so readily admitting cool air to pass *over* the fire; which air, of course, must be less heated, and consequently less capable of heating the flue than such as, entering from below, passes *through* it. The use of the ash-pit door is to act as a regulator to the current of air, or as a damper or suffocator.

Vacuities have been formed around furnaces, and by communications between these and the open air, and an air-flue in the house, a stream of heated air has been introduced; but this air is so little at the command of the gardener, is so dried up or burnt, as the phrase is; that is, mixed with offensive gases from burned oil, iron, sulphur, or very fine dust, and so liable to be mixed with smoke, that such plans are now generally laid aside. Vacuities, however, are frequently used round furnaces, and the first four or six feet of the flue, in order to temperate the heat in that part; but such vacuities rarely have any communication with the air of the house. Where a house of considerable length and contents is to be heated it is generally deemed better to increase the number of furnaces than to increase their size, or have recourse to air flues; for when the latter practice is resorted to, they are necessarily projected so far into the shed, or otherwise kept back from the house, that a great part of the heat is lost in the mass of brick work which surrounds them. Small furnaces, on the contrary, may be built in great part under the walls or floor of the house.

In countries where turf, wood, or inferior coal, is used for fuel, the chamber of the furnace must be large; on the contrary, where the best coal, cinders, charcoal, or coke, (the three last, the best of all fuel for hot-houses, as having no smoke,) is used, they may be made smaller in proportion to the different degrees of intensity of the heat produced by these different materials.

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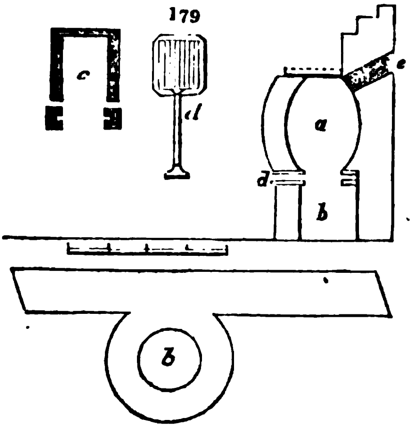

671. In some places, it is customary to construct over hot-house furnaces, a small lime kiln (*fig.* 179. *a*) or fixed crucible, for burning lime; and when the heat, which passes through the limestone, is made to enter the flues (*e*), it is evident a real benefit must result from the practice, as the heat applied to the burning of lime in the common way escapes in the atmosphere. The grate or fuel bars (*d*) are contrived to draw out, by means of a grooved frame (*c*), when the lime is burned, which then drops into the ash pit (*b*).

In fixing on the situation of furnaces, care must be taken that they are always from one to two feet under the level of the flue, in order to favor the circulation of the hot air and smoke, by allowing it to ascend.

672. As to *the size of Hot-house Fire-places*, the door of the furnace may be from ten inches to one foot square; the fuel-chamber from two to four feet long, from eighteen inches to two feet wide, and of the same dimensions as to height. Every thing depends on the kind of fuel to be used. For Newcastle coal, a chamber two feet long, eighteen inches broad, and eighteen inches high, will answer as well as one of double the size, where smoky Welch or Lancashire coal is to be used.

Various contrivances, as hoppers, horizontal wheels, &c. have been invented for supplying fuel to furnace-fires without manual labour, and especially during night; but from the nature of combustion, and the common materials used in this country to supply it, no effectual substitute has yet been discovered. If wood or charcoal, or even cinders or coke were used, there would be a greater chance of such invention succeeding, but we do not think ourselves warranted in detailing any of them.

673. *Flues.* Of the mode of constructing these, there is considerable variety. The original practice was to build them on the naked earth, like drains or conduits; or in the solid walls of the backs and fronts of the pits, like the flues of dwelling houses. The first improvement seems to have been that of detaching them from the soil by building them on flag-stones, or tyles supported by bricks; and the next was, probably, that of detaching them from every description of wall, and building their sides as thin as possible. A subsequent amelioration consisted in not plastering them within, but in making their joints perfect by lime-putty, by which means the bricks were left to exert their full influence in giving out the heat of the smoke to the house.

The sides of common flues are commonly built of bricks placed on edge, and the top covered by tyles, either of the full width of the flue outside measure, or one inch narrower, and the angles filled up with mortar, which Nicol prefers, as neater. Where a stone that will endure fire-heat without cracking is found to be not more expensive than tyles, it is generally reckoned preferable, as offering fewer joints for the escape of the smoke. Such stones are sometimes hollowed on the upper surface, in order to hold water for the benefit of plants in pots, or for steaming the house.

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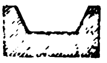

Of other improvements which have been proposed, that of making them broad and deep, agreeably to the Dutch practice, has been recommended by Stevenson (*Caled. Mem.*); that of making them narrow and deep, agreeably to the practice in Russia, is recommended by Oldacre, gardener to Sir Joseph Banks, and that of using thin bricks (*fig.* 180.)

with thick edges by S. Gowen, (*Hort. Trans.* iii.) In Gowen's flues, the section (181. *a*), shows less materials than any other brick-flue, the covers (*b*), and the common bricks (*c*), being quite thin, the base requisite for building them on one another being obtained by the thickness of their edges, (*d, e,*) which is equal to that of common bricks.

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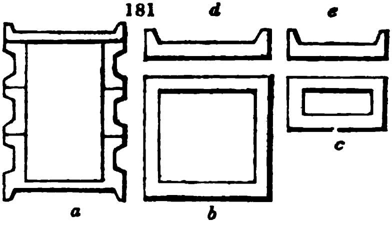

674. *Can Flues* (*fig.* 182.), long since used by the Dutch, imbedded in sand, and for the last fifty years occasionally in England, have been revived by Lorimer, of Dunbar, and others. They consist of earthen pipes, straight (*a*), or rounded at the ends for returns (*b*), and joined together by cement, placed on bricks (*c*). They are rapidly heated, and as soon cooled. None of the heat, however, which passes through them, can be said to be absorbed and lost in the mass of inclosing matter, as T. A. Knight and Sir Joseph Banks (*Hort. Trans.*) assert to be the case with common flues. They are only adapted for moderate fires, but judiciously chosen, may frequently be more suitable and profitable than common flues; as, for example, where there are only slight fires wanted occasionally; or where there is a regular system of watching the fires, in which case, the temperature can be regulated with sufficient certainty.

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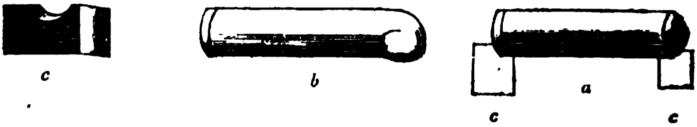

675. *The Embrasure Flue*, (*fig.* 183,) is the invention of Sir G. Mackenzie, and is by him strongly recommended, as exposing a greater heated surface in proportion to its length. (*Hort. Trans.* vol. ii. p. 175.)

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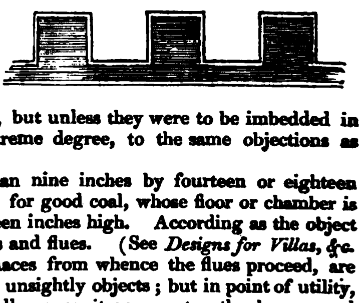


676. *Cast-Iron Flues* have also been recommended on account of their durability, but unless they were to be imbedded in sand, or masonry, they are liable, in an extreme degree, to the same objections as can-flues.

677. *The Size of Flues* is seldom less than nine inches by fourteen or eighteen inches inside measure, which suits a furnace for good coal, whose floor or chamber is two feet long, eighteen inches wide, and eighteen inches high. According as the object varies, so must the proportion both of furnaces and flues. (See *Designs for Villas, &c.* 1812, and *Hort. Trans.* vol. iv.) The furnaces from whence the flues proceed, are generally placed behind the backwall, as being unsightly objects; but in point of utility, the best situation is at the end of the front wall, so as it may enter the house, and proceed a considerable length without making an angle. A greater utility, however, is here given up for fitness; it being more fitting in a gentleman's garden that something should be sacrificed to neatness, than that all should be sacrificed to profit.

678. *The Direction of Flues*, in general, is round the house, commencing always within a short distance of the parapet, and after making the course of three sides, that is of the end at which the fire enters, of the front, and of the opposite end, it returns (in narrow houses) near to or in the back-wall, or (in wide houses) up the middle, forming a path; and in others, immediately over or along side of the first course. In all narrow houses this last is the best mode.

679. *The Power of Flues* depends so much on their construction, the kind of fuel, the roof, mode of glazing, &c. that very little can be affirmed with any degree of certainty on this subject; 3000 cubic feet of air is in general enough for one fire to command in stoves or forcing-houses; and 5000 in lean-to green-houses. In houses exposed on all sides, 2000 cubic feet is enough in stoves, and 3000 cubic feet for green-houses. The safest side on which to err is rather to attach too little as too much extent to each fire, as excessive fires generally force through the flues some smoke or mephitic air; and besides produce too much heat at that part of the house where the flue enters.

680. *Dampers or Valves* are useful in flues and chimneys, both in case of accident and also to moderate the heat, or in case of one furnace supplying two flues, to regulate the passage of smoke and heat. For general purposes, however, the ash-pit door is perfectly sufficient. The damper, and furnace, and ash-pit doors, ought seldom to be both shut at the same time, as such a confinement of the hot air of the flue, is apt, owing

to its expansion, by increased heat from the hot masonry, to force some of it through the joints of the flue into the house.

681. *Chimney-Tops* are generally built on the coping of the back-wall, generally plain, but sometimes ornamented with mouldings, and even disguised as vases. Where there are only one or two to a conservatory or other house of ornament, these last modes may be allowable; but in culinary ranges, it appears to us an unsuitable application of ornament either to form on the stone or brick chimneys many mouldings, or to disguise them, as urns or vases. When these last are to be adopted, cast iron presents abundant facilities of economical execution.

Sometimes the flues are carried under ground to some distance from the hot-house, and the chimney carried up in a group of trees, or otherwise concealed. This practice is suitable to detached buildings, formed of glass on all sides.

Subsect. 7. *Steam Boilers and Tubes.*

The most simple and effectual mode of heating hot-houses, and indeed, large bodies of air, in every description of chamber, is by steam; but the heat given out by vapor, differs in nothing from that given out by smoke, though an idea to the contrary prevails among gardeners, from the circumstances of some foul air escaping into the house from the flues, especially if these are over-heated or over-watered; and from some vapor issuing from the steam-tubes when these are not perfectly secure at the joints. Hence flues are said to produce a burnt or drying heat, and steam-tubes, a moist or genial heat. This mode of heating is applied by means of boilers and tubes, the former containing water, and heated by a furnace larger, but similar, in general plan, to that already described. But when there are several houses to be heated from one boiler, a smoke consuming-furnace, such as that of Parke's, should be made choice of, since nothing can be more desirable than to get rid of the smoke, especially in districts where the coal does not burn clear. Any attempt, however, to consume the smoke when the fire is not large, at least equal to four common hot-house fires, will seldom be found to answer.

We shall not here enter into the details of the steam apparatus, but merely offer some leading ideas as to forms or kinds of boilers and tubes, and some grounds of choice in selecting from them.

682. *Steam-Boilers* are either of cast iron, wrought iron, or copper; and in form either round, oblong, square, or pear-shaped.

The form of the boiler originally used in Lancashire and Scotland, about twenty-five years ago, when steam was first introduced, was that of a carron-pot or cauldron, with a heavy stone lid, from which proceeded the earthen pipes for the steam. The water was supplied by a cistern, communicating with the bottom of the boiler, and the water of which was always kept at the same level as that in the boiler, by a ball or regulating cock. This practice had many inconveniences, which it is unnecessary to detail.

683. *The Cast Iron Boilers* used in England, in the most extensive examples of the application of steam, as at Earl's Court, are round, furnished with a *man-hole*, or opening at top for a man to enter and clean them out, and with a variety of other necessary and precautionary appendages, which need not be here described.

To cast iron boilers it is objected, that they are more difficult to heat, and more liable to explode, than those of wrought iron or copper.

The *Wrought-iron Boiler* is of various shapes and kinds, the most powerful being that of Treviathick, adopted by Messrs. Loddiges at Hackney.

684. *Copper Boilers* have been hitherto used only on a small scale, as being somewhat more expensive than those of iron. They have been applied at Kensington, Claremont, and Hampton Court, by Frazer, (a very meritorious and ingenious mechanic,) and at Sir Joseph Banks's, and various other places by Sheen, but are now generally laid aside in favour of wrought-iron boilers. Various improvements have of late been attempted in these engines by different mechanics and engineers, and patents taken out for some by Chabannes, Frazer, and others: so great indeed is the general approbation of steam, and so rapid its introduction, that in a few years, its real value as a means of communicating heat to hot-houses and pits will be duly appreciated. At present, the most cautious persons introduce it in connection with fire-heat, which, where flues and furnaces already exist, is a very reasonable degree of precaution.

All boilers should, where it does not interfere with other arrangements, be sunk so as to be from 10 to 15 feet under the level of the pipes in which the steam is conducted; for by this means, the whole of the condensed water can be returned to the boiler, attended by a consequent saving of water, fuel, and labour. A watery subsoil without an outlet for drainage, may seem an objection to sinking to such a depth; but by building the sides of the excavation circular, and rather bellied below, using proper lime, or lime and cement, the area or chamber obtained, will be perfectly water-tight, and by bulging out the lower part, even a pressure of water below, which in some soils might happen, would not force up the chamber, on account of the surrounding, and in part superincumbent load. Vaults in wet church-yards are daily formed in this way so as to be quite dry within; and it is well known that the Dutch have chambers of this description, which they use as living and sleeping rooms beneath the level of the sea.

Steam is circulated through the house or chamber to be heated in tubes or pipes as smoke is in flues; but as steam circulates with greater rapidity, and conveys more heat in proportion to its bulk, than smoke or heated air, steam-pipes are consequently of much less capacity than smoke flues, and generally from three to six inches diameter inside measure. Where extensive ranges are to be heated by steam, the pipes consist of two sorts, mains or leaders for supply, and common tubes for consumption or condensation. Contrary to what holds in circulating water or air, the mains may be of much less diameter than the consumption pipes, for the motion of steam is as the pressure; and as the greater the motion, the less the condensation, a pipe of one inch bore makes a better main than one of any larger dimension. This is an important point in regard to appearance as well as economy. In order to procure a larger mass of heated matter, M'Phail proposes to place them in flues, where such exist. They might also be laid in cellular flues built as cellular walls, (*fig.* 146.) or perhaps such flues might be substituted for steam pipes. The most complete mode, however, is to have three parallel ranges of steam pipes of small diameter, communicating laterally by cocks. Then, when least heat is wanted, let the steam circulate through one range of pipes only; when more, open the cocks which communicate with the second range; and when most, let all the three ranges be filled with steam. This plan has been adopted by Messrs. Loddiges at Hackney, and Messrs. Bailey in heating the hot-houses at Knowle.

685. *Steam Pipes* are formed of cast-iron, tinned copper, and stone ware; but cast-iron has very generally the preference. Stone and earthen ware, however, have been tried in some places; their first cost is of course a great deal less than that of any description of metal, but the repairs are continual.

The *Direction of Steam Pipes* follows the same general principle as that of flues, and they have, at regular distances, outlets commanded by cocks and valves, for admitting the steam into the house, and for drawing off the condensed water.

686. *Pipes of Hot Water* have been proposed to be circulated through hot-houses by T. A. Knight, (*Hort. Trans.* vol. iii.); the plan was tried many years ago by the late Gould, gardener to Prince Potemkin, in the immense conservatory of the Tauridian palace at Petersburg (87.) There, however, pumps were employed to redeliver the water to the boiler. It is adopted to a certain extent by Davis, a sugar boiler in Essex; but it does not appear likely to become general. The only advantage proposed is, that should the boiler or steam apparatus go wrong in the night time, pipes filled with water would be longer of cooling than pipes filled with steam. It has been asserted in reply, that an apparatus capable of circulating hot-water, would be much more likely to go out of order than one adapted to circulate steam.

SUBSECT. 8. *Trellises.*

687. Half the advantages of culture in forcing-houses, and houses for fruiting the trees of hot climates, would be lost without the use of trellisses. On these the branches are readily spread out to the sun, of whose influence every branch, and every twig and single leaf partake alike, whereas, were they left to grow as standards, unless the house were glass on all sides, only the extremities of the shoots would enjoy sufficient light. The advantages in point of air, water, pruning, and other parts of culture, are equally in favour of trellisses, independently altogether of the tendency which proper training has on woody fruit trees, as the peach, to induce fruitfulness.

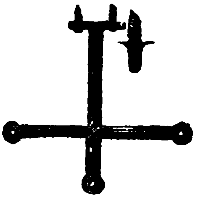
The *Trellis* is formed either of wood or metal, and in culinary hot-houses, is placed against the back wall, close under the glass roof, or in the middle part of the house, or in all these modes. Sometimes it is in separate parts, and either fixed or moveable, and in some cases, though rarely, it is placed across the area of the house. Sometimes it is introduced ornamentally in arches, festoons, &c. The most general plan is to place it as near the glass as possible.

The *Back Wall Trellis* was formerly in general use, and considered the principal part of the house for a crop; but that is now only the case in narrow houses. In many cases a trellis is still applied against the back wall for temporary crops, till the plants trained under the front glass trellis cover the roof; or for figs, which are found to succeed better than most trees under the shade of others.

688. The *Middle Trellis* is generally of a curved form, so as not to exclude the light from the back wall. Sometimes it is horizontal for the same purpose, and sometimes it is omitted, and dwarf standards preferred in its room.

The *Front or Roof Trellis* generally covers the whole of the roof, at the distance of from 10 to 18 inches from it. It is generally formed of wires stretched horizontally at 6 or 8 inches distance, and retained in their places by being passed through wrought-iron trellis rods proceeding from the parapet to the back wall, or the lower edges of rafters, when formed in a manner adapted for this end.

184



689. The *Fixed Rafter Trellis* consists ordinarily of three wires, which pass through the points of crosses, (*fig.* 184.) in breadth from fourteen to eighteen inches, and which crosses are screwed to the under edge of the rafter; the first fixed at the plate of the parapet, and the last at the upper end of the rafter, and the intermediate ones at distances from three to four feet.

690. The *Moveable Rafter Trellis* consists of a rod bent parallel to the roof, with crosses attached, or only horizontal studs containing two collateral wires, the rod itself forming the third. This rod is hinged, or moves in an eye or loop, fixed either immediately above the plate of the parapet, or near the top of the front glass. It terminates within one or two feet of the back wall, and is suspended from the roof by two or four pieces of chain attached to the sheds, the links of which are put on hooks attached to proper parts of the roof. Their advantage is chiefly in the case of very early forcing, when they can be let down two or three feet from the glass, and thus is lessened the risk of injury from frost. A whole sheet or tegument of trellis, if desirable, has been lowered and raised on the same general plan. (See the details, *Hort. Trans.* vol. iii.)

Rafter Trellises are in general used only for such houses as are not chiefly devoted to vines; such as pineries, peach-houses, and sometimes green-houses.

691. The *Secondary Trellis* is placed from six inches to eighteen inches behind the first, and is used for training shoots of the current year, while that nearest the light is devoted to such as are charged with fruit. In ordinary trellises, the wires are generally placed from nine inches to a foot asunder, in a horizontal direction; on the secondary trellis they are placed at double that distance.

692. The *Cross Trellis* has been sometimes employed in peach-houses, and is strongly recommended by Sir George Mackenzie, in what he calls an economical hot-house. These trellises, however, unless kept very low, darken the house to such a degree as to prevent the ripening of fruits. They may be useful for nurserymen for training peaches or fig-trees for sale, but for culinary forcing are worse than useless. Sir G. M.'s house, though lauded by Dr. Duncan (in *Caled. Memoirs*, vol. ii.) was soon obliged to be cleared of its cross trelisses, and restored to the common form.

693. The *Entrance* to hot-houses is commonly at each end, and sometimes in the middle, either of which modes answers perfectly where the ground-plan is a parallelogram; but for any description of curvilinear house, the entrance is more commodiously made through a lobby at each end of the house, and which lobby is formed behind the wall. When there are a number of curvilinear houses placed against one wall, one door in the wall between each will serve every purpose, and the whole will be at once elegant and commodiously connected. (See *fig.* 170.)

Subsect. 9. *Pits, Stages, Shelves, Doors, Paths,* &c.

694. These parts of interior detail are partly common to hot-houses in general, as doors, paths, and shelves; and partly peculiar to certain kinds of houses, as pits, stages, &c.

The only disadvantage of a door in the front or ends of a curvilinear house, is that it somewhat injures the unity and beauty of the figure, and obstructs light.

The *Paths* in hot-houses vary in direction, breadth, and construction. In general, one path runs parallel to the front, sometimes upon the front flue, but more generally beside it; at other times, as in peach-houses, it passes near the back wall, or through the middle of the house. In pineries and houses with pits, it generally surrounds these, and in green-houses it is commonly confined to a course parallel to the front and ends.

695. The *Materials* of which the path is composed in the case of some houses, are mere planks, or lattice work, supported on cross pieces of timber, in order to admit the sun and air to the soil below, and not to indurate it by the pressure of feet. An improvement on this mode consists in using grated cast-iron plates, which are more durable, and may be set on iron stakes driven in till their tops are on a level, and at a proper height, &c. These gratings are also particularly preferable when the path is over a flue, not only as presenting a cooler surface to walk on than the covers of the flue, but also by readily admitting the ascent of the heat in the interstices, and preventing the movement of the covers by the motion of walking. But the best material for a permanent path, as in green-houses, botanic stoves, &c. is argillaceous flag-stone, and of this one of the best varieties is that obtained from *Arbroath*, and known by the name of Arbroath-pavement. It is a light grey schistus, which rises in lamina, of from three to six inches in thickness, and eight or ten feet square; requires very little work on the surface, and has the property of but very slightly absorbing moisture from the atmosphere, or from the

moist ground on which it may be placed. Thus, unless when watered on purpose, it always appears perfectly dry and agreeable, however moist the soil below. Where the paths in a house are on different levels, they are commonly united by steps; but an inclined plane, when not steeper than one in six, will generally be found more convenient for the purposes of culture and management; and if the slope is one in eight, it is more agreeable to ascend or descend than a stair.

696. *Pits*, as applied to the interior parts of houses, are excavations, or rather enclosures for holding bark, or other fermentable substances. They should be raised so as the plants may stand at a moderate distance from the glass, which of course depends on the nature of these plants, whether dwarf, bushy plants, as the pine, or taller, as palms and hot-house trees. They are generally surrounded by walls of brick, four or nine inches thick, or to save room, by plates of cast-iron, stone, or slate. Sometimes the slope of their surface approaches to that of the roof; but as, in this case, the tan or leaves in the course of fermentation, do not settle or compress regularly, the pots are thrown off their level, and therefore the more common way is to adopt a slope not exceeding 5°, or to form a level surface. Tan will ferment with all the rapidity necessary for bottom heat, if in a layer of two and a half or three feet thick, and therefore no tan-pits need exceed that depth. Those for leaves may be somewhat deeper. Heat from fire, or steam, or water, is sometimes substituted for that afforded by fermentable substances, and in these cases various forms of construction are adopted. For fire-heat, flues are made to circulate under a covering of pavement, on which sand, gravel, scoria, or saw-dust, is placed to preserve a moist heat round the pots. An air chamber is thus formed under the pit, from which the heated air may be allowed to escape, if desired, by upright tubes, with stops, as in the Chelsea garden, or small openings in the side walls of the pit, as at N. Kent's, ofClapton. These modes we suggested in 1804. (See *Tr. on Hoth.* 8vo. Edin. 1804. and *Hort. Trans.* vol. ii.)

Another mode consists in filling the vacuities round the flues with loose stones, flints, brick-bats, or large gravel. These materials, when once heated, retain their heat a very long time, and give it out slowly to the superincumbent mass of sand, gravel, or other *media*, in which the pots may be plunged. Sometimes soil is placed over this strata of stone and gravel, and the plants inserted in the soil. We have seen pines grown in this way at Underley park from our suggestions. (See *Tr. on Hoth.* 8vo. Edin. 1804. and *Tr. on Country Resid.* vol. i. 1806.)

Another, and very old method of heating pits by smoke is by forming a vault under them, building in a furnace and ash-pit door at one end, and a chimney at that opposite. This is the mode originally used in France and Germany. (*Encyc. method. vol. d'Aratoire et Jardinage, art. Serre.*)

The heat from steam may be derived from either of the above modes, substituting tubes for flues, and in the case of the vault, merely introducing the steam tube about the middle of the space, and omitting the chimney. Or the tubes may circulate at once in the tan, sand, or saw-dust; or a vacuity may be formed not more than six inches deep, the whole width of the pit, covered by pierced oak boards, and the steam introduced there at proper intervals. All these and other plans have been tried by Butler at Knowle, near Prescot, in 1791, Mawer at Dalry, in 1795, Thomson at Tynningham in 1805, Gunter at Earl's Court in 1818, and various other persons; accompanied, as was to be expected, by different degrees of success. A cistern of water of the size of the pit has been heated by steam, and left to give out its heat to the superincumbent materials of the pit, by Count Zuboff at Petersburg. We have seen cucumbers grown over a cistern in which the hot-water from a distillery passed through. The result of all the attempts hitherto made to find a substitute for the heat of fermentable substances, as applied to pits in which pots are to be plunged, is not such as to warrant much deviation from the usual practice. But that bottom-heat may be very generally dispensed with altogether, modern experience goes far to prove; and it is more likely that it will be given up altogether, and bottom-moisture obtained by plunging the pots in gravel or scoria, than that methods so expensive, and attended with so much risk to the plants, will ever come into much use.

697. *Beds and Borders* in hot-houses are generally formed on the ground level, though sometimes raised above it. They are either composed of earth, for the direct growth of plants, or of gravel or scoria, in which to place pots. When the use of tan is given up, as in some plant-stoves, the tan-pits are filled with gravel, on or in which, the pots are set or plunged. Where heat and moisture are judiciously applied, this mode is found to succeed perfectly, as at the Count de Vandes', Bayswater, and Messrs. Loddiges', Hackney.

698. *Shelves*, excepting such as are placed near the ground, or almost close under the upper angle of the roof, are extremely injurious to the vegetation going forward in the body of the house by the exclusion of light. This consideration, therefore, must be kept in view in placing them; in some cases they are inadmissible, as in conservatories; in others, as in propagating-houses, the light they exclude can better be spared, than in

fruiting or flowering departments. For forcing strawberries, they may be introduced under the roof in vine and peach-houses, and removed when their shade proves injurious, &c. The ordinary form is that of a flat board; but an improvement consists in nailing two fillets along its edges, and covering the board with a thin layer of small gravel or scoria. This preserves a cool genial moisture which keeps the earthen pot moist, and lessens the effect on the earth of alternate dryings and waterings; and it also admits the escape of water from the orifices in the bottoms of the pots. Some, in the case of forcing strawberries, and French beans, have the fillets or ledges of the shelves so high as to contain two or three inches of water, by which means whole rows of pots can be inundated at one operation; but this is too indiscriminate an application of a material on which so much in the growth of plants depends.

699. *Stages* are shelves in series rising above each other, and falling back so as their general surface may form a slope. They vary in form according to that of the house. The houses with shed roofs and opaque ends have merely a series of steps reaching from one end to the other; but wherever the ends are of glass, by returning each shelf to the back wall, due advantage is obtained from the light furnished by the glass ends. The addition of ledgement, or turned-up edges to each shelf, and the covering them with gravel, is, of course, as advantageous as in separate shelves, and surely more consonant with natural appearances, than leaving them naked like household, or book-shelves.

Subsect. 10. *Details for Water, Wind, and Renewal of Air.*

700. These parts of culture depend less on interior arrangement, than on details in the roof, and on certain portable or fixed engines already described.

The reservoirs of water in hot-houses are commonly cisterns of stone or timber, lined with lead or cast-iron troughs or basins. Sometimes, also, tanks are built in the ground, and lined with lead or cement.

The cistern is sometimes placed in an angle, or other spare part of the house, and the water lifted from it at once with the watering pots; but a more complete plan is to build it in an elevated part of the back wall, where it may have the benefit of the heat of the house, and whence pipes may branch off to different parts of the house with cocks, every 30 or 40 feet, for drawing supplies. Tanks and cisterns below the level of the front gutter may be supplied great part of the year from the water which falls on the roof; but more elevated cisterns must either be supplied by pumps, or elevated springs. The sources of supply, and the quality of the water must be taken into consideration before the situation of the cisterns are determined on. In all cases, there must be waste boxes at the cocks, and waste pipes from the cistern to counteract the bad effects of leakage.

701. *Artificial Rain.* A very elegant plan has been invented and executed by Messrs. Loddiges, for producing an artificial shower of very fine rain in hot-houses, by conducting pipes horizontally along the roof, at the distance of six or eight feet, and having these pipes very finely perforated by a needle. According to the power of the supply, one or more pipes may be set to work at a time, and a very fine shower thrown down on the leaves of the plants with the greatest regularity. This has been done in the large palm-house of these spirited cultivators at Hackney, and for which a medal was voted to them by the Horticultural Society, in 1817. The following is a particular account of this apparatus. (*Hort. Trans.* vol. iii. p. 15.)

" A leaden pipe of half an inch bore is introduced into one end of the house, in such a situation that the stop-cock, which is fixed in it, and which is used for turning on the supply of water, may be within reach: it is then carried either to the upper part, or the back of the house, or to the inside of the ridge of the glass frame-work, being continued horizontally, and in a strait direction, the whole extent of the house, and fastened to the wall, or rafters, by iron staples, at convenient distances. From the point where the pipe commences its horizontal direction, it is perforated with minute holes, through each of which the water, when turned on, issues in a fine stream, and, in descending, is broken, and falls on the plants, in a manner resembling a gentle summer shower. The holes are perforated in the pipe with a needle, fixed into a handle like that of an awl; it being impossible to have the holes too fine, very small needles are necessarily used for the purpose, and in the operation great numbers are of course broken. The situation of the holes in the pipe must be such as to disperse the water in every direction that may be required, and in this particular the relative position of the pipe, and of the stations of the plants to be watered, must be considered, in making the perforations. The holes are made, on an average, at about two inches distance from each other, horizontally, but are somewhat more distant near the commencement, and rather closer towards the termination of the pipe, allowing thereby for the relative excess and diminution of pressure, to give an equal supply of water to each end of the house. A single pipe is sufficient for a house of moderate length: one house of Messrs. Loddiges, which is thus watered, is sixty feet long, and the only difference to be made in adapting the plan to a longer range, is to have the pipe larger. The reservoir to supply the pipe, must of course be so much above the level, as to exert a sufficient force on the water in the pipe, to make it flow with rapidity, as it will otherwise escape only in drops; and as too strong a power may be readily controlled by the stop-cock, the essential point to be attended to, in this particular, is to secure force enough.

"From the above details it will be observed, that some nicety is required in the arrangement and formation of the machinery; but it is only necessary to view the operation in Messrs. Loddiges' house, to be convinced of the extreme advantage and utility of the invention, when it is properly executed." (*Sabine in Hort. Trans.* vol. iii. p. 15.)

We have adopted this plan on a smaller scale in our erections at Bayswater, and the whole of the plants under the square dome (*fig.* 161.) is watered from a perforated pipe, which passes round the dome near its apex, and radiates from thence a very fine shower, which reaches every part of the house.

Wind in Hot-houses has been attempted, or rather recommended to be attempted, by Dr. Anderson and others by means of fans. If any thing of this sort were desirable, the Eolian machine invented by B. Deacon, already mentioned (632.) might be employed, either placed in the house, and kept in motion by human, or mechanical power, or placed at one end to force in or draw out the air. In a range of houses forming a circle or square, or any endless figure, a perpetual breeze might be readily produced in the following manner. Place under the floor, a powerful fan of the width of the house. Exactly over the fan, place a glass division across the house, and let the fan draw in the air through apertures in the floor on one side of the division, and give it out through similar apertures, or through tubes of any sort on the other. It is evident, a regular current would thus be produced, more or less powerful according to the size of the fan, and the rapidity of its motion.

703. *Ventilators*, &c. The general mode of renewing the air, is by opening the sashes or doors of the house, in periods when the exterior temperature and weather is such as not to injure the plants within. The cool air of the atmosphere being then more dense than that of the house, rushes in till it cools down the air of the house nearly to an equilibrium with that without.

The next mode most common, is that of having two or three small ventilators, or tubular openings in the lower and upper parts of the house, and conducting the channels or tubes from the upper ventilators near to a flue, or so that fire may be applied under or beside them, to excite a current. In this way, the air of a hot-house may be renewed in the most foggy weather, which in graperies is sometimes of use to prevent the damping or moulding off of the fruit. Sometimes these ventilators are made with a cylinder and fans to extract the air, and sometimes, as most generally, they are mere openings of small dimension; but, in order to effect any circulation or renewal with this sort of ventilators, there must be a considerable difference of temperature between the air of the house and the open air.

To effect the renewal, or cooling down the air without manual labour, some contrivances have been adopted besides the artificial gardener of Kewley already described (*fig.* 129.) Dr. Anderson and J. Williams made use of oblong bladders made fast at one end, and with the other attached by means of a cord to a moveable pane or small sash. The bladder being filled and hermetically sealed with air at the common temperature allowed for the house, the window remains at rest; but as the air of the house becomes heated, so does that of the bladder, which consequently swells, and assumes the globular form, its peripheries are brought nearer together, and of course the sash or pane pulled inwards. In a small house this scheme may answer perfectly well for the prevention of extreme heat.

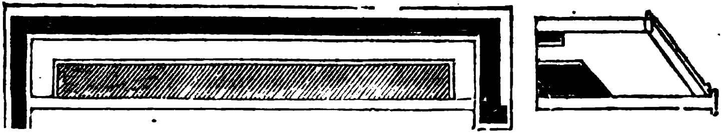
Another mode is by using a rod of metal, such as lead, of the whole length of the house, and one end being fixed to the wall, on the other is attached a series of multiplying wheels, the last of which works into one, which in various ways may open valves or sashes. As the expansion of lead is considerable, the effect of twenty degrees of increase with proper machinery, might perhaps guard against extremes, as in the other case. A column of mercury, with a piston rod and machinery attached, has also been used; but the only complete mode is that of Kewley. For details at greater length on all the departments of the construction of hot-houses, see *Remarks*, &c. 4to. 1817.

Subsect. 11. *Mushroom-houses.*

704. This variety of plant habitation differs from the others in requiring very little light. The simplest form of the mushroom-house is that of an open shed or roof, supported on props, for throwing off the rain, and protecting from perpendicular cold. Under this, the mushrooms are grown on ridges, covered by straw, &c. to maintain the requisite temperature.

The *flued Mushroom-house* (*fig.* 185.) is an improvement on the shed, by being better calculated for growing them in winter. Provided it be placed in a dry situation, the aspect, size, proportions, doors, or windows, are of little consequence. To be sufficiently warmed by one fire in winter, it should not contain more than 10,000 cubic feet of air. As mushrooms will not thrive without some light, and at all events require air, it ought to have two or three windows or valves for these purposes.

185



705. The *German Mushroom-house*, (*fig.* 186, 187, 188.) It is a common practice with German gardeners to grow mushrooms on shelves, and in pots and boxes, placed behind stages, or other dark parts of their forcing houses which can be made no other use of. (See *Diedrich's Gärtner's Lexicon*, and *Ransleben's Brieffe*, &c.) This practice was carried to Russia, and from Russia brought to England by Isaac Oldacre, who thus describes the sort of house adapted for the German practice. "The outside walls, (*G, H. fig.* 186, 187.) should be eight and a half feet high, for four heights of beds, and six feet and a half for three heights, and ten feet wide withinside the walls; this is the most convenient width, as it admits of a set of shelves three feet and a half wide on each side; and affords a space through the middle of the house, three feet wide, for a double flue, and walk upon it. The wall should be nine inches thick, and the length of the house as it may be judged necessary. When the outside of the house is built, make a floor or ceiling over it (as high as the top of the outside walls), of boards one inch thick, and plaster it on the upper side, (*e e*,) with road-sand well wrought together, one inch thick, (this will be found superior to lime,) leaving square trunks (*f*,) in the ceiling, nine inches in diameter, up the middle of the house, at six feet distance from each other, with slides (*s*,) under them, to admit and take off air when necessary; this being done, erect two single brick walls, (*v v*,) each five bricks high, at the distance of five feet and a half from the outside walls, to hold up the sides of the floor-beds, (*a a*,) and form one side of the air flues, (*t u, t u*,) leaving three feet up the middle (*t x t*,) of the house, for the flues. Upon these walls (*v v*,) lay planks, (*t v*,) four and a half inches wide, and three inches thick, in which to mortice the standards (*t k*,) which support the shelves. These standards should be three inches and a half square, and placed four feet six inches asunder, and fastened at the top (*k k*,) through the ceiling. When the standards are set up, fix the cross-bearers (*i n, i n*,) that are to support the shelves, (*o o*,) morticing one end of each into the standards, (*i*,) the other into the walls (*n*,). The first set of bearers should be two feet from the floor, and each succeeding set two feet from that below it. Having thus fixed the uprights (*t k*,) and bearers (*i n*,) at such a height as the building will admit, proceed to form the shelves, (*o o*,) with boards an inch and a half thick, observing to place *a* board (*d d*,) eight inches broad and one inch thick, in the front of each shelf, to support the front of the beds. Fasten this board on the outside of the standards, that the width of the beds may not be diminished.

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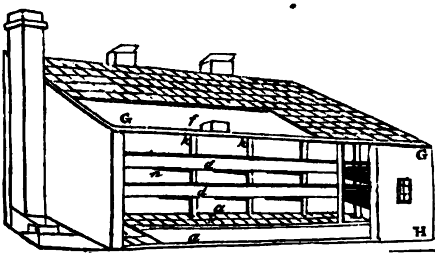

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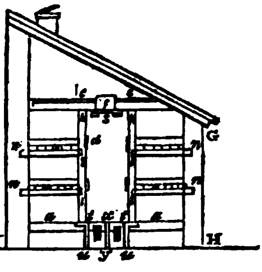

The shelves being complete, the next thing to be done is the construction of the flue, (P. *fig.* 188.) which should commence at the end (L) of the house next to the door, run parallel to the shelves the whole length of the house, and return back to the fire-place, where the chimney (S) should be built, the sides of the flue inside to be the height of four bricks, laid flat-ways, and six inches wide, which will make the width of the flues fifteen inches from outside to outside, and leave a cavity (*t u, figs.* 186 and 187.) on each side, betwixt the flue and the walls that are under the shelves, and one ($x\ y$) up the middle betwixt the flues, two inches wide, to admit the heat into the house from the sides of the flues. The middle cavity ($x\ y$) should be covered with tiles, leaving a space ($h\ h$) of one inch betwixt each tile, for the admission of the heat. The top of the flue, including the covering, should not be higher than the brick walls that form the front of the floor beds. The reason why the sides of the flues are recommended to be built stronger than usual, is, because they support the walk. The walk itself is formed by three rows of tiles, the outside rows making the covering of the flues, and those of the centre row are what cover the middle cavity ($x\ y$), as above mentioned; the outside cavities ($t\ u$) of the flue are left open, the tiles which are placed over the flues being laid so as not to cover these cavities, which allows the heat of the sides of the flues to rise upwards." *Oldacre in Hort. Trans.* vol. ii.

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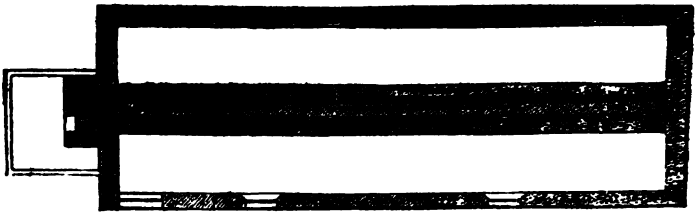


CHAP. III.

Edifices used in Gardening.

These are various, and for the sake of order, may be considered as economical, anomalous, and decorative. In all of them, the details of construction belong to civil architecture; but the design of the greater part ought to be regulated by the judgment of the gardener or garden architect.

SECT. I. *Economical Buildings.*

These are chiefly dwellings, store-rooms, and working places, entrance lodges, and buildings for procuring or retaining water.

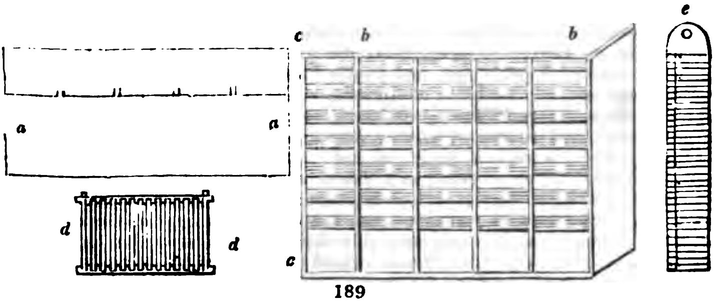
706. The head *gardener's dwelling-house,* in small places, often assumes the character of the porter's lodge to the gate of entrance; or is placed in some point of the grounds for protection. In all cases it should be near to the garden, and if forcing is carried on, the nearer it is placed to that department the better. Sometimes it is placed in the back-sheds, but that is an unwholesome situation, such sheds fronting the direct north, and without a single opening to the south, east, or west, are entirely excluded from the sun, excepting during a few mornings and evenings in summer. A small enclosure, near the forcing department, and, if possible, on rising ground, so as to command a view of at least that part of the garden, is to be preferred. With respect to accommodation, no dwelling in this country, for a servant expected to do his duty, ought to contain less on the ground-floor than a kitchen, back-kitchen, and parlour; on the floor above that, at least two bed-rooms, with closets, and other requisite appendages, internal as well as external. This will suit a prudent man and his wife, not in circumstances to keep a maid, or to produce a numerous offspring. But for such as afford to keep a servant, or have, or deem it right to have, a large family, or persevere without thinking any thing about the consequences in creating one child after another, more bed-rooms will be necessary, and a larger parlour and kitchen. As a gardener, in common with other domesticated servants, is liable to be removed from the house he occupies at a short notice, and without any reference to his having, or being able to procure another, it follows, as a matter of justice, that what are called house fixtures should be provided by the master. Water should be conducted to, or near to, a pump fixed in the back-kitchen; a furnace and boiler for washing affixed; a proper range, with oven, &c. dressers, tables, shelves, &c. in the principal kitchen; grates, and such closets and clothes' presses placed in the parlour and other rooms, &c. as the occupier would place there, if he held the house on lease.

In general, we may observe that a master has seldom occasion to repent making his servants' abodes comfortable, and even rather agreeable and elegant, than otherwise. A well regulated mind, indeed, will be anxious to effect this, as far as lies in his power, for every portion of animated nature under his protection.

707. *The gardener's office* is necessarily omitted in small places; but it is an essential requisite wherever several men are kept. It should, if possible, adjoin the dwelling, and be connected with the seed-room, fruit-room and cellar, root-cellar, tool-house, and gardener's lodge. The furniture or appendages to this room are the writing-desk; a bookcase, containing a small library, to be lent out to the men; a map of the garden, and of all the grounds under the master's care; a herbarium press, (271.) and a cabinet for such specimens of plants as the gardener may find it useful to dry for his own use, or, as often happens, for that of his family; a drawing board and T square; a board to be used when new grounds are laying out, as a *plain table*, (in geometry); a theodelite, Gunter's chain, and measuring laths; with any similar articles, as spare thermometers, budding-knives, &c. There should also be shelves for named tallies not in use, and similar objects.

708. A door may pass from the office through a lobby to the *seed-room*. This should be a small room, well ventilated, with a cabinet of drawers, as in a common seed-shop, but on a smaller scale, and somewhat different system The lower tier of drawers should, of course, be the largest, and may be one foot deep by two wide on the face, and eighteen inches broad within. This tier will serve for beans, peas, acorns, mast, &c. A second may be three-fourths the size, for carrot, turnip, spinage, larch seed, &c. A third, half the size, for salad-seeds, and the fourth for those of pot and sweet herbs, need not be more than four inches deep on the face. The upper part of the cabinet may consist of shallow drawers, divided into ten or twelve compartments each, for flower seeds; and on the top of all, as being least in requisition, similar shallow drawers, with moveable partitions for bulbous roots. As the kind or kinds placed in each drawer will probably vary every year, it seems better that their names should only be written on paper and pasted on. There ought to be a small counter, with a weighing machine, (that of *Meadows'* is much the best,) an ink-piece placed on it, and drawers, with paper bags, pack-threads, &c. &c. below. Some seeds, which it is desirable to keep in the fruit, as capsicum, pompion, &c. may be suspended from rows of hooks, fixed in the ceiling.

709. A door from the seed-room may lead to the *fruit-room*. This ought to be well ventilated, and for this purpose, like the three other rooms, it ought to have a small fire-place. The fruit-room was formerly a mere loft, where fruits were kept on the floor in common with onions, with no proper means of separation, or arrangement for systematic consumption. Now, however, they are regularly fitted up, either with shelves of lattice work, on which to place sieves of different sorts of fruit; or with close shelves, for jars, boxes, &c. according to the various modes adopted of preserving them. The room may be of any form, but one long and narrow (*fig.* 189, *a, a*,) is generally best adapted for ventilation and heating, or drying, when necessary, by a flue. The system of shelves (*b, b*,) may be placed along one side, and may be raised to the height of six feet or more, (*c, c*,) according to the number wanted. These shelves are formed of open work, (*d, d*,) on which to place square sieves of fruit, each of which should be numbered, and a table or slate, (*e*,) containing the corresponding numbers, may be hung up in the room, and opposite each number should be a space for noting down daily the number taken out of each sieve for use. From this table statements may be made from time to time of the quantity of fruit on hand for the use of the house steward. (*Maher*, in *Hort. Trans.* vol. ii. 76.)



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Forsyth directs that all the floors or shelves on which apples are to be kept or sweated, should be made of white deal, as when red deal is made use of for these purposes, it is liable to give a disagreeable resinous taste to the fruit, and spoil its flavor; when white deal cannot be procured, he advises covering the shelves with canvass. Those sorts of fruit which keep longest are generally best preserved in jars, excluded from the air, and placed in cold dry situations, not under 32° nor above 40°.

710. In the lobby already mentioned, a small stair should descend to the *root-cellar*,

placed beneath the office and seed shop; and the *fruit-cellar* below the fruit room. The great object is to keep the air in these apartments cool, and always, as near as possible, of the same degree of coolness: and for this purpose the windows should be small, placed below the ground level, and furnished with double or treble casements or sashes. These cellars should also be approached through double doors for the same reason. The fruit-cellar may be fitted up with binns or cells, like a wine cellar, in which casks and jars, or sieves of fruit may be placed; and the root-cellar may have a few divisions on the ground to keep different roots apart, and sand, to keep them of uniform plumpness or moisture.

711. From the same lobby, a stair should ascend to three rooms or garrets, viz. one for drying and cleaning *seeds*; one for drying *bulbous roots*, as onions, hyacinths, &c.; and one for drying *fruits* or preserving them there. In all of these rooms, there should be hooks from the roof for hanging bundles of pot-herbs, branches of seeds, sieves, bags, &c. and a moveable table or counter in the centre of each, with lattice shelves below for holding sieves of roots, seeds, or fruits. A very small fanning machine, and a couple of grooved cylinders to act as a threshing machine, or a Meikle's threshing-machine to be worked by two men, are requisite appendages of the seed-room.

Supposing these rooms to form one wing to the gardener's house, the office opening into his kitchen; then the other wing may consist of a *tool-house* and men's living room on the ground-floor; cellars for potatoes and fuel for their use under, and sleeping apartments over, with a door, lobby, and stair, corresponding with the other wing.

712. *The Tool-House* is commonly a small apartment in the back-sheds of hot-houses, in which the tools are laid down or piled up in the angles promiscuously; but in a proper tool-room, wherever situated, there should be contrivances of different sorts for hanging up the tools, so as their important parts, such as the teeth of rakes, blades of hoes, and spades, &c. may always be so exposed, that the master may see whether or no they are properly cleaned. There are certain tools, of which each workman appropriates one to himself, as spades, scythes, &c.; in these cases a small space should be allotted to each hired man, with his name affixed, &c. Watering-pots, syringes, engines, &c. should have their moveable parts separated, and be reversed, in order to drain and continue dry. Lists, nails, and mat ties, should be kept in close drawers. Pruning-instruments oiled, and laid horizontally on latticed shelves or pins. A grind-stone and other stones, and hones, with a vice, and files for sharpening the tines and teeth of forks and rakes, are the appropriate furniture of the tool-house.

713. The *Gardener's Lodge* should never consist of less than three apartments or divisions; first, an outer lobby, with a pump and exit for water, in which the workmen may wash their hands on entering to their meals, and the party who acts as cook or servant, which is generally taken by turns, may wash, scour, &c.; secondly, the cooking and living room, in which should be an economical kitchen range, with an oven and boiler included, and proper closets, cup-boards, tables, &c. to expedite and simplify cooking; and thirdly, the bed-room over, where the bed-steads should be of iron, narrow, and without curtains, and for not more than one person. To each bed, there should be a small clothes' press, in which should be kept the linen, &c. belonging to each bed, and for which the occupier ought to be rendered responsible. The cellar for fuel and edible roots has been already mentioned.

It is a common practice to place the lodges for working gardeners behind the hot-houses, or some high wall, in what is called a back-shed. There, in one ill-ventilated apartment, with an earthen or brick floor, the whole routine of cooking, cleaning, eating, and sleeping, is performed, and young men are rendered familiar with filth and vermin, and lay the foundation of future diseases, by breathing unwholesome air, and checking the animal functions by cold and damps. How masters can expect any good service from men treated worse than horses, it is difficult to imagine; but the case is ten-fold worse, when head-gardeners and their families are compelled to lodge in these shed-houses. Independently of filth and incommodiousness, the mother never fails to contract, early in life, rheumatism or agues; and it is only the extreme healthfulness of the employment of gardening, and the consequent vigor of the operatives, that ward off till a later day the same and similar diseases in the fathers and journeymen.

714. A line of *Sheds* is generally placed behind the range of hot-houses, or behind the hot-wall, or other high wall of the garden. These are used as *stores*, or places of reserve for utensils, machines and implements, and for working-sheds.

The width and height of this line of sheds is necessarily regulated by the height of the wall. The roof of the shed being towards the north, and therefore without the advantage of the sun, to dry it after rains, should not make an angle of less than 40° with the horizon, and as the lower wall ought, at least, to be seven feet high above the level of the floor of the shed, the width is guided accordingly. All the fitting up requisite for the part destined to hold materials, is a few hooks and projecting pins for ladders, &c. and a sound floor, either paved or prepared with mortar, Roman cement, and scoria; and the whole, or the greater part of the division may have props or columns in front, instead of a wall and windows. As these sheds generally contain the hot-house furnaces, each of these, or every pair or group of them, ought to be inclosed with a low parapet to retain the fuel, give an orderly and neat appearance, and guard against accidents by fire, which might communicate with mats, litter, &c. Doors generally communicate with the hot-houses at different points, and near to each of these should be a bench or table on which to set or shift pots, &c.

The part of these sheds more particularly set apart for working, ought to be enclosed with a wall on all sides, and warmed by a fire-place or flue. It ought to be made perfectly light, and well aired by having numerous windows, and along these a range of benches or tables, for potting cuttings, or bulbs, sowing seeds, preparing cuttings, number tallies, painting and naming them, preparing props for plants, hooks for layers, lists for wall-trees, making baskets, wattled hurdles, and a great variety of other operations performed in winter, or severe weather, when little or nothing can be done in the open air. It may by some be thought too great a refinement to place a fire-place or a flue in such sheds; but if work is really expected to be done in them in cold weather, the saving will soon be rendered obvious.

In small gardens; where there are no hot-houses, one small building is generally devoted to all the purposes for which the office, seed, tool, and fruit rooms, and working sheds, are used. This should be fitted up with some degree of attention to the various uses for which it is designed, and a fire-place never omitted.

715. *Entrance Lodges and Gates* more properly belong to architecture than gardening. But, as in small places, they are sometimes designed by the garden-architect, or landscape-gardener, a few remarks may be of use. In respect to *style*, the lodge ought always to bear as much analogy as possible to the mansion. If the one is Grecian, so should the other; but the lodge should display less decoration, because, as the mind naturally ascends from the less to the greater, the lodge would otherwise prove a false index to the mansion. In regard to *general form*, a cubic mass with a central chimney, is an unvaried comfortless-looking dwelling, whether great or small. It is an attempt to form a whole without composing it of parts. A lodge, however small, to be a picturesque object, ought to contain a principal and subordinate mass or masses, and in the composition of which, the gate and piers may form one gradation. In respect to accommodations for the occupier, it ought never to contain less than three apartments, a kitchen or living-room, back kitchen, and sleeping-room, with the usual conveniences, and, at least, two sleeping-rooms where there are children.

A handsome architectural entrance is but a poor compensation for its want of harmony with the mansion, of which that at Zion-House is an instance, and that at Blenheim, of the contrary. But architects, like all of us, are sometimes so wrapt up in their art, or their favorite part of it, that they forget, that congruity of parts is essential to the unity of the whole.

716. *Buildings for raising Water.* There are various contrivances for procuring water in garden-scenery, where it is not found in springs, rills, or lakes; and where it is found, of collecting and retaining it. The principal of these are wells, conduit-pipes or drains, and reservoirs.

Wells are vertical excavations in the earth; always of such a depth as to penetrate a porous stratum charged with water, and mostly as much deeper as to form a reservoir in this stratum or in that beneath it. A well otherwise excavated, is a mere tank for the water, which may ooze into it from the surface strata.

The form of the well is generally circular, and to prevent the crumbling down or falling in of the sides, this circle is lined with timber, masonry, or zones of metal. The earthy materials being thus pressed on equally in every point of this circle, are kept in equilibrium. When the well is not very deep, and in firm ground, this casing is built from the bottom to the top, after the excavation is finished; but when the soil is loose, the excavation deep, or its diameter considerable, it is built on the top in zones, sometimes separated by horizontal sections of thin oak boards, which, with proper management, sink down as the excavation proceeds. There are various other modes, which, those who follow this department of architecture, are sufficiently conversant with.

The height to which the water rises in the well, depends on the height of the strata which supply the water; occasionally it rises to the surface, but generally not within a considerable distance. In this case it is raised by buckets and levers, by buckets and hand-machines placed over the well, or by buckets raised by horse-machines (*fig.* 190.)

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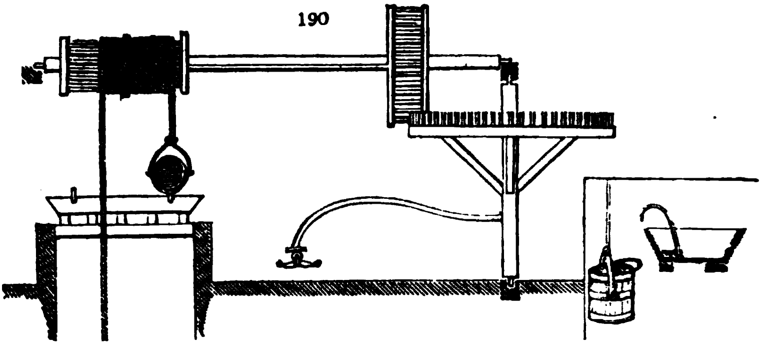

The first mode is the most ancient and the simplest. It is common in the market-gardens round London and Paris, and in most of the villages from France to Berlin, Warsaw, Moscow, Astracan; and, we are told, through Turkey, Persia, India, and China.

The hand and horse machines are more recent inventions, applicable to market-gardens.

717. *Pumps* are of various kinds, as the lifting pump, the forcing pump for very deep wells, the suction-pump, and the roller-pump, a recent invention for such as do not exceed thirty-three feet in depth. The best pump for gardens, where the water is not to be raised above twenty-eight or thirty feet in depth, is that of Robertson Buchannan, (author of a treatise on heating by steam, &c.) because this pump, which also acts by the pressure of the atmosphere, will raise drainings of dung-hills, or even water thickened by mud, sand, or gravel. " The points in which it differs from the common pump, and by which it excels, are, that it discharges the water below the piston, and has its valves lying near each other. The advantages of this arrangement are — that the sand or other matter, which may be in the water, is discharged without injuring the barrel or the piston-leathers; so that besides avoiding unnecessary tear and wear, the power of the pump is preserved, and it is not apt to be diminished or destroyed in moments of danger, as is often the case with the common and chain-pumps; that the valves are not confined to any particular dimensions, but may be made capable of discharging every thing that can rise in the suction-piece, without danger of being choked; and that if, upon any occasion, there should happen to be an obstruction in the valves, they are both within the reach of a person's hand, and may be cleared at once, without the disjunction of any part of the pump. It is a simple and durable pump, and may be made either of metal or wood, at a moderate expense."

Where clear water only is to be raised, Aust's (of Hoxton) *curvilinear* pump is preferable even to Buchannan's. The advantages depend on the curvilinear form of the barrel, which allows, and indeed obliges, the rod, the handle, and the lever, on which it works, to be all in one piece. Hence simplicity, cheapness, precision of action, more water discharged in proportion to the diameter of the barrel, and less frequent repairs. (*Repository of Arts, January*, 1821.)

There are innumerable contrivances for raising water, which any person will find detailed in works on Hydraulics.

718. *Conduits* for watering gardens are either open or surface conduits, or internal tubes or apertures. Open conduits are not common in Britain, though very general in France and Italy. They are formed in the commonest gardens of puddled or well incorporated clay; in the better sort of brick, or rough stone lined with stucco or cement; and in the best of hewn stone, in regular troughs, carefully jointed both by mechanical and chemical means.

Internal tubes may be formed of timber, iron, lead, or earthenware. For mains or large supplies, cast iron is the most durable, and timber the cheapest material; but for the minute ramifications necessary to afford supplies at different points, lead excels every thing else. A beautiful application of the principles of chemistry to the jointing of lead pipes, has been made by James Kewley (Inventor of the Artificial Gardener.) Instead of a large gibbous joint, formed by plastering on a mass of solder at an expense both of material and time, which in inch-pipes amounts to at least 3*s.* a joint, Kewley prepares clear transverse sections on the extremities to be joined, places these in perfect contact, heats the pipe within a few degrees of the melting point, and then, with one drop of solder not larger than a pea, he forms a junction as perfect as if no separation had previously existed. By proper irons this is done in three minutes, at an expense, time and materials included, of not more than one penny per joint. Earthen-pipes in a clayey sub-stratum may be used with economy, to convey water from one point to another; their disadvantages are liability to fracture or derangement from operations performed on the soil, to guard against which they should be laid at not less than three feet depth from the surface, and well bedded in worked clay.

Conduits of common masonry can seldom be advantageously used on a small scale, unless for serving jointly as drains and conduits, but where they are eighteen inches or two feet in diameter, a complete cylinder of masonry may be formed, which, well executed, becomes very durable. It is to be observed, however, that all conduits of masonry, and even earthen pipes, can only be used as such where the water is conducted along a level or declining bed; whereas by metal or wooden pipes, water may pass alternately over hollows and eminences, the latter not being higher than the source, without loss in the ground through which it passes.

719. *Reservoirs* may be either tanks, cisterns, basins, or ponds. Tanks and cisterns are sometimes old barrels well tarred or painted, and then sunk in the soil; occasionally they are framed boxes of timber, the joints filled with oxide of lead and oil, and the whole pitched over, and then placed where they are to remain either above or on a level with the surface.

Ponds or large basins (*fig.* 190.) are reservoirs formed in excavations, either in soils retentive of water, or rendered so by the use of clay. This clay is tempered, or made compact and tenacious, by working it, so as to exclude the larger globules of air and water; and intimately unite all its parts with as much moisture as leaves it plastic. The bottom and sloping sides of the excavation, being smoothed and made firm, this tempered clay or puddle is to be spread evenly over it, from margin to margin, about a foot thick, and well compacted by beating. To preserve it from injury, by the pressure of feet, or other accidents, it should be covered with gravel, in thickness according to the supposed liability to accidents. If cattle are to enter it, eighteen inches of coarse gravel, or stones covered with six inches of fine gravel, will not be too much. Sometimes these basins are lined with pavement, tyles, or even lead, and the last material is the best, where complete dryness is an object around the margin.

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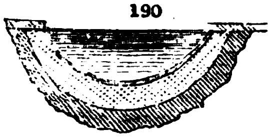

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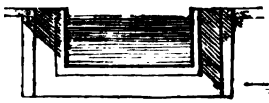

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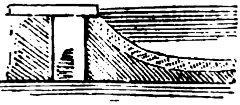


720. *Tanks or Cisterns* (*fig.* 191.) are generally excavations in the earth, lined with masonry, and sometimes raised two or three feet above it. This masonry is always built with mortar, which sets or hardens under water as the Dorking and other sorts of lime, gypsum, and any lime mixed with oxide of iron, in the form of what is called Roman cement, or Puzzolana earth. (*Davy's Elements of Agr. Chem. lect.* vii.) To protect this, the bottom of the cistern or basin is sometimes covered with six or eight inches of clay.

Sometimes the bottom of the excavation for a pond, is naturally a retentive clay, while the sides are of porous earth. In this case, the simplest way is to raise a wall, or vertical stratum of puddle (*fig.* 192.) from the horizontal stratum of clay, to within a few inches of the surface of the ground.

Water for culinary purposes should be preserved in tanks, or in barrels interiorly charred, sunk deep in the ground, and rendered inaccessible to surface water. Tanks should be arched over with masonry, leaving, as ought always to be done in wells, a hole for the pump, sufficiently large to admit a man to clean or repair. A similar construction is proper for reservoirs of liquid manures, but they need not be so deep, as coolness in them is less sought for. (See *Radcliff's Agr. of Fland.* 1819.) All reservoirs for pure water to be used in gardening, ought to be exposed to the sun and air.

Sect. II. *Anomalous Buildings.*

However unsuitable or discordant it may appear, it has long been the custom, in country residences, to delegate to the gardener's care certain minor articles of culinary luxury, as ice, and the breeding and rearing of certain animals, as bees. In some cases also he has the care of the dove-house, fish-ponds, aviary, a menagerie of wild beasts, and places for snails, frogs, dormice, rabbits, &c. but we shall only consider the ice-house, apiary, and aviary, as legitimately belonging to gardening, leaving the others to the care of the game-keeper, or to constitute a particular department in domestic husbandry. That the subject of anomalous buildings may not occur again, we shall here conclude it by treating also of their management.

721. The *Ice-house.* Ice is kept on the continent in cellars, at a greater or less depth from the surface according to the climate. These cellars are without windows, surrounded by very thick walls, and entered by double and treble doors, sometimes placed in angular or circuitous passages, and always with intervals of several feet between them. Sometimes precautions are taken to carry off any water which may arise from a partial thaw, by forming gutters across the floor, and covering it with a grating of strong lattice-work, leading to a cess-pool in the passage, whence the water can be taken out by utensils without opening the inner door; but very frequently full confidence is had in the coolness of the situation, especially if the surrounding soil be dry. Where the surrounding soil is moist, a frame-work or cage of carpentry, grated at bottom, is constructed in the cellar, so as to be from one to two feet apart from the floor, sides, and roof, and in this the ice is as perfectly preserved as in a dry soil. See *Cours, &c.* and *Bordley's Essays and Notes on Husbandry, Philadelphia,* 1780.

Ice is kept perfectly in the cellars of the confectioners in large cities in Britain, and also by some of the market gardeners, in heaps, built on an elevated base in the open garden, with no sort of building or frame-work whatever, but merely with a very thick covering of straw or reeds.

The form of ice-houses, commonly adopted at country-seats, both in Britain and in France, is generally that of an inverted cone, or rather hen's egg, with the broad end uppermost.

" The proper situation for an ice-house is that of a dry spot of ground; as, wherever there is moisture, the ice will be liable to dissolve: of course, in all strong soils which retain the wet, too much care cannot be taken to make drains all round the houses to carry off moisture; as when this is lodged near them, it will occasion a damp, which is always prejudicial to the keeping of ice.

" The places should likewise be elevated, that there may be descent enough to convey off any wet that may happen near them, or from the ice melting; and also as much exposed to the sun and air as possible; not under the drip, or in the shade of trees, as is too often the practice, under the supposition that, if exposed to the sun, the ice will melt away in summer, which never can be the case where there is sufficient care taken to exclude the external air, as the heat of the sun can never penetrate through the double arches of the buildings, so as to add any warmth to the internal air; while, when entirely open to the sun and wind, all damps and vapours are readily removed.

" The form of the building may vary according to circumstances; but for the well into which the ice is put, a circular form is the most convenient; the depth and diameter of it being proportioned to the quantity of ice wanted; but it is always best to have sufficient room, as when the house is well built, it will keep the ice two or three years: and there will be this advantage in having it large enough to contain ice for two years' consumption, that if a mild winter should happen, when there is not ice to be had, there will be a stock to supply the want in the house.

" Where the quantity wanted is not great, a well of six feet diameter, and eight feet deep, will be large enough; but for a large consumption, it should not be less than nine or ten feet diameter, and as many deep: where the situation is either of a dry, chalky, gravelly, or sandy kind, the pit may be made entirely below the surface of the ground; but in strong loamy, clayey, or moist ground, it will be better to raise it so high above the surface, as that there may be no danger from the wetness of the soil.

" At the bottom of the well, there should be a space about two feet deep left, for receiving any moisture which may drain from the ice, and a small underground drain should be laid from this, to carry off the wet; over this space should be placed a strong grate of wood, to let the moisture fall down, which may at any time happen from the melting of the ice. The sides of the well must be walled up with brick or stone at least two feet thick; but if it be thicker it will be better, as the thicker the walls are made, the less danger there is of the well being affected by external causes. When the wall of the well is brought within three feet of the surface, there must be another outer arch or wall begun, which must be carried up to the height of the top of the intended arch of the well; and if there be a second arch turned over from this, it will add to the goodness of the house; but this must depend on the person who builds going to the expense. When not, the plate into which the roof is to be framed must be laid on this outer wall, which should be carried high enough above the inner arch to admit of a doorway in to get out the ice. Where the building is to be covered with slate or tiles, there should be a thickness of reeds, straw, or other similar material laid under, to guard against the effects of the sun and external air; where they are laid two feet thick, and plastered over with lime and hair, there will be no danger of the heat penetrating. The external wall of the house need not be built circular, but of any other form, as square, hexangular, or octangular; and where it stands much in sight, may be so contrived as to make it a pleasing object.

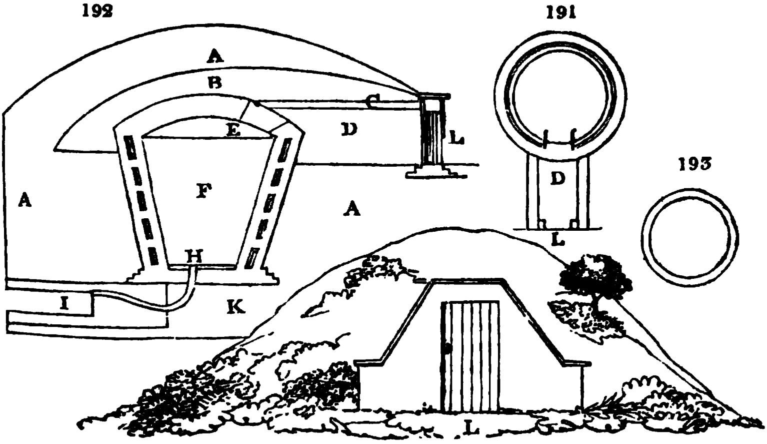
" Ice-houses," Miller observes, " may be built in such a manner as to have alcove seats in the front, having passages to get out and put in the ice behind them; or the entrance may be behind to the north; small passages being left next the seats, through which to enter to take out the ice, a large door being contrived with a porch wide enough for a small cart to back in, to shoot down the ice upon the floor near the mouth of the well, where it may be well broken before it is put down. The aperture of this mouth of the well need not be more than two feet and a half in diameter, which will be large enough to put down the ice, a stone being left to stop it, which must be closed up as securely as possible after the ice is put in, and all the vacant space above and between this and the outer door be filled close with barley-straw, or other similar material, to exclude the external air.

" The door to enter for taking out the ice should be no larger than is absolutely necessary for the coming at the ice, and must be strong and close to exclude the air; and at five or six feet distance from this, another door, should be contrived, which should be closely shut before the inner door is opened, whenever the ice is taken out of the house.

722. " *Management.*—When the house is finished, it should have time to dry before the ice is put into it; as when the walls are green, the damp of them frequently dissolves the ice; and, at the bottom of the well, upon the wooden grate, some small faggots should be laid; and if upon these a layer of reeds be placed smooth for the ice to rest upon, it will be better than straw, which is commonly used. In the choice of the ice, the thinner it is the better it may be broken to powder; as the smaller it is broken, the better it will unite when put into the well. In putting it in, it should be rammed close, and a space left between it and the wall of the well, by straw being placed for the purpose, so as to give passage to any moisure that may be collected by the dissolving of the ice on the top or otherwise. If snow is used instead of ice, it ought to be pressed very firmly together, so as to exclude air, and in fact approach in texture to ice. To aid in consolidating both ice and snow, a little water may be occasionally poured over it from the rose of a watering-pot.

" In putting the ice into the house, some mix a little nitre with it, to make it congeal more fully; but this is not necessary.

" As the ice becomes solid in the well, an iron crow is necessary to take it up with.



" (*Fig.* 191. Ground-plan. *Fig.* 192. Section in the direction of the entrance passage. *Fig.* 193. Ground-plan of the well. *Fig.* 194. Elevation. A. Upper covering of earth. B and K. Strata of clay. C. Wall of the arched roof of passage. D. (*figs.* 191. and 192.) Entrance passage. E. Entrance aperture of the well. F. Well. In its side-walls may be seen the cavities for the retention of the warm air, which would otherwise make its way to the well. H. Pipe for carrying off the water or moisture. I. Drain of it. L. (*figs.* 191, 192, and 194.) Door of passage."

We may observe, that it would be an improvement in rural architecture to constitute the ice-house one of the domestic appendages of the mansion, and to put its management, at least after being filled, under the house-steward, rather than under the gardener. Ice cold rooms might then be formed near it, which would be found useful for many purposes in domestic œconomy. A very scientific view of the subject of ice-houses will be found in *Rozier's Dict. of Agr.*, and in *Nouveau Cours d'Agriculture*, &c. art. *Glacière*.

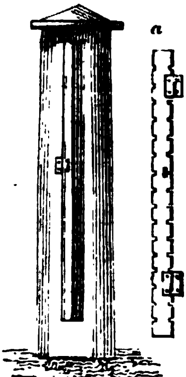
723. *Bees.* The care of bees seems more naturally to belong to gardening than the keeping of ice; because their situation is naturally in the garden, and their produce is a vegetable salt. The garden bee is found in a wild state in most parts of the globe, in swarms or governments; but never in groups of governments so near together as in a bee-house, which is an artificial and unnatural contrivance to save trouble, and injurious to the insect directly as the number placed together. Thus, if ten acres are sufficient to maintain two hives, a hundred acres will be required to maintain twenty; but while, in the former case, the hives being placed in the centre of the ten acres, each bee need not perform a longer journey than two hundred yards; in the latter, the colony being similarly situated as to the hundred acres, the average journey for each insect will be nearly a mile. Hence, independently of other considerations, one disadvantage of congregating hives in bee-houses or apiaries. The advantages are, greater facility in protecting from heats, colds, or thieves, and greater facilities of examining their condition and progress.

The simplest form of a bee-house consists of a few shelves in a recess of a wall or other building, exposed to the south, and with or without shutters, to exclude the sun in summer, and, in part, the frost in winter.

The scientific or experimental bee-house is a detached building of boards, differing from the former in having doors behind, which may be opened at any time during day to inspect the hives. In both kinds of houses, small holes, say half an inch high, and three inches wide, with a small projection, as a landing-place, are made in the front shutters, opposite the situation of each hive on the shelf. The upper part of these openings or entrances are sometimes guarded by a horizontal fillet to throw off the rain. Such are the buildings in which swarms are congregated. Of the constructions, or utensils, in which individual swarms are congregated, there are various sorts.

724. The *Polish Hive* (*fig.* 195.) may be considered as the primitive form of artificial dwellings for bees. It is simply the trunk of a tree, of a foot or fourteen inches in diameter, and about nine feet long. It is scooped out (boring in this country would be better) for about six feet from one end, so to form a hollow cylinder of that length, and of six or eight inches diameter within. Part of the circumference of this cylinder is cut out during the greater part of its length, about four inches wide, and a slip of board is made to fit the opening. On the sides of this slip or segment (*a*), notches are made every two or three inches, of sufficient size to allow a single bee to pass. This slip may be furnished with hinges and with a lock and key; but in Poland it is merely fastened in by a wedge. All that is wanting to complete the hive is a cover at top to throw off the rain, and then it requires only to be placed upright like a strong post in the garden so as the bottom of the hollow cylinder may be not nearer the ground than two feet, and the opening slip look to the south. When a swarm is to be put in, the tree, with the door or slip opened, is placed obliquely over it; when the bees enter, the door is closed, and the holes stopped with clay till the hive is planted or placed upright. When honey is wanted, the door is opened during the finest part of a warm day, when most of the bees are out; its entire state is seen from top to bottom, and the operator, with a segar in his mouth, or with a lighted rag, to keep off the bees from his hands, cuts out, with a hooked knife, as much comb as he thinks fit. In this way fresh honey is obtained during the whole summer, the bees are never cramped for room, nor does it become necessary to kill them. The old comb, however, is annually cut out to prevent or lessen the tendency to swarming, which, notwithstanding this and the size of their dwelling, they generally do once a year; for the laws of nature are not to be changed.

195



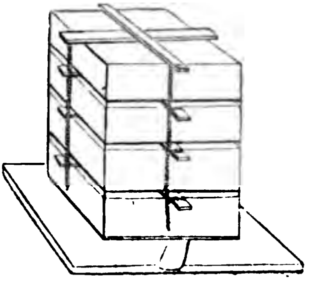
Though it is a fact that a small swarm of bees will not do well in a large hive, yet if the hive extend in length and not in breadth, it is admitted both by Huber and Huish, that they will thrive in it. "If too great a diameter," says Huber, "be not given to the abode of the bee, it may without danger be increased in the elevation, their success in the hollow trees, their natural domicile, incontestibly proves the truth of this assertion." We witnessed in 1813, near Grodno, the management by a woman, Panna Andriewschiesckniowna, (*N. M. Mag. June*, 1818,) in whose house we lodged, of above a dozen of these hives for nearly four months, and are of opinion that they merit a trial in this country. It is singular, that this should be almost the only continental hive that Huish, who seems to have paid more attention to the subject by foreign travel, study, and practice, than almost any man, has not seen. In Poland, he says, the inhabitants have no regular bee-hives. (*Treatise on Bees*, 3d edit. 1817, p. 52.)

725. The *Common Hive*, called by the French the *Scotch Hive*, is a thimble-shaped basket of rushes, straw, and sometimes of willows, about a foot in diameter within, and fourteen inches high. It is formed by coiling ropes of straw of wheat on a mould, sewing the layers to each other in advancing by flattened shoots of bramble, clematis, or willow. In Georgia, hives of this class are wrought with willows in the form of a cone, and the bees enter by the apex. (*Johnston's Journey overland from India*, 1817.)

726. The *Glass Hive* is variously constructed, sometimes with two of the sides of glass in order to see the bees at work; at other times the hive is entirely of wood or straw, but with a flat surface at top, pierced with holes about an inch diameter, on which to insert chrystal bell-glasses, or drinking-glasses, in which the bees may be seen at work, and which glasses, when filled with comb, may be removed and replaced by empty ones, and thus occasional supplies of fresh honey obtained during summer. In the glass hive of White and Thorley, one large globe is used, which, as often as filled, is removed and replaced by an empty one. Such hives must necessarily be placed in the bee-house, or under a proper cover to exclude the weather. Huish says, "they are fit only for the amateur, or those persons who wish to have a little fine honey during the season, but who have no inclination to preserve the bees for the benefit of the succeeding year.

727. The *Stoyring or Pyramidal Hive*, admits of increase, by the addition of horizontal sections of case, whether of straw or timber. The object is to produce a very strong hive; but this, when carried beyond a certain point, is found injurious, rather than otherwise. See *Huish*, p. 67.

196



728. The *Hive of Palteau* (*fig.* 196.) is composed of three or four frames, each a foot square, by three inches in height. These square frames are placed the one on the other, and the first and last can always be lifted without deranging the work in the others. Each square is strengthened from every side by a cross piece of eight or ten lines in width, and two lines in thickness, which serves to sustain the combs of the bees. All the frames are tied together by means of these cross pieces; a board is placed on the top; and a general cover is placed over the whole to guard it from the effects of the seasons.

In autumn, when the honey is to be taken from this hive, the cross-pieces are untied, and one or two of the upper frames are removed, passing the long blade of a knife or a wire between. This done, an empty frame is placed above and another under all the rest, which make up for the two removed. "In an hour after," says Bosc, who describes and recommends this hive, "the bees are at work as if nothing had happened; and the same operation can be renewed to infinity."

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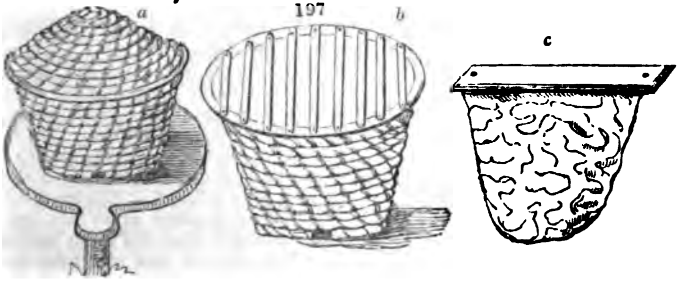
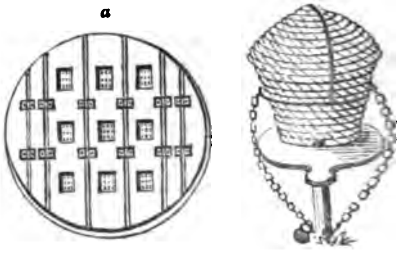


729. *Huish's Hive* (*fig.* 197.) is about the capacity of the common straw hive (725.), in shape like a flower-pot, placed on its narrow base, with a convex cover (*a*). It is so constructed interiorly that each comb (*c*) may be extracted by itself without deranging the rest; the combs being attached to slips of board (*b*) placed across the mouth or top of the hive. Any one of them may be lifted up, and to this the tapering construction of the interior is favorable.

198



To prevent the bees from working between the slips, air is admitted by means of pierced plates of tinned iron (*fig.* 198. *a*), and to prevent human thieves from carrying off the whole hive, it is chained and padlocked (*fig.* 198. *b*) to a strong post, which serves also as a fulcrum. The inventor of this hive has tried it, he says, for nearly twenty years, and the following he states as the mode of using it, and the advantages attending its construction. "At any time and season when I require some honey-comb, or at the end of the season, when I deprive my bees of their superfluous store, I open the top, and take the sideboards out, from which having cut the honey-comb, I replace them in the hive, and the operation is facilitated by having some vacant boards ready to supply the places of the full ones. This operation is very easily and speedily performed; it has the advantage of not disturbing the middle combs, and I have often deprived these hives of their honey without the loss of a single bee, excepting those few, who left their stings in various parts of my dress. — Two very considerable advantages arise from the use of this hive: in the first place, there is never any occasion to make an addition to the hive at the bottom, when the bees, by lying out in clusters, declare that they stand in need of room; for the operation of depriving them of a part of their combs from the top, will give them the room which they require, and which they will soon replenish with honey. In the common hive, it is customary, in this predicament, to place, what is called in Scotland, an eek, which consists of from four to six bands of the same diameter as the hive; but, on taking away this eek in the autumn, I have seen the most injurious consequences result to the hive. It is, in general, performed by cutting the combs with a wire between the hive and the eek, and then, whilst one person lifts up the hive another draws the eek away: the hive then rests on the stool. Few persons, however, consider that, as the combs are cut parallel with the bottom of the hive, they will all touch the stool on which it stands, and I have thus known a whole hive perish. The second advantage is, that the whole of the interior of the hive is open to your inspection, and you are thus enabled to examine the devastation of the moth, or to ascertain the presence of any other enemy," (*Treatise on Bees*, p. 85.)

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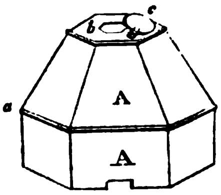

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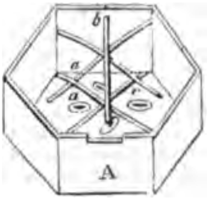

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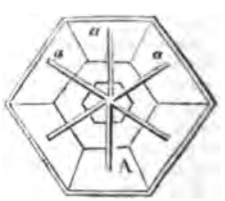

730. Dr. *Howison's Hive* (*fig.* 199 to 201.) for obtaining the honey without killing the bees, "consists of two distinct hexagons, one placed above the other. The under is formed of six panes of half inch deal, each measuring ten inches in width, and eight in depth, and covered with a thin board at top. This forms a box that will contain two pecks' measure of corn, and which he considers as sufficient for the largest swarm. This is intended for the breeding, as well as winter habitation of the bees. The upper is of the same dimensions and form as the under at bottom, but, in order to give it a conical shape, for the more conveniently fixing thereon a coat of straw, the panes at top are only five inches wide, which is also covered by a piece of board. The upper box has a moulding fixed to its under part, which projects about a quarter of an inch, and so exactly embraces the upper part of the lower box, as to join these two firmly together. In the deal which forms the top of the lower box, are cut four oval holes, each one inch wide, and two inches long, through which the bees pass into the upper. This communication, when not wanted, is shut by a board, which moves on a nail in its centre. The small pane of glass in the top of the upper box, admits of seeing the progress the bees have made in it, without separating it from the lower one. When the swarm is first put into the lower box, the communication is shut with the upper, until the bees have completely filled the lower with combs. The communication is then to be opened, when the bees will ascend, and, if the season is favourable and the swarm numerous, they will fill it also, but not until they have completely stocked the

lower. By removing the straw covering, and looking through the glass in the upper box, it may be seen what honey has been collected. Should a part or the whole of it be wanted, it will only be necessary carefully to separate the upper from the lower box, and shut the board of communication. The upper box is then to be removed to some distance, and the bees contained in it driven off, on which they will immediately join their companions in the lower. So soon as the honey is taken from the box, it can be replaced, and if early in the season, the communication opened for making more honey, but if late, it must be kept shut until the hive has swarmed next summer. If honeycomb early next season is preferred to a swarm, then the communication must be opened about the beginning of June. All the honey procured in this way is remarkable for its purity, none of the cells having been ever polluted by the hatching of young bees. The greatest advantages, however, from this method, are the early and large swarms; the consequence of not killing the bees."

(In *fig.* 199. A A is the upper and lower boxes joined, forming the complete hive; *a* the moulding of the upper box, which fixes it to the lower; *b* the small pane of glass in the upper box; *c* its wooden shutter, which moves on a nail.

Fig. 200. A the lower box inverted; *a a* the two rows of cross horizontal sticks, for supporting the combs; *b* the perpendicular stick for the ascent of the bees; *c c c c* the holes of communication.

Fig. 201. A is the upper box inverted; *a a a* the single row of cross sticks for supporting the combs.) (*Caledonian Memoirs*, vol. ii. p. 133.)

731. *Management of Bees.* Being of opinion that the common straw or Scotch hive is the best for general purposes, we shall give Dr. Howison's mode of management as being simple and effectual for the common end in view. If the lives of the bees are to be saved, then some of the others may be tried; and the simplest, we think, is the Polish hive; and the next best that of Howison. The most ingenious, and the fittest for an amateur, is no doubt that of Huish. The latter author justly remarks, that "there is no certain method, nor will one be ever discovered, by which a great harvest of wax and honey, and great swarms, can be obtained at pleasure: these are chimeræ, which it is folly to pursue, because the former depends on the seasons being more or less favorable to the secretion of honey; on the countries which the bees inhabit, being more or less wooded and covered with flowers, and which have a particular influence on the fecundity of the queen; from which arises that annual difference between the harvest of honey and wax, and the largeness or smallness of the swarms. To the same causes may be attributed why a mode of treatment, which has succeeded one year, will not succeed the next, although the circumstances be almost the same in appearance. It is these differences and variations, which, for the period of fifty-five years, have given rise to hives of different forms and materials, which have only tended to instruct us, that bees can inhabit, work, and collect provisions in vessels of every form, from the excavated trunk of the tree, as it is used in Poland and the northern countries, to the expensive and useless glass-hive, or to the hive of Duhamel; and, where no hollow trunk of the tree can be found, in the holes of walls, in chimneys, and under the roofs."

732. *Position of the Apiary.* "In the southern countries the aspect which is preferred is always to the eastward; in the northern countries, it is always to the eastward and the southward; but in England little or no attention is paid to the aspect. It is certain, however, that the aspect of the apiary should vary with the climate of the country; and in this climate, there can be little doubt that two points to the eastward of south, is the best.

"In whatever position the hives are placed, they should be protected from the winds. In this country, therefore, a protection from the south-west is advisable. The high winds not only prevent the bees from leaving the hive in quest of honey, but they also surprise them in the fields, and often kill them by dashing them against the trees and rocks, or into the rivers.

"The hives in an apiary should always be placed in a right line; but should the number of the hives be great, and the situation not capacious enough to admit of their being placed longitudinally, it is more advisable to place them over one another, on shelves, than in double rows on the ground. A bee, on leaving the hive, generally forms an angle of about forty-five with the horizon; the elevation of the hive should, therefore, be about two feet from the ground, in order to protect it from humidity. The greater the elevation of the hive, the longer is the flight of the swarm; and when they are at a certain point of elevation, the swarms are lost for ever to the proprietor. If the hives are to be placed in a double row, the hinder ones should alternate with, and be placed at, such a distance from the front ones, that when the bees take their flight, no obstruction is offered to their ascent.

"The plan which is often adopted, of placing several hives upon the same bench, is very injurious, and during the swarming season, it is often attended with very destructive consequences. Huish was once requested by a gentleman to perform an experiment upon a hive, which was placed on the same bench with six others, and in attempting to move the hive destined for the operation, the others were agitated, and the whole apiary became in a little time in a state of confusion. The easy access also, which the bees of one hive have to those of another, promotes quarrels and murderous battles. It is an erroneous opinion, though held by some skilful apiarians, that all the bees of one apiary know each other, and that it is only the bees of a foreign apiary, with whom they quarrel. Huish having been often witness of the destructive animosity of these little insects, and the wars which they wage upon the weaker hives in their own establishment, endeavours to impress it strongly upon the attention of every apiarian, to place every hive upon a respective pedestal. In general a post is placed at each corner of the stand, as some prejudiced people believe that a hive stands firmer upon four feet, than upon one; but Huish is certain that they, who have once used the single pedestal, will never have recourse again to the four-legged stool. Another advantage particularly arises from the use of a single pedestal, which is, that the hive may be chained down and locked.

" The apiary should be kept particularly clean; all noxious weeds carefully removed, and no rubbish be left in which the enemies of the bees can conceal themselves. A few low trees or shrubs, planted in the vicinity of the apiary, will be found useful in arresting the flight of the swarms, for they very often alight on espalier trees, or on currant and gooseberry bushes.

" It is essential, however, to observe, that the apiary should not be incommoded with herbs nor plants, which rise to a height equal to, or exceeding the entrance of the hive; because the bees, on their arrival from their journeys, being much fatigued, are impeded by these plants, and regain their habitation with difficulty. If they touch these plants on passing, they often fall to the ground, and become victims to their enemies, or are unfortunately trodden under foot. Such plants also serve the purpose of a ladder, for the enemies of the bees to ascend into the hive, and especially the ants, which in some districts are particularly numerous. These little insects are a great detriment to a hive, and they baffle the most vigilant attention of the apiarian to prevent their depredations. I have found that a small leaden reservoir of water, encircling the bottom of the pedestal, is of great service in preventing the ascent of these insects.

" The stand on which the hive is placed should be often cleaned, that is, about four times in a year.

" The vicinity of great towns is not a proper situation for an apiary. The smoke of a city is very detrimental to bees, as the chimneys are in general the resort of the swallows and martins, who are great destroyers of these insects.

" The proximity of a large river is also injurious, as the bees in their homeward flight are often dashed into it by the high winds, or fall into it from fatigue."

733. " *Variety of Bees.* To the common observer, all working bees, as to external appearance, are nearly the same; but to those who examine them with attention, the difference in size is very distinguishable; and they are in their vicious and gentle, indolent and active natures, essentially different.

" Of the stock which I had in 1810, it required 250 to weigh an ounce; but they ere so vicious and lazy, that I changed it for a smaller variety, which possesses much better dispositions, and of which it requires 296, on an average, to weigh an ounce. Whether size and disposition are invariably connected, I have not yet had sufficient experience to determine."

734. " *Materials and Size of Hives.* Hives made of straw, as now in use, have a great advantage over those made of wood or other materials, from the effectual defence they afford against the extremes of heat in summer, and cold in winter. That the hives in size should correspond as nearly as possible with that of the swarms, has not had that attention paid to it which the subject demands, as much of the success in the management of bees depends on that circumstance.

" From blind instinct, bees endeavour to fill with combs whatever hive they are put into, before they begin to gather honey. Owing to this, when the hive is too large for its inhabitants, the time for collecting their winter store is spent in unprofitable labour: and starvation is the consequence. This evil also extends to occasioning late swarming the next summer; it being long before the hive becomes so filled with young bees as to produce a necessity for emigration, from which cause the season is too far advanced for the young colonies to procure a winter stock.

" I should consider it as a good rule in all cases, that the swarm should fill two-thirds of the hive. The hives used by me for my largest swarms, weighing from five to six pounds, will contain two pecks measure of corn, and will yield, in a good season, eight Scots pints of honey, and for smaller swarms in proportion. Hives with empty combs are highly valuable for second swarms, as the bees are thereby enabled much sooner to begin collecting honey."

735. " *Situation for Hives.* That the hives should be so placed as to receive the rays of the rising as well as meridian sun, is of considerable importance; heat and light appearing

the principal stimulants to the action of bees. A hive so situated as not to be touched by the sun until some hours later than the other hives in the same garden, would, in the course of the season, lose a proportional number of days' labour. Hives should stand at some distance from walls and hedges. When lately building a garden-wall, with a good exposure for bees, I ordered a number of niches to be made, into which I afterwards put hives. These were, however, so much infested with snails in summer, and mice in winter, that I was under the necessity of removing them to a more open situation."

736. "*Feeding of Bees.* Near the sea little honey is collected after the first week in August; but in high situations, where the flowers are later, and heath abounds, the bees labour with advantage until the middle of September. These are the proper periods, according to situation, for ascertaining if the hives intended to be kept, contain a sufficient winter stock. The killing of the drones, (a very singular fact in the history of the bee, and which will be noticed hereafter); perhaps marks this time with more precision.

"If a large hive does not weigh thirty pounds, it will be necessary to allow it half a pound of honey, or the same quantity of soft sugar, made into a syrup, for every pound that is deficient of that weight; and, in like proportion, to smaller hives. This work must not be delayed, that time may be given for the bees to make the deposit in their empty cells before they are rendered torpid by the cold.

"I must here notice, that sugar simply dissolved in water, (which is a common practice,) and sugar boiled with water into a syrup, form compounds very differently suited for the winter store of bees. When the former is wanted for their immediate nourishment, as in spring, it will answer equally as a syrup; but if to be laid up as store, the heat of the hive quickly evaporating the water, leaves the sugar in dry crystals, not to be acted upon by the trunks of the bees. I have known several instances of hives killed by hunger, while some pounds' weight of sugar in this state remained in their cells. The boiling of sugar into syrup forms a closer combination with the water, by which it is prevented from flying off, and a consistence resembling that of honey, retained. I have had frequent experience of hives not containing a pound of honey, preserved in perfect health through the winter, with sugar so prepared, when given in proper time, and in sufficient quantity."

737. "*Covering the Hives.* Bees are evidently natives of a warm climate, a high temperature being absolutely necessary to their existence; and their continuing to live in hollow trees during the severe winters of Russia and America, must depend on the heat produced from the great size of the swarms which inhabit these abodes. From my own observation, the hives which are best covered during winter, always prosper most the following summer. In consequence, about the end of harvest, I add to the thin covering of straw put on the hives at the time of swarming a thick coat, and shut up the aperture through which the bees entered, so that only one can pass at a time. Indeed, as a very small portion of air is necessary for bees in their torpid state, it were better, during severe frosts, to be entirely shut up, as numbers of them are often lost from being enticed to quit the hive by the sunshine of a winter day. It will, however, be proper at times to remove, by a crooked wire or similar instrument, the dead bees and other filth, which the living at this season are unable to perform of themselves.

"To hives, whose stock of honey was sufficient for their maintenance, or those to which a proper quantity of sugar had been given for that purpose, no further attention will be necessary, until the breeding season arrives. This, in warm situations, generally takes place about the beginning of May, and in cold, about a month after.

"Owners of hives are often astonished, that, at this advanced season, when their bees had, for weeks preceding, put on the most promising appearance, after a few days of rain, they become so weak and sickly as to be unable to leave the hive, and continue declining until they at last die.

"From paying attention to this subject, I am convinced that the cause is as follows: The young bees, for a short time previous to their leaving their cells, and some time after, require being fed with the same regularity that young birds are by their parents; and if the store in the hive be exhausted, and the weather such as not to admit of the working bees going abroad to collect food in sufficient quantity for themselves and their brood, the powerful principle of affection for their young compels them to part with what is not enough for their support, at the expense of their own lives.

"To prevent such accidents, I make it a rule, that if, during the breeding season, it rain for two successive days, to feed all the bees indiscriminately, as it would be difficult to ascertain those only who require it."

738. "*Of Swarming.* For several years past, my hives have uniformly sent forth their first swarms during the second week in July, from which it appears, that early or late swarming, *in the same situations*, is not so much regulated by good or bad seasons as might have been expected. Near the sea this will, of course, take place some weeks earlier.

"The first swarming is so long preceded by the appearance of drones, and hanging out of working bees, that if the time of their leaving the hive is not observed, it must be owing to want of care. The signs of the second are, however, more equivocal, the most certain being that of the queen, a day or two before swarming, at intervals of a few minutes, giving out a sound a good deal resembling that of a cricket. It frequently happens that the swarm will leave the old hive, and return again several times, which is always owing to the queen not having accompanied them, or from having dropt on the ground, being too young to fly to a distance. In such cases, I have seen her found near to the old hive, and on being taken up and placed in the new one, the swarm instantly settled.

"Gooseberry or currant bushes should be planted at a short distance from the hives, for the bees to swarm upon, as, by attending to this, I have not lost a swarm by straying for several years. This, I am however convinced, depends much on the nature of the bees which form the stock. When a hive yields more than two swarms, these should uniformly be joined to others that are weak, as from the lateness of the season, and deficiency in number, they will otherwise perish. This junction is easily formed, by inverting at night the hive in which they are, and placing over it the one you intend them to enter. They soon ascend, and apparently with no opposition from the former possessors, as I have never observed fighting to be a consequence. It being very universally believed that two queens cannot live together in the same hive, I have, for several days after this forced junction, searched for the murdered queen, but never with success. Should the weather, for some days after swarming, be unfavourable for the bees going out, they must be fed with care until it clears up, otherwise the young swarm will run a great risk of dying." (*Howison, in Mem. Caled. Hort. Soc.*)

739. *Taking the Honey.* This may be effected, even with hives of the common construction, by three modes, partial deprivation, total deprivation, and suffocation. The first mode is performed about the beginning of September. "Having ascertained the weight of the hive, and consequently the quantity of honey-comb which is to be extracted, begin the operation as soon as evening sets in, by reverting the full hive, and placing an empty one over it; particular care must be taken that the two hives are of the same diameter, for if they differ in their dimensions, it will not be possible to effect the driving of the bees. The hives being placed on each other, a sheet or large table-cloth must be tied round them at their point of junction, in order to prevent the bees from molesting the operator. The hives, being thus arranged, beat the sides gently with a stick or the hand, but particular caution must be used to beat it on those parts to which the combs are attached, and which will be found parallel with the entrance of the hive. The ascent of the bees into the upper hive will be known by a loud humming noise, indicative of the pleasure in finding an asylum from their enemy; in a few minutes the whole community will have ascended, and the hive with the bees in it may be placed upon the pedestal from which the full hive was removed. The hive, from which the bees have been driven, must then be taken into the house, and the operation of cutting out the honey-comb commences. Having extracted the requisite quantity of comb, this opportunity must be embraced of inspecting the hive, and of cleaning it from any noxious matter. In cutting the combs, however, particular attention should be paid not to cut into two or three combs at once, but having commenced the cutting of one, to pursue it to the top of the hive; and this caution is necessary for two reasons. If you begin the cutting of two or three combs at one time, were you to extract the whole of them, you would perhaps take too much; and secondly, to stop in the middle of a comb, would be attended with very pernicious consequences, as the honey would drop from the cells which have been cut in two, and then the bees on being returned to their native hive, might be drowned in their own sweets. The bees, also, in their return to their natural domicile, being still under the impression of fear, would not give so much attention to the honey which flows from the divided cells; and as it would fall on the board, and from that on the ground, the bees belonging to the other hives would immediately scent the wasted treasure, and a general attack upon the deprivated hive might be dreaded. The deprivation of the honey-comb being effected, the hive may be returned to its former position, and reversing the hive which contains the bees, and placing the deprivated hive over it, they may be left in that situation till the morning, when the bees will be found to have taken possession of their native hive, and if the season proves fine may replenish what they have lost." (*Huish's Treatise on Bees.*)

740. *Total Deprivation* is effected in the same manner, but earlier in the season, immediately after the first swarm; and the bees, instead of being returned to a remnant of honey in their old hive, remain in the new empty one, which they will sometimes, though rarely, fill with comb. By this mode, it is to be observed, very little honey is obtained, the bees in June and July being occupied chiefly in breeding, and one, if not two, swarms are lost.

741. *Suffocation* is performed when the season of flowers begins to decline, and generally in October. The smoke of paper, or linen rag soaked or smeared with melted sul-

phur, is introduced to the hive by placing it on a hole in the ground, where a few shreds of these articles are undergoing a smothering combustion; or the full hive may be placed on an empty one, inverted as in partial deprivation, and the sulphureous smoke introduced by a fumigating bellows, &c. The bees will fall from the upper to the lower hive in a few minutes, when they may be removed and buried, to prevent resuscitation. Such a death seems one of the easiest, both to the insects themselves and to human feelings. Indeed, the mere deprivation of life to animals not endowed with sentiment or reflection, is reduced to the precise pain of the moment without reference to the past or the future; and as each pulsation of this pain increases in effect on the one hand, so on the other the susceptibility of feeling it diminishes. Civilized man is the only animal to whom death has terrors; because he has the gift of reflection. Life to him is a more precious loan, and the contemplated want of it a greater deprivation. He wishes, or ought to wish, to make the most of this loan; and finding, on retrospection, that few things are done that could not have been done better, he naturally wishes for time to improve. Besides, there are certain superstitious feelings, which serve in part, through a certain period in the progress of the human mind, to effect nearly the same end with more correct and enlightened ideas of the nature of things. Hence the contemplated deprivation of life, and the possibility of future punishment, added to some ideas of the physical pain to be suffered in dying, have in man thrown a gloom round the fulfilment of this law of nature which does not belong to it; and which he very naturally transfers to other animals very differently constituted from himself. Hence the origin of that (what we consider) false humanity, which condemns the killing of bees in order to obtain their honey; but which might, with as much apparent justice, be applied to the destruction of almost any other animal used in domestic economy, as fowls, game, fish, cattle, &c.

The subject of destroying bees, with a view to obtain their honey, as compared with any method of deprivation whatever, has only, as far as we know, been candidly examined by La Grenée, a French apiarian. "Let not any person suppose," he says, "that in adopting the method of suffocating the bees, I am prejudiced against the reasons which have been advanced to induce me to relinquish it. No, I have scrupulously perused all the writings on the subject. I have weighed them most attentively: I have not only studied their theory, but practised the different methods which have been laid down; but neither books nor experiments have been able to convince me, that there is a more preferable method than that which I use, which is suffocation.

"The question is how to procure for and from the country an abundance of honey and wax, and to the proprietor of the bees an actual profit, and a sufficiency to enable him to bestow the necessary attention and costs on the maintenance of his apiary. We will suppose that a proprietor has ten hives: according to the removing system, they will furnish each twelve pounds of honey, which amount in the whole to 120 pounds, and the proprietor will possess twenty hives, ten old and ten new ones. The sixty pounds af honey may be valued at 9*l.*, and 20*l.* for the twenty hives. According to the suffocating system, ten hives will produce thirty pounds of honey each, which amount to 300lbs., and the proprietor will have twelve young hives, that is, ten composed of the first swarms, and two of the second and third, or, in other words, the honey will amount to 22*l.* 10*s.* and the hives to 12*l.* In order to facilitate the calculation, I suppose that each hive gives but one swarm in the year.

"Although these two kinds of profit, as well in honey as in hives, appear to the two proprietors to amount to nearly the same sum in money, a considerable difference is still to be remarked; for, in the first case, the public profit only by 120 pounds of honey for their consumption, and the proprietor has realized only 9*l.* in money; whereas in the second, the public are put in possession of 300 pounds of honey, and the proprietor has realised 22*l.* 10*s.* in money.

"It must not either be supposed, that in the following years, the benefit of the first proprietor will far exceed that of the second, by the greater multiplication of his hives; this would be tantamount to a voluntary concealment of the frequent and almost general mortality occasioned by the method of removing the bees from one hive to another, and which will indubitably reduce every year the great number of hives of the first proprietor, to a number below that remaining to the second, by which we may be assured, that the annual profits of the former, so far from being more considerable than those of the latter, will always be much smaller.

"This method, therefore, of removing the bees into other hives, after the departure of the first swarm, is advantageous neither to the proprietor nor to the public.

"In regard to those hives composed of stories, I allow that the deprivation of the honey is performed much more easily than in others. But is the proprietor always regardful of the important circumstance, to extract only that particular quantity from the hives, which will prevent the danger of famine? For if the stories be small, and if, from a fear of injuring the bees, he extracts but a small portion of their produce, wherein then does his advantage consist? On the other hand, if the upper stories be large, they contain perhaps the whole of the honey, and in taking them away, the bees are consequently deprived of their winter food, and must inevitably perish.

"If, to avert this evil, the system of feeding be resorted to, the proprietor will be under the necessity of returning to the bees the honey which he took from them, and if the bees escaped from a death of famine, they would inevitably perish by the pillage, which is frequently and almost universally occasioned by these artificial supplies of food.

"I am well aware that authors in general pretend to prescribe a remedy for all these evils; they accumulate rules upon rules, whether it be respecting the time of depriving the strong hives (on which, by-the-bye, scarcely two persons agree,) or the manner of feeding the weak ones; and finally they recommend strong barricadoes to be placed at the entrance of the hives, to protect them from pillage. But in what manner is the mind of the peasant to be instructed in this code of laws, which even to an attentive and reflecting mind, presents matter of very serious and difficult consideration?" *La Grenée.*

On this reasoning, Huish candidly observes, that if humanity be taken out of the scale, the ideas of La Grenée are founded on truth and demonstration. In reasoning analogically, humanity ought to plead in the same manner for the ox which has drawn the plough, or the cow which has furnished us with her milk. On their arriving at that age, when they are no longer of any use to man in a living state, they are fattened, and killed for his nutriment. The only objection to this mode of reasoning may be, that the produce of the bee may be considered a superfluity and a luxury; the produce of the animals above mentioned is actually necessary to the subsistence of man." (*Huish's Treatise on Bees.*)

742. The *Aviary* was common to the country-houses of the Romans, but used principally, as it would appear from Pliny, for birds destined to be eaten. Singing-birds, however, were kept by the Persians, Greeks, and Romans in wicker-cages; and these utensils, no doubt, gave rise to the large and fixed cage called an aviary; but in what country, and in what age, appears uncertain. They are highly prized in China, and seem there to confer about a similar degree of dignity to a house and family as does a large conservatory in this country; for, in the altercations which took place during Lord Amherst's embassy, it was stated, on the part of the emperor that Sir George Staunton had profited greatly from China, and had built himself a house and *an aviary.* That they were in use in England in Evelyn's time, is evident, from his relating that the Marquis of Argyle took the parrots in his aviary at Sayes' Court for *owls.*

743. The *Canary or Singing Bird Aviary,* used not unfrequently to be formed in the opaque roofed green-house or conservatory, by enclosing one or both ends with a partition of wire; and furnishing them with dead or living trees, or spray and branches suspended from the roof for the birds to perch on. Such are chiefly used for the canary, bulfinch, linnet, &c.

744. The *Parrot Aviary* is generally a building formed on purpose, with a glass roof front, and ends; with shades and curtains to protect it from the sun and frost, and a flue for winter heating. In these artificial, or dead trees with glazed foliage, are fixed in the floor, and sometimes cages hung on them; and at other times the birds allowed to fly loose. An aviary of this sort was built at Morden by the late Abraham Goldschmidt.

745. The *Verdant Aviary* is that in which, in addition to houses for the different sorts of birds, a net or wire curtain is thrown over the tops of trees, and supported by light posts or hollow rods, so as to inclose a few poles, or even acres of ground, and water in various forms. In this the birds in fine weather sing on the trees, the aquatic birds sail on the water, or the gold pheasants stroll over the lawn, and in severe seasons they betake themselves to their respective houses or cages. Such an inclosed space will of course contain evergreen, as well as deciduous trees, rocks, reeds, aquatics, long grass for larks and partridges, furze bushes for linnets, &c.

An aviary, somewhat in this way, was formed by Catherine of Russia, in the Hermitage Palace; and at Knowlsley in Lancashire. In short, these are the only sorts admissible in elegant gardens; since nothing surely to one who is not an enthusiast in this branch of natural history, can be more disagreeable than an apartment filled with the dirt and discordant music of innumerable birds, such, for example, as the large aviary at Kew.

At Chiswick, portable netted inclosures, from ten to twenty feet square, are distributed over a part of the lawn, and display a curious collection of domestic fowls. In each inclosure is a small wooden box or house for sheltering the animals during night, or in severe weather, and for breeding. Each cage or inclosure is contrived to contain one or more trees or shrubs; and water and food are supplied in small basins and appropriate vessels. Curious varieties of aquatic fowls might be placed on floating aviaries on a lake or pond.

Birds from the hot climates are sometimes kept in hot-houses among their native plants, as in the large conservatories at Vienna (70) In this case, the doors and openings for giving air must be covered with wire cloth, and the number must not be great, otherwise they will too much disfigure the plants with their excrements.

The most useful sort of aviary is that which contains specimens of all the native birds of the country, with a view to promoting the knowledge of their names, classification, and habits; the next such as contain the hardier birds of other countries, with the same object in view, and also their acclimating and naturalization.

746. *Management.* A person or persons must be exclusively devoted to this department, and each species treated according to its nature and habits, as ascertained from nature, or books on ornithology.

747. *Menageries* were formerly attached to most of the royal gardens and parks of Europe. The most complete example is that of the Paris garden, constructed and arranged, as much as possible, according to the natures and habits of the different animals enclosed. The subject, however, can hardly be considered within our department.

748. The *Piscinaries*, cochlearium, ranarium, columbarium, &c. belong to that part of rural economy which forms the connecting link of rural and domestic economy.

Sect. III. *Decorative Buildings.*

The general characteristic of this class is, that they are introduced more for their picturesque effect as part of external scenery, than as absolutely necessary. Their construction, like the others, belongs chiefly to civil architecture and sculpture; but the choice and emplacement to gardening. Their variety is almost endless; but we shall rank a few selections under the different heads of useful, convenient, and characteristic decorations.

Subsect. 1. *Useful Decorative Buildings.*

These are such, as while they serve as ornaments, or to heighten the effect of a scene, are also applied to some real use, as in the case of cottages and bridges. They are the class of decorative buildings most general and least liable to objection.

749. *Cottages* are of various sorts; one grand division is founded on the style of architecture employed, as Grecian, Gothic, Chinese, &c.; another, on the materials used, as stone, brick, timber, wicker-work, with moss or mud; and another, on the peculiar style of different countries, as English, Swedish, Italian, &c. (*See Prin. of Design in Arch.* 8vo. 1821.)

The *Gothic Cottage* is characterised by the forms of the Gothic or pointed style of architecture in the openings, as doors, windows, &c. in the chimney tops and gable ends. It may be thatched; but the most appropriate roof is grey slate, or slate stone, or flat grey tyles.

The *Grecian Cottage* is that in which the lines of Grecian architecture prevail. These are generally horizontal, and may be displayed in the windows, roof, and other parts. The roof is generally flat and projecting, and the best slate or flag-stone seems the most approved covering.

The *Chinese Cottage* is characterized by concave lines in the roof, projecting eaves, small windows, and bell or drop ornaments. The proper roofing is parti-colored tyles, with which the walls may also be covered.

The *Bengal Cottage* has walls of mud, the openings surrounded by frames of bamboo, the doors and divisions of the windows of the same material, and the roof covered with reeds.

The *English Cottage* is generally Gothic as to style, the lowest order formed of mud and thatched, with boarded labels over the windows and doors; the second order of framed timber, filled up with brick-work, with oaken door and window-frames; and the third order of solid brick, with stone door aud window-frames, and Gothic mouldings and labels.

There is a very pleasing assemblage of picturesque cottages, mostly thatched, erected on the grounds at Blaize castle, near Bristol. They are not only varied in form, for which much facility is obtained, by including two, and sometimes three dwellings, in one pile; but their disposition on the ground, and the surface of the ground itself, is varied; and by the management of the walks and trees, an eyeful of any part seldom contains more than two or three groups; always one in the fore-ground, and the others in the middle or remote distance. They were designed by Nash.

The *Scotch Cottage* is, as to architectural style, something between Gothic and Grecian. It is the same with the cottage of France and Flanders, is characterised by high narrow gable ends, with notched or step-like finishings. The material of the walls, almost always stone; and of the roof, pantiles or grey schistus slate.

The *Italian Cottage* is characterized by Grecian lines, and forms bold projections and recesses, as far as a cottage admits of these; high pantiled roofs of a peculiar construction; the walls, white-washed, and in farmers' cottages, especially in Tuscany, often a part of the roof raised as a sort of *watchtower*.

The *Polish Cottage* is formed chiefly of timber, with some plaister and wicker work to thicken the walls within. The roof is covered with shingles or fir-timber split into pieces of about eighteen inches long, and six inches broad, and half an inch thick. The ends are generally upright, not *en pavillion*, and the roofs projecting.

The *Russian Cottage* is also built of timber, but of solid logs or trees notched, and let into each other at the angles of the building where they intersect. They are roofed as in the Polish cottage, and sometimes highly ornamented at the ends by carved imitations of the sun, moon, stars, &c. protruded from the ends, and protected by the projection of the roof.

The *Swedish and Danish Cottage* is built of logs and moss, like the Russian.

750. The *Primitive Hut, or Cabin,* varies as to material, according to the country in which it is formed. The rudest description of artificial shelter for man, is perhaps that used by the aboriginal inhabitants of Botany Bay, which is a large plate of the bark of a tree bent in the middle, and its two ends stuck in the earth. The rudest European hut is generally a cone formed by branches, poles, or young trees, with their ends set in the ground, made to lean against each other at the top. They are then covered with spray, heath, straw, reeds, or turf. One opening serves the purpose of all others. In countries abounding in noxious reptiles, this is made in the upper part of the roof, and entered as by a trap-door, as in Stedman's hut at Surinam; but in Europe the entrance is generally made on a level with the floor, as in the huts of Ireland, the Highlands of Scotland, and Lapland. Modifications of this and other rude forms (*figs.* 202 to 205), may sometimes be admitted in garden scenery, as tool-houses, or shelters for other materials, game, &c.

202

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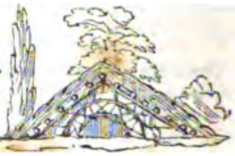


751. The *Bridge* is one of the grandest decorations of garden scenery, where really useful. None require so little architectural elaboration, because every mind recognizes the object in view, and most minds are pleased with the means employed to attain that object in proportion to their simplicity. There are an immense variety of bridges, which may be classed according to the mechanical principles of their structure; the style of architecture, or the materials used.

With respect to the *principles* of mechanical structure, the materials of bridges are held together, either by their gravity, as in all arches, whether of stone, iron, or timber; or by their tenacity, as in single planks, flat bridges of iron, or timber, and those new and wonderful exertions of ingenuity, suspended bridges, of which fine examples have been executed across the Menai and the Tweed, and the principles of which we have elsewhere (*Annals of Philosophy, Jan.* 1816.) entered into at large.

With respect to *styles* of architecture, the bridge affords little opportunity of detailed display; but the openings may be circular arches, (Roman), and pointed (Gothic), or right-lined (Grecian), or a mixture of these.

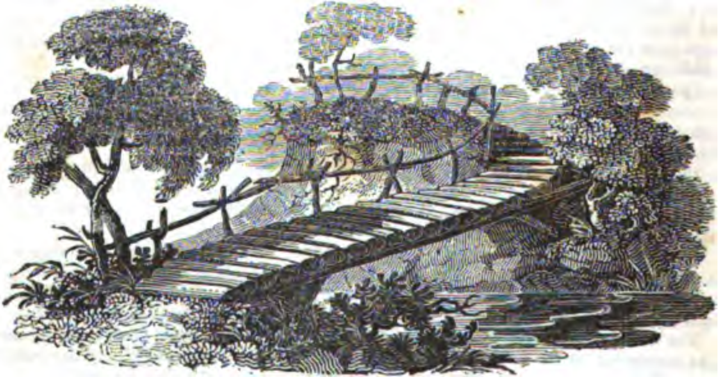
As *to material,* bridges of tenacity are formed of timber, or wrought-iron; bridges of gravity, generally of cast-iron or stone; but they may be formed of any material. We submit a few examples in different styles, and composed of different materials.

The *Fallen Tree* is the original form, and may sometimes be admitted in garden scenery, with such additions as will render it safe, and somewhat commodious.

The *Foot Plank* is the next form, and may or may not be supported in the middle, or at different distances by posts.

The *Swiss Bridge* (*figs.* 206 and 207.) is a rude composition of trees unbarked, and not hewn or polished.

206



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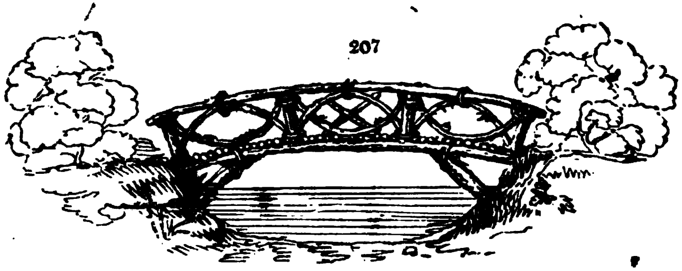
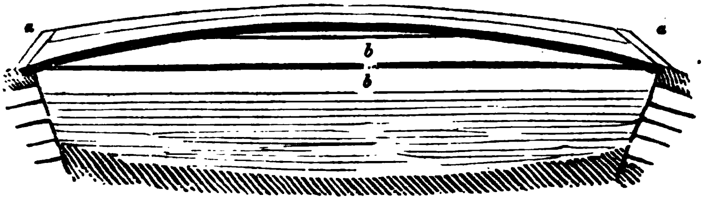


752. The *Tied Plank* (*fig.* 208.) is formed by fixing the ends of one or more planks in two heads or cases of cast-iron, (*a a*) and then connecting them by wrought-iron rods (*bb*) fixed to the heads in the manner of a string to a bow. A very light bridge is thus formed, which acts both by tenacity and gravity. Thus, when a light weight is on the bridge, the particles of the boards are not moved, but merely pressed on, and therefore the arched part may then be said to act by gravity, while this pressure being propagated to the abutments, these are held in equilibrium by the iron rods acting by their tenacity. On the other hand, when a bridge of this sort is heavily loaded, the arch will bend down, or yield in some places and rise in others, in which case, the whole acts by its tenacity.

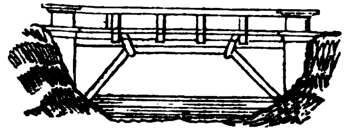
208



A very light and strong bridge may be formed by screwing together thin boards in the form of a segment, or by screwing together a system of triangles of timber. This principle may be carried to a great extent; by using so many lamina, the elasticity of the materials is lessened without rupturing their parts, and though, from the form of such arches, they would appear to act by gravity, yet in truth, they act more by tenacity, for the ends of the segment cannot be pressed out without rupturing the soffit, or crushing the crown of the arch. For broad tame rivers in flat grounds, such arches may be appropriately adopted, as attaining the end without any appearance of great effort. (See *Fulton on Bridges. Howard on Military Bridges.*)

753. *Bridges of Common Carpentry* (*figs.* 209, 210.) admit of every variety of form, and either rustic or with unpolished materials, or of polished timber alone, or of dressed timber and abutments of masonry.

209



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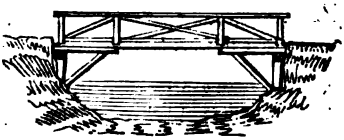
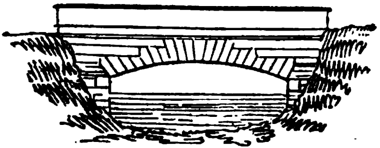


754. *Bridges of Masonry* (*fig.* 211.) may either have raised or flat roads; but in all cases those are the most beautiful (because most consistent with utility) in which the road on the arch rises as little above the level of the road on the shores as possible; notwithstanding the prejudices of some eminent engineers, (*Telford in Ed. Encyc. art. Bridge.*) in favor of the old practice of always forming the extrados of a considerable curve. It is only where masted vessels are to pass under, that the raising the arches higher than what is necessary for the transit of the stream can be considered in good taste.

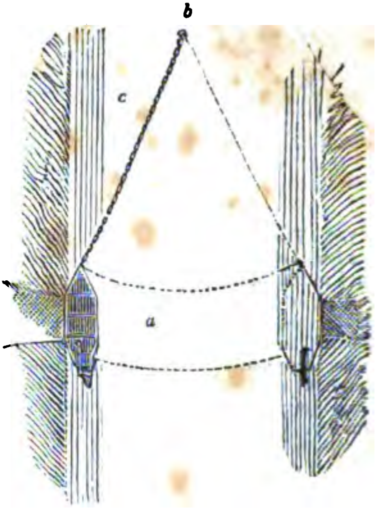
211



755. *Cast-iron Bridges* are necessarily curved; but that curvature, and the lines which enter into the architecture of their rails, may be varied according to taste or local indications.

756. The *boat*, as to construction, belongs to naval architecture. In gardening, it is sometimes used as a substitute for the bridge; sometimes worked by a mechanical power, as the wheel and pinion, and commonly with the deck arranged as part of the gravel walk, which approaches the edge of the water. But where a river with a current is to be crossed, the *flying boat*, with the deck arranged as part of the walk, (*fig.* 212.) is preferable. The motion of this boat is derived from the obliquity of its sides to the direction of the current, which must be kept up by the use of the rudder. The boat (*a*) must be anchored to a post (*b*) fixed in the middle of the river; and the longer the cable (*c*), the manœuvre will be more easily executed, provided the movement is not made in a greater arc than 90°. The force of the stream is at a maximum, when the angle formed by it, and the side of the boat is 54° 44′. The same purpose may be effected by a triangular raft without the use of a rudder. See *Howard on Military Bridges*, *Sect.* 4. p. 97.

212



757. *Sepulchral* structures have been adopted as parts of garden scenery from the earliest times. They are most common in the Protestant countries of Europe, and in England are to be found in parks and pleasure grounds in various characters and styles, from the consecrated flower plot, as at Nuneham Courtenay, to the superb mausoleum of Castle Howard, or of Cobham Hall.

The most ancient form of sepulchres seems to have been *tumuli, burrows, or mounts of earth;* sometimes planted, but generally left to acquire a clothing of turf. In cool regions, these may be considered the most durable of all tombs, because the roots and clothing of the turf prevent the earth from being washed or blown away by the weather, and the material presents no temptation to the avarice of mankind. Of such tombs there are several on a small scale in Wiltshire, and on a large scale round the city of Cracow; the last considered as the sepulchres of the ancient kings of Poland.

The next form is the Cairn, or cone of rough stones, common in some parts of Britain. To this succeeded the pyramid of Egypt. These are, in their nature and construction, calculated to serve as durable monuments, and were very properly employed by kings and chiefs in rude ages; for then, as now, the idea of being quite forgotten was felt to be unpleasant. But in more modern times, those parts of men's actions, which are worth remembering, can be recorded in books, which, when good, are the most durable of all monuments. Such piles as have been mentioned are felt as too expensive, and considered as too gross a display of the love of fame; men, therefore, have recourse to what may be called emblems of monuments, known under the names of mausoleums, obelisks, pillars, tombs, vaults, stone coffins, sarcophagi, urns, &c.; all of which exist from general consent, and not from the indestructive nature of their materials or construction, as in the former class. The most unnatural form of sepulture, and the most liable ultimately to defeat the very end in view — respect to the memory of the deceased — is that in which the body is embalmed, or hermetically sealed up in a box or chest of durable materials, such as lead, and placed in a richly ornamented building of valuable stone. Here, in times of intestine war and rapine, the building will be broken into, and the lead and other valuable materials taken from the bodies; even the stuffs in which the body is wrapped may be an object, as was the case with the retreating French army at Kowno and other places in 1812; or the architectural ornaments, and the dead bodies themselves, may be objects of research, as in the case of certain Grecian marbles, and the despoliation of numerous Egyptian tombs. A very natural form of sepulture for a family residing on their own estate in the country, is a consecrated grove or inclosure, in which each individual is buried near a tree, inscribed with his name on the bark. All that an enemy, or a new purchaser can do, is to cut down the trees, and change the state of the ground from pasture to arable. If any of the family have effected any great public good, it will be elsewhere permanently recorded; if they have not, it is fitting their names should, as indeed they always will, perish with their bodies. The utility of epitaphs and tombs in public groves, or church-yards, however, it is not meant to deny; nor to impugn the different tastes of individuals. The grand object appears to us to be the attainment of the greatest possible quantum of enjoyment, mental and corporal, while living.

As to monuments for the inferior animals, such as are to be found at Potsdam, Oatlands, and Bramley Hall, we say, with that enviable and remarkable character the Prince de Ligne,

> " Loin ces vains monumens d'un chien ou d'un oiseau,
> " C'est profaner le deuil, insulter au tombeau."

758. The *Gate* is of various forms and materials, according to those of the barrier of which it constitutes a part. In all gates, the essential part of the construction, or those lines which maintain its strength and position, and facilitate its motion, are to be distinguished from such (*a a*, *figs.* 213; and *fig.* 214.) as serve chiefly to render it a barrier, or as decorations. Thus a gate with a raised top or head, (*fig.* 215.) is almost always in bad taste, because at variance with strength; while the contrary form (*fig.* 214.) is generally in good taste, for the contrary reason. In regard to strength, the nearer the arrangement of rails and bars approaches in effect to one solid lamina, or plate of wood or iron, of the gate's dimensions, the greater will be the force required to tear or break it in pieces. But this would not be consistent with lightness and economy, and, therefore, the skeleton of a lamina is resorted to, by the employment of slips or rails joined together on mechanical principles; that is, on principles derived from a mechanical analysis of strong bodies. Strength of the most perfect kind is resolvable into hardness and tenacity; and in artificial compositions, the latter is obtained by what in carpentry are called ties (*a*, *figs* 213. *and* 216.) and the former by what are called struts (*b*, 216.). The art of carpentry, as far as construction is concerned, whether of gates, or of roofs, consists in the judicious composition of ties and struts; the former always resisting a drawing or twisting power, and the latter one of a pressing or crushing nature.

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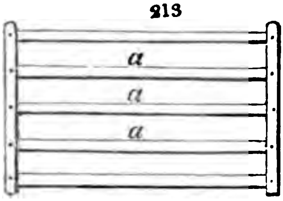

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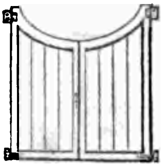

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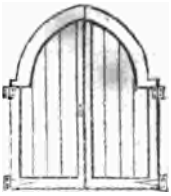

759. By the *maintenance of a gate's position*, we mean the resistance to that tendency which most gates have to sink at the head or falling post, and thus no longer to open and shut freely. If the construction and hanging of the gate were perfect, this could not possibly take place; but as the least degree of laxity in trussing the gate, or want of firmness in fixing the post in the ground, will occasion, after frequent use, a sensible depression at the head, it becomes requisite either to guard against it as much as possible, in the first construction; or, to have, as in N. Parker's gate, a provision in the design of the upper hinge, for rectifying the deviations as they take place. In order to understand the construction best calculated to resist depression, suppose a gate hung, and resting on its heel (*c*), acting as a strut, and maintained there by its upper hinge (*d*), acting as a tie, then the bottom rail of the gate considered as representing the whole, becomes a lever of the second kind, in which the prop is at one end (*c*), the power at the other (*g*), and the weight placed between them in the line of the centre of gravity of the gate (*i*). Now, as two equal forces, to hold each other in equilibrium, must act in the same direction, it follows, that the power acting at the end of the lever (*g*), will have most influence when exerted at right angles to

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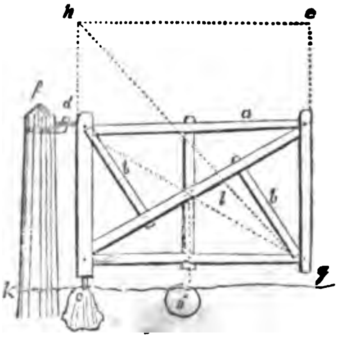

it (g e), but as this cannot be accomplished in a gate where the power must be applied obliquely, it follows, that a larger power becomes requisite; but that the less the obliquity, the less will be the power, or in other words the less the strain on the construction of the gate, or the less the tendency to sink at the head. The half of the right angle (g e c), seems a reasonable limit, by which, if the power requisite to hold the weight in equilibrium, when acting at a right angle, be as the side of a square of the length of the lower bar of the gate (g c), then the power requisite to effect the same end, when acting at an angle of 45 degrees, is as the diagonal to this square (g h). By changing the square to a parallelogram, the relative proportions will still be the same, and the advantages and disadvantages will be rendered more obvious. (For g d is not to d c, as g h is to h).

It is evident from this principle, that gates whose upper line is concave, or falls from the posts or piers to the centre, (*fig.* 214.) are more fitting, and consequently more beautiful, than such as are of an opposite description (*fig.* 215). But a person totally ignorant of mechanical principles, but of good taste in visual matters in general, might prefer the latter, which shews, that a just or true taste must be founded on science or reason, and is by no means so vague and indefinite, or arbitrary an exertion of judgment as many are apt to imagine.

760. Where there is no choice between a *construction* calculated to resist sinking, and the common form, then the corrective or *compensation hinge* of N. Parker, (*fig.* 217.) is very proper for division gates in parks or drives; but a scientific construction either polished, or rustic (*fig.*218.) may be easily contrived for gates in forests and farms. When Parker's hinge is used, all that is necessary when the gate sinks at the head, is to screw it up by the nut (a, *fig.* 217.) till it is replaced in its original position.

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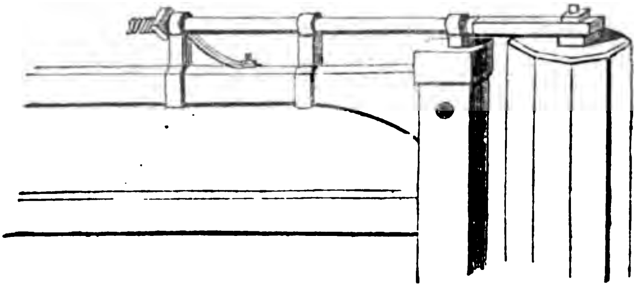


With respect to facilitating the motion of gates, that is to be done by lessening the friction of their hinges. Friction is as the extent of rubbing surface, and the weight; therefore, of the two hinges of a gate, the friction of the heel, when a pivot, is by much the least, as the rubbing there is limited to one point, instead of the whole surfaces of two cylinders. Whatever, therefore, has a tendency to throw the preponderancy of weight on the heel, must lessen the friction of the upper hinge. This will be accomplished in proportion as the centre of gravity is moved from the centre of the gate towards the heel; and this, as well as additional strength, may be obtained by increasing the dimensions of the materials, gradually from the head to the heel.

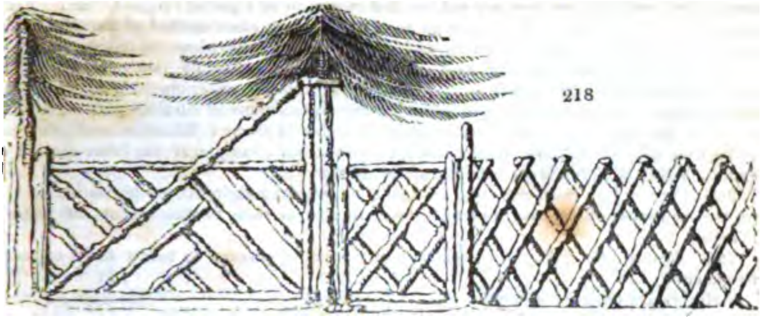
The forces and directions of the strains on the hinges of gates will be found practically explained and mathematically demonstrated by N. Parker (*Essay on Gates*, 1816.) The turnpike gate of this author seems to be a very near approach to perfection.

Some have proposed to suspend gates by weights, in the manner of windows, instead of hanging them; but excepting in anomalous cases, this would be an unsightly and inconvenient practice. (See *Farmer's Mag.* 1819.)

761. *Gates, as decorations*, may be classed according to the prevailing lines, and the materials used. Horizontal, perpendicular, diagonal, and curved lines, comprehend all gates, whether of iron or of timber, and each of these may be distinguished more or less by ornamental parts, which may either be taken from any of the known styles of architecture, or from heraldry or fancy.

The published designs for gates are numerous, especially those for iron gates; for executing which, the improvements made in casting that metal in moulds, afford great facilities. By a judicious junction of cast and wrought iron, the ancient mode of enriching gates with flowers and other carved-like ornaments might be happily re-introduced.

In garden scenery, where elegant or architectural gates are not required to support character, simple or rustic gates, (*fig.* 218.) wickets, turn-styles, and even moveable, or suspended rails, (like the German *schlagbaum*), may be introduced according to the character of the scene.



762. *Rails, or Fences*, for parks and garden scenery, are, as to lines, similarly characterized as gates. Hurdles, whether of wood or iron, are the most convenient description of temporary fences. They are manufactured of various forms and dimensions, so as to prove, as to height, and openings between the rails rods or wires, barriers to the hare sheep cattle or deer. Where iron fences are considered as permanent fixtures, those parts which are inserted in the ground, should be of cast-iron, as resisting oxidation much better than the wrought material. It ought, at the same time, to be covered with tar, pitch, or pyrolignous acid, or, whilst hot, painted over with oil. For interior fences, poles or laths may be formed into treillage work of different kinds (*fig.* 219.); preserving the bark of the former, and pitching or charring the ends inserted in the earth.

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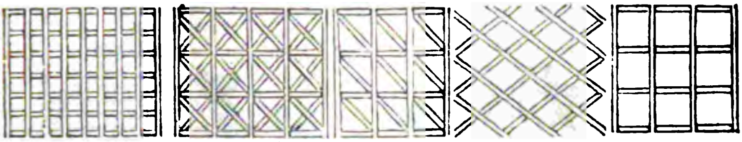

Walls are unquestionably the grandest fences for parks; and arched portals, the noblest entrances; between these and the hedge or pales, and rustic gate, designs in every degree of gradation, both for lodges, gates, and fences, will be found in Wright, Gandy, Robertson, Aikin, Pocock, and other architects who have published on the rural department of their art.

Subsect. 2. *Convenient Decorations.*

Of these, the variety is almost endless, from the prospect tower to the rustic seat; besides aquatic decorations, agreeable to the eye and convenient for the purposes of recreation or culture. Their emplacement, as in the former section, belongs to gardening, and their construction to architecture and engineering.

763. The *Prospect Tower* is a noble object to look at, and a gratifying and instructive position to look from. It should be placed on the highest grounds of a residence, in order to command as wide a prospect as possible, to serve as a fixed recognized point to strangers, in making a tour of the grounds. It may very properly be accompanied by a cottage; or the lower part of it may be occupied by the family of a forester, gamekeeper, or any rural pensioner, to keep it in order, &c.

The *Kiosque* is the Chinese prospect-tower, of peculiar construction, characterized by numerous stories designated by projecting roofs, and pendent bells. An example exists at Kew, and its details will be found in the " *Plans of the Buildings*," &c. erected there by Sir W. Chambers.

Sometimes the prospect-tower is a hollow column, as in the monumental column of London, that to the memory of Lord Nelson, at Edinburgh, and to Lord Hill, at Shrewsbury; but the stairs in such buildings are necessarily too narrow for the prospect-tower of country residences, and besides there can be no rooms as resting places, which are absolutely necessary, where ease and enjoyment are studied, and where some attention is had to the delicacy of women, and the frailties of old age.

764. *Temples*, either models or imitations of the religious buildings of the Greeks and heathen Romans, are sometimes introduced in garden scenery to give dignity and beauty. In residences of a certain extent and character, they may be admissible as imitations, as resting places, and as repositories of sculptures or antiquities. Though their introduction has been brought into contempt by its frequency, and by bad imitations in

perishable materials, yet they are not for that reason to be rejected by good taste. They may often add dignity and a classic air to a scene; and when erected of durable materials, and copied from good models, will, like their originals, please as independent objects. Richard Payne Knight, and some other connoisseurs, of less note, disgusted by the abuse of temples, have argued, as it appears to us, too exclusively against their introduction, and contend for cottages as the fittest ornaments of rural scenery; but why limit the resources of an art because they are liable to abuse? Thatched roofs may become tiresome, as well as columns; and if Stow is an example of the latter carried to excess, White Knights is as certainly of the former.

765. *Porches and Porticoes*, (*fig.* 220.) are sometimes employed as decorative marks to the entrances of scenes; and sometimes merely as roofs to shelter seats or resting benches.

766. *Alcoves* (*fig.* 220.) are used as winter resting places, as being fully exposed to the sun.

Arbours are used as summer-seats and resting places; they may be shaded with fruit-trees, as the vine, currant, cherry, climbing ornamental shrubs, as ivy, clematis, &c. or herbaceous, as everlasting pea, gourd, &c. They are generally formed of timber lattice work, sometimes of woven rods, or wicker-work, and occasionally of wire.

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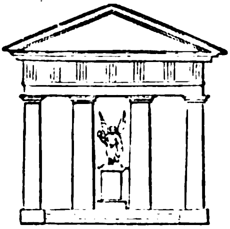

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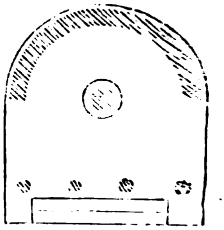

767. The *Italian Arbour* (*fig.* 222.) is generally covered with a dome, often framed of thick iron or copper wire, painted, and covered with vines or honeysuckles.

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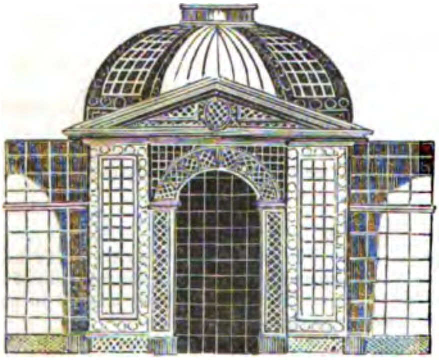

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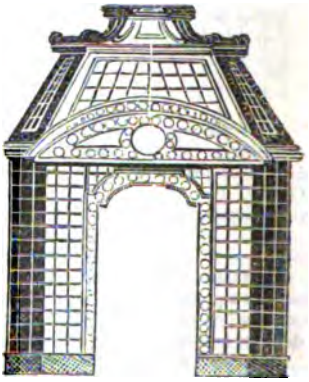

The *French Arbour* (*fig.* 223.) is characterized by the various lines and surfaces, which enter into the composition of the roof.

768. *Caves and Caverns*, where they exist naturally in the grounds of a residence, as at Piercefield, Corby castle, or can be readily formed, are to be regarded more as singularities or picturesque objects than as places of use or enjoyment in this climate; in Italy and Spain they are great luxuries.

769. *Grottoes* are resting-places in recluse situations, rudely covered externally, and within finished with shells, corals, spars, crystalizations, and other marine and mineral productions, according to fancy. To add to the effect, pieces of looking-glass are inserted in different places and positions.

770. *Roofed Seats*, *Boat Houses*, *Moss Houses*, *Flint Houses*, *Bark Huts*, and similar constructions, are different modes of forming resting-places, containing seats, and sometimes other furniture, or conveniences in or near them. Very neat buildings and furniture of this class may be formed of hazel rods; or of any tree with a clean bark, and straight shoots, as young oaks or mountain ash. The spruce fir affords a good outside material: and five or six young trees coupled together, make good rustic columns. At White Knights, the Slopes at Windsor, and Bothwell Castle, are good examples of covered seats of the rustic kind. (*Figs.* 224. 225. and 226.)

224

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226

Roofed seats of a more polished description are boarded structures generally semi-octagonal, and placed so as to be open to the south. Sometimes they are portable, moving on wheels, so as to be placed in different positions, according to the hour of the day, or season of the year, which, in confined spots, is a desirable circumstance. Sometimes they turn on rollers, or on a central pivot, for the same object, and this is very common in barrel seats. In general they are opaque, but occasionally their sides are glazed, to admit the sun to the interior in winter.

A sort of medium seat, between the roofed and the exposed, is formed by constructing the backs of chairs, benches, or sofas with hinges, so as they may fold down over the seat, and so protect it from rain. After rain, when these backs are replaced in their proper position, a dry seat, and dry back to lean against, are at once obtained.

771. *Elegant structures* of this kind for summer use, may be constructed of iron rods and wires, and painted canvass; the iron forming the supporting skeleton, and the canvass the protecting tegument. The mushroom or umbrella form, (*fig.* 227.) and that of the Turkish tent, (*fig.* 228) the oriental pavilion, or any other exotic form free from vulgarity and meagre lines, may be made choice of on such occasions.

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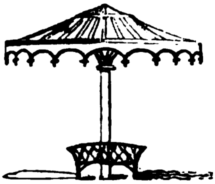

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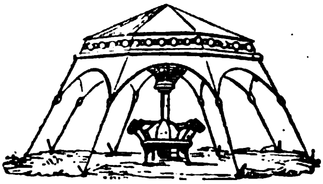

772. *Exposed Seats* include a great variety, rising in gradation from the turf bank to the carved couch. Intermediate forms are stone benches, root-stools, sections of trunks of trees, wooden, stone, or cast-iron mushrooms painted or covered with moss or mat, or heath; the chinese barrel seat, the rustic stool, chair, tripod, sofa, the cast-iron couch or sofa, the wheeling chair, and many sub-varieties.

773. *Swings,* (*fig.* 229.) see-saws, &c. are not very common in English gardens, but, as exercising places for children, are very proper in retired, but airy parts of the pleasure-ground. Hurley burleys, riding wheels, &c. are better substituted by donkeys and poneys. No greater danger is incurred, and something of the art of horsemanship is thus actually acquired. In every country residence where there are children, contrivances for their exercise and amusement ought to be considered essential objects; for these purposes, a riding school, and bath or pond for learning to swim and row a boat, may be considered essential. The former may also serve for acquiring the infantry and cavalry exercise, and learning to fire at a mark, jump, run, wrestle, box, climb trees or smooth poles, ascend ropes, &c. &c.

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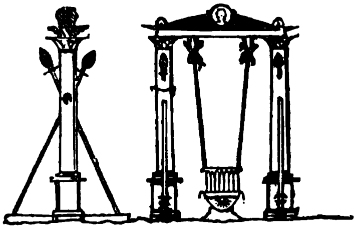
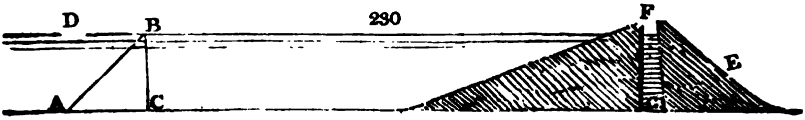


774. Of *constructions for displaying water,* as an artificial decoration, the principal are cascades, waterfalls, jets, and fountains. The foundation of the cascade and waterfall, is the bead or dam which must be thrown across the river or stream; and in this, two things are to be considered, its strength, and the materials of which it is composed.

With respect to strength, the pressure of water is as its depth, and consequently a dam, whose section is a right-angled triangle, (*fig.* 230. A B C,) and whose hypothenuse (A B) forms an angle of 45°, with the base (A C) formed of any material of greater specific gravity than water, would, as far as strength is concerned, hold in equilibrium a body of still water of a depth equal to its perpendicular. If the hypothenuse, or sloping side, be placed next the water, it will more than hold the water in equilibrium, by the weight of the triangle (A B D) of the water superincumbent on the triangle of the dam or bank. That the materials of the bank must be of a nature impervious to water, and also must adhere to the base or bottom, so as not to admit water to escape beneath it, are obvious conditions of the proposition.

The practice of forming dams or heads, is derived from this theory; but to guard against accident, the base of the triangle is always made three or more times greater than its height; the slope next the stream may form an angle with the horizon, of from 40° to 20°, and that on the lower side is regulated by the uses of the dam. If for raising water so as to cover a hollow where there is little or no overflow expected, then the slope is generally of earth, 40° or 35° (*fig.* 230. E F) turfed or planted; if for a cascade, the slope is regulated by the form or undulations on which the rocks to produce the breaking of the water are to be placed; and if for a waterfall, a perpendicular wall is substituted, over which the water projects itself in a sheet or lamina, in breadth proportioned to the quantity of the current.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In all these cases, instead of forming the dam entirely of materials impervious to water, it is sufficient if a vertical stratum of wrought-clay be brought up its centre (*fig.* 231. G E), and the surface of the bank rendered firm by a coating of gravel on the slope next the water.

775. The construction of the *waterfall*, where avowedly artificial, is nothing more than a strong-built wall across the stream, perfectly level at top, and with a strong, smooth, accurately fitted, and well-jointed coping. On the perfection of the coping, both as to level and jointing, depends the regular distribution of the lamina of water to be projected. Formerly artificial cascades of this sort were curved in the ground-plan, the concavity pointing down the stream, by which some strength and a better view of the water were supposed to be obtained. With respect to strength, this can only hold true, or at least be of consequence, in cases where the upper slope of the dam is very steep, and the force of the current great; and as to a fuller view, this can only take place when the eye of the spectator is in the focus of the segment. Where a natural waterfall is to be imitated, the upright wall must be built of huge irregular blocks; the horizontal lamina of water broken in the same way by placing fragments of rocks grouped here and there so as to throw the whole into parts; and as nature is never methodical, to form it as if in part a cascade.

776. In imitating a natural *cascade* in garden scenery, the horizontal line must here also be perfect, to prevent waste of water in dry seasons, and from this to the base of the lower slope the surface must be paved by irregular blocks, observing to group the prominent fragments, and not distribute them regularly over the surface. In the infancy of landscape gardening, the lower bank or slope of the dam was formed into ogee and other curves, or a serpentine line, and smoothly paved or causeyed, fixing on the convexities of the curves projecting boards across the current; and the current being thus interrupted, was thrown up in arched waves. Such was the sort of beauty then admired; for it is a long time in the progress of improvement before man can see any other beauty than that which he has himself produced.

In general, it may be observed as to cascades and waterfalls, that the greatest danger consists in attempting too much. A very few blocks, disposed with a painter's eye, will effect all that can be in good taste in most garden scenes; and in forming or improving them in natural rivers, there will generally be found indications both as to situation and style, especially if the country be uneven, or stony, or rocky. Nothing can be in worse taste than piles of stones and rocks across a river either natural or artificial, in a tame alluvial meadow: they may be well chosen fragments from suitable materials, and arranged so as to form a cascade or waterfall very beautiful of itself, but whose beauty is really deformity or monstrosity, relatively to the surrounding scenery, or to that whole of which it should form an accordant part.

777. *Jets and other hydraulic devices*, though now less in repute than formerly, are not to be rejected in confined artificial scenes, and form an essential decoration where the ancient style of landscape is introduced in any degree of perfection.

The first requisite for jets or projected spouts, or threads of water, by atmospheric pressure, is a sufficiently elevated source or reservoir of supply. This being obtained, pipes are to be conducted from it to the situations for the jets. No jets, however constructed, will rise as high as the fountain-head; because the water is impeded by the resistance of the air, the friction against the opening of the pipe or adjutage, and its own gravity. It is not easy to lay down data on this head; if the bore of the adjutage be too small, the rising stream will want sufficient weight and power to divide the air, and so being dashed against it will fall down in vapour or mist. If too large, it will not rise at all. The length of pipe between the reservoir and the jet will also impede its rising in a slight degree by the friction of the water on the pipe. This is estimated by P. J. Francois (*Art des Fontaines*, 137.) at one foot for every hundred yards, from the reservoir. The proportion which this author gives to the adjutages relatively to the conducting-pipes, is one-fourth; and thus for a jet of four lines, or a third of an inch, he requires an adjutage of between four and five lines, and a conducting pipe of one inch and a half diameter; for a jet of six or seven lines, a conducting-pipe of two inches, and so on. From these data, the height of the fountain and the diameter of the conducting-pipe being given, the height to which a jet can be forced can be estimated with tolerable accuracy, and the contrary. But where the pipes are already laid, and the power of the head, owing to intervening obstructions, not very accurately known, the method by trial and correction by means of a leaden nozzle, will lead to the exact power under all the circumstances.

There are several sorts of adjutages contrived so as to throw up the water in the form of sheaves, fans, showers, to support balls, &c.; others to throw it out horizontally, or in curved lines, according to the taste of the designer; but the most usual form is a simple opening to throw the spout or jet upright. The grandest jet of any is a perpendicular column issuing from a rocky base, on which the water falling, produces a double effect both of sound and visual display. A jet rising from a naked tube in the middle of a basin or canal, and the waters falling on its smooth surface, is unnatural, without being artificially grand.

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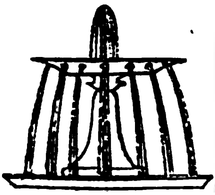

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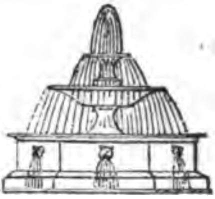

778. *Drooping Fountains* (*figs.* 231. 232. and 233.), overflowing vases, shells (as the Chama Gigas), cisterns, and sarcophagi, dripping rocks, and rock-works, are easily formed, requiring only the reservoir to be as high as the orifice whence the drip or descent proceeds. This description of fountains with a surrounding basin, are peculiarly adapted for the growth of aquatic plants. Both classes of water-works may be combined with good effect.

In all water-works in gardens, pipes or drains must be contrived to carry off such of the water as is not used in culture. The diameter of these should be somewhat larger than the conducting-pipes, for obvious reasons.

779. *Sun-Dials* are venerable and pleasing garden decorations; and should be placed in conspicuous, frequented parts, as in the intersection of principal walks, where the "note which they give of time" may be readily recognised by the passenger.

780. *Vanes* are useful in the same way, but are an unsuitable garden ornament, though frequently introduced on the summits of garden buildings. The ideas to which they give rise are connected with ships, flags, fairs, military standards, and weathercocks, all opposite to the stillness and repose of gardens. Over a library or office they are useful, connected with an internal index; and they are characteristic and proper over churches, family chapels, clock-towers, and domestic offices.

Subsect. 3. *Characteristic Decorations.*

The constructions hitherto mentioned have all had some particular use or application, in gardening or in general œconomy. Those which follow are purely decorative, without any pretensions to convenience; they should ever be very sparingly employed, and only by persons of judgment and experience. A tyro in gardening will be more apt to render himself ridiculous by the use of decorations, than by any other point of practice, and most easily by the use of characteristic decorations.

781. *Rocks* are generally considered as parts of the foundation of the earth, and their general character is that of grandeur, sometimes mixed with the singular fantastique or romantique. Their expression forms a fine contrast to that of perishable vegetation, and therefore they have been eagerly sought after in gardens, both on this account, and as forming a suitable habitation for certain descriptions of plants. Plant rock-works are protuberant surfaces, or declivities irregularly covered with rocky fragments, land-stones, conglomerated gravel, vitrified bricks, vitrified scoriæ, flints, shells, spar, or other earthy and hard mineral bodies. Such works are, in general, to be looked on more as scenes of culture than of design or picturesque beauty.

Rock-works, for effect or character, require more consideration than most gardeners are aware of. The first thing is to study the character of the country, and of the strata of earthy materials, whether earth, gravel, sand, or rock, or a mere nucleus of either of these, such as they actually exist, so as to decide whether rocks may, with propriety, be introduced at all; or, if to be introduced, of what kind and to what extent. The design being thus finally fixed on, the execution is more a matter of labour than of skill. (See *Landscape Gardening*).

782. The *Ruins* of objects adapted by their natures or constructions to brave time, have always excited veneration; and this sentiment, forming a contrast with those emotions raised by mere verdant scenes, has ever been esteemed very desirable in gardens. Hence, the attempt to produce them by forming artificial ruins, which being absolute deceptions, cannot admit of justification. If any thing is admissible in this way, it is the heightening the expression of ruins which already exist, by the addition of some parts, which may be supposed to have existed there when the edifice was more entire. Thus, the remains of a castle-wall, not otherwise recognizable from that of a common house or inclosure, may be pierced with a window or a loop-hole, in the style appropiate to its date, or it may be heightened or extended in some degree. In other cases, turrets, or pinnacles, or battlements, or chimney-tops, may be added, according to circumstance, and as a judicious and experienced taste and antiquarian architect may direct. Unless the style of the age of the ruins be adopted, the additions become worse than useless to all such as are conversant in the history of architecture, of which an example may be given in the modern Gothic turrets, in the grounds of White Knights, intended to represent the abbey of that name, founded soon after the Norman conquest.

783. *Antiquities* (*fig.* 234.) are nearly allied to ruins, but differ from them in being of some value as objects, independently of locality. They may be valuable from their great age, as druidical altars; from historical traditions connected with them, as stones, indicating the site of a battle, the cross-stone of an ancient town, &c.; or from the excellence of the workmanship or the material, as in fragments of Grecian and Roman sculpture and architecture. This class of decorations is very common in Italy, and especially near Rome and Naples. Viewed as parts of landscape almost every thing depends on their union with the surrounding scenery.

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784. *Rarities, and curiosities,* like antiquities, possess a sort of absolute value; but the sentiments to which they give rise are more allied to wonder than veneration. They

are occasionally introduced in gardening, such as the jaw-bones of the whale, basaltic columns, lava blocks, pillars of earthy rock-salt. The tuffs, corals, and madrepores brought from Otaheite by Captain Cook, as ballast, now form part of the rock-work in the Chelsea garden. Chinese rocks, idols, and other Chinese garden ornaments, are sometimes admitted, not as imitations of rocks or sculpture, but as curiosities.

785. *Monumental objects*, as obelisks, columns, pyramids, may occasionally be introduced with grand effect, both in a picturesque and historical view, of which Blenheim, Stow, Castle-Howard, &c. afford fine examples; but their introduction is easily carried to the extreme, and then it defeats itself, as at Stow. In this department may be truly said, after Buonaparte, "*Du sublime au ridicule il n'y a qu'un pas!*"

786. *Sculptures.* — Of statues, therms, busts, pedestals, altars, urns, and similar sculptures, nearly the same remarks may be made. Used sparingly, they excite interest, often produce character, and are always individually beautiful, as in the pleasure-grounds of Blenheim, where a few are judiciously introduced; but profusely scattered about, they distract attention.

787. *Vegetable Sculptures* (*fig.* 235.) are very appropriate in parterres and other scenes in the ancient style. That they may be executed with correctness and without loss of time, the skeleton should be formed of wire, within which all the shoots should be confined, and when once the form is filled up with vegetation, the gardener has only to clip the protruding shoots. Groups of figures of different colors may be very curiously executed by using different colored greens. In the garden of the convent of the Madre di Dio, near Savonna, is a group representing the flight of Joseph into Egypt, in yellow box, variegated with holly, myrtle, cypress, laurel, and rosemary. The attending priest told us these plants completed their forms in three years.

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788. *Inscriptions*, as historical records, without comment, may in some cases be admissible; as the date when any work was begun and finished, the height of elevated points above the level of the sea, or relatively to other surrounding elevated and conspicuous objects, &c. &c.; but sentimental and religious inscriptions cannot be approved of by men in general. They are something superadded to what is or ought to be already complete, and place nature in the situation of the painter, whose portraits required the aid of graphical description. "This is a black bear." That is "A happy rural seat of various view."

789. *Eye traps*, painted perspectives, on walls or boards, as terminations, mock-hermits, soldiers, banditti, lions, (as at Hawkstone,) or any other figures of men or animals, intended to pass for realities, though still used in Holland and France, may be pronounced as too puerile for the present age. If they are still admired by the city-mob in a suburban tea-garden, so much the better; the mob must be pleased as well as their superiors, and the rich vulgar may join with them; but the object of all the arts, whether useful or agreeable, is to elevate our tastes and enjoyments; and therefore, as soon as men's minds are prepared for any refinement on former things, the particular art to which these things belong should prepare the way for their removal, by presenting appropriate substitutes. A few reading tents and portable coffee-houses scattered over the public parks round London and Edinburgh, as at Paris and Vienna, in umbrageous and picturesque situations, would be fitting substitutes for those crowded yards called tea-gardens.

CHAP. IV.

Of the Improvement of the Mechanical Agents of Gardening.

790. Of the implements and buildings enumerated in the foregoing chapters, a number may no doubt be done without, even in the first-rate gardens; on the other hand we have knowingly omitted some which are in use in particular situations and circumstances, as not meriting to become general, and others of forms or constructions too obsolete for modern practice, or too new and imperfect in construction to merit recommendation. A gardener of science and experience is not to be confined in his choice to what is or has been in this or in any department of his art; but drawing from the resources of his own mind, he may, and ought not only to improve what is already in use, but design and get executed, new tools, instruments, and constructions, better calculated to effect the ends in view generally, or more suited to the exigences of his particular case.

Notwithstanding the alterations and ameliorations which have of late been so frequently made, there are few of the mechanical agents of gardening now in use, that do not admit of some, and many of them unquestionably, of much improvement. The ultimate effect of all these ameliorations is to lessen human labor, and increase the quantity, or improve the quality, of garden productions, so that every attempt to extend them is highly meritorious.

Such being the importance of implements and buildings in gardening, it is evident, that to whatever extent they are used in any department of this art, it must be desirable to select the best designs, and to have these executed in the best manner and of the best materials. This can scarcely be too strongly impressed on the mind of the gardener or his employer. With tools or instruments made of improper timber or iron, and of indifferent workmanship, the operator can never satisfy either himself or his master. The quantity of his labour is less, and the quality inferior; add to this, that the instrument soon begins to decay, and requires to be renewed, so that independently altogether of the loss in the quantity and quality of labour, the loss occasioned by the renewal of the tool, instrument, or machine, ought to be a sufficient inducement to procure at first only the very best. The true way to ensure this, where the party are not judges, is to employ tradesmen of good repute and long standing. In general, seedsmen should be the persons from whom all the implements of gardening ought to be procurable; but as they often omit this branch of their business, from the want of regular demand, recourse must be had to ironmongers, or to those new establishments, called Horticultural and Agricultural Repositories.

By far the most important class of garden constructions are hot-houses; and with respect to them, no degree of horticultural skill and practical attention will compensate for the want of light or air, or a bad exposure; and where the arrangements for supplying artificial heat are imperfect, the risk is great, and painful for a zealous gardener to contemplate. One night may destroy the labours of the past year, and forbid hope for the year to come; the blame may be laid where it is not merited, and a faithful servant may lose his situation and his character, without having committed either errors of ignorance or carelessness.

In all buildings, the most complete, elegant, or grand design, when badly executed, is disagreeable to the view, defective in the object of its erection, and ruinous to the proprietor. Bad foundations and roofs, improper materials, materials of different degrees of durability, piled incongruously together, and bad workmanship, form the elements of bad execution. In no country are materials and labour obtained in greater perfection than in England; and in all regular works coming under the architect or the engineer, we generally find little to condemn, and often much to admire in the execution of the work. Garden-buildings, however, and especially that important class, hot-houses, are, relatively to civil architecture, an anomalous class of structures; and hence they are more the subject of chance or caprice in design, and of local convenience in execution, than these of any department of rural architecture. The subject of horticultural architecture, indeed, till very lately, has not been deemed of sufficient importance, to induce an architect to make himself master of the first step towards improvement in every art, the knowledge of what has already been done in it by others. Hence it follows, that garden-buildings, and especially hot-houses, are left either wholly to gardeners, who understand little of the science of architecture, or wholly to architects, who understand as little of the science of gardening. The consequence in either case, generally is, incongruity in appearance, want of success in the useful results, and want of permanency in duration. It would be more easy to adduce examples than to avoid the charge of impartiality in the selection.

The recent improvements in the manufacture of iron, and the war-price of timber, have greatly extended the use of the former material in most erections, and contributed, from the novelty of the thing, to a good deal of incongruity in the disposition of the materials of buildings. Thus we have cast iron sashes in deal frames, cast iron rafters placed on timber wall-plates, iron bars sheathed with copper, and many such discordant arrangements, certain in the end of defeating the purpose for which they were adopted.

There are two modes which proprietors may adopt who are desirous of embodying in garden erections the modern improvements. The first is, to employ a first-rate head gardener, and to authorize and require of him, to consult with a regular architect or engineer, previously to fixing on any plan for a structure or machine; and the second is, to employ a regular garden-architect. A connoisseur will, no doubt, think for himself, and form his own plans; and a spirited amateur will be the first to adopt new improvements; but the policy of a well-regulated man, who has no pretensions to particular skill himself, will certainly lead him to adopt one of the two first modes.

BOOK IV.

OF THE OPERATIONS OF GARDENING.

791. After the previous studies of the vegetable kingdom, the materials of growth and culture, and the implements and structures by which the gardener operates on soils and plants; the next step is to describe these operations. They are all mechanical in the first instance, though the principal intention of many of them is to effect chemical changes, and of others, changes on the vital principle. They are also all manual, or effected by man, who, though possessing little power over nature in his naked, unarmed state, yet taking in his hands some one of the implements or machines described, becomes thereby armed with a new power, and operates on the soil, or on the vegetable itself, by effecting changes in his own centre of gravity, and by muscular movements of his legs and arms, calculated by pushing, drawing, or lifting, to bring the implement into the action proper for performing the operation in view. All these movements are governed by the laws of mechanics, and the operations performed, are all referable to one or more of the mechanical powers, and chiefly, as we have before observed, to the lever and the wedge.

Operations, with a view to chemical and vital changes, call into action the thinking faculty more than the physical strength of man. Excited by the desire of attaining some particular end or object, he recurs to his memory for the knowledge there stored up of the nature of vegetables, and of the elements of common matter by which they are affected. Aided by his imagination, he selects and combines ideas, suited to his purpose; submits them to a series of mental equations, or what is called reasoning, till, arriving theoretically at the desired results, he finishes by giving practical directions for the performance of processes calculated to attain them.

In the infancy of gardening, as the implements were few, so would be also the operations of culture. The ground would be loosened on the surface with a pointed stick, or scratched with a bone, or a horn in the spring season; the plants or seeds rudely inserted, and the produce in autumn broken over or pulled up, as wanted by the family or band to whom they belonged. But in the present state of human improvement, the operations of gardening have branched out into a number and variety which at first sight appears astonishing. The operations of pulverization and sowing, for example, are not confined to spring; but are practised in every month of the year. The season of reaping or gathering crops is equally extended; and for such productions as cannot be produced or preserved in the open air, recourse is had to hot-houses, and fruit and root store-rooms. Vegetation is accelerated, retarded, and modified, almost at the will of the operator; and by processes which suppose a considerable degree of physiological and chemical science, as well as practical skill, mechanical dexterity, and personal attention. Thus, shading, airing, and watering, though operations exceeded by none in manual simplicity, cannot be performed without continual reference to the state of the plant, of the soil, and of the climate or weather. Hence it is, that an operative gardener who really knows his profession, requires to be not only a habile workman, but a thinking and reasoning being, and a steady man.

We shall consider the operations of gardening, — 1. As consisting of operations or labors in which strength is chiefly required. 2. As operations where skill is more required than strength; and 3. As operations or processes where strength, skill, and science, are combined.

Chap. I.

Operations of Gardening, in which Strength is chiefly required in the Operator.

To acquire the practice of these operations, a few hours' labor with the implements or machines will be of more use than a volume of words; all that we shall submit, therefore, will be merely some observations relatively to the mechanical action of the implement and operator, the object of the operation, and the best season of performing it. They may be arranged as — 1. Mechanical operations common to all arts of manual labor. 2. Garden labors on the soil. 3. Garden labors on plants.

Sect. I. *Mechanical Operations common to all Arts of Manual Labor.*

All the operations which man performs with implements or machines, are, as far as his own person is concerned, reducible to lifting, carrying, drawing, and thrusting. Man himself, considered as an engine, derives his power from alterations in the position of his centre of gravity, and he applies it chiefly by his hands, arms, and legs, acting as levers of the third kind.

792. *Lifting* is performed by first stooping or lowering the centre of gravity, and at the same time throwing it to one side. The object being then laid hold of by the hands, the body is raised, and the centre of gravity, in being restored to its true position, acts as a counter balancing weight to the weight to be raised. The weight retained by the hand is now raised a certain height, never exceeding half that of the man; if to be raised higher, recourse is had to muscular strength, or the power of the arms to act as levers.

793. *Carrying*. To carry a thing is merely to walk with a greater weight than before, and walking is performed by a series of alternate derangements and adjustments of the centre of gravity, slow or rapid, according as the person may walk or run. According to Delolm, the most advantageous weight for a man of common strength to carry horizontally is 112lbs.; or, if he returns unladen, 135lbs.

794. *Drawing*. In this operation, the upper part of the body is thrown forward, so as to act as a power to counterbalance or lift up the body or weight to be moved; and by joining to this lifting motion the operation of walking, the weight is at once lifted up and drawn along. This compound operation is exemplified in a horse, when straining at a draught in a plough or cart. He first lowers his chest, then raises it, and lastly steps forwards. When drawing at ease, the lifting motion is scarcely distinguishable from the progressive one.

795. *Pushing or Thrusting* is performed exactly on the same principles as drawing, and differs from it chiefly in the kind of implement or machine which requires to be employed; all machines which are to be pushed requiring to be attached to the animal machine by parts acting by their rigidity; whereas, those to be drawn may be attached by parts acting by their tenacity merely.

All these operations may be varied in quantity, either by a variation in the weight or gravity of the man, or moving power; or by a variation in the time or rapidity of his motions. Thus a heavy man may, in one movement, lift a weight ten times greater than can be done by one of less weight; but a light man may, by increasing the time of performance, lift the same weight at ten times. A man, who in digging can apply with his feet five cwt. of his weight towards pushing the wedge or blade of the spade into the soil, has an evident advantage over a lighter man who can only apply three cwt. for that purpose; but yet the latter may equal the former, by accompanying his power or foot with a proportionate increase of motion. The power in this last case is said to be obtained by the *momentum*, or quantity of matter in a body multiplied by the velocity with which it is moved. Power, therefore, we thus ascertain, is obtained by matter and motion jointly, and what may be deficient in the one, may be made up by excess in the other. Thus, a small, light workman may (though with more animal exertion) produce as much work as a larger or heavier man: for if we suppose the quantity of matter in the large man to be thirty, and his motion at the rate of two, then if the quantity of matter in the small man be twenty, and his motion at the rate of three, he will produce an equal effect with the large man. As small human machines, or men, are generally constructed of firmer materials, or more healthy and animated, than large ones, the small man performs his rapid motions with nearly as great ease to himself as the heavy man moves his ponderous weight; so that in point of final result they are very nearly on a par.

Sect. II. *Garden Labors on the Soil.*

The simple labors peculiar to arts of culture are performed either in the body of the soil, as picking, digging; on its surface, as hoeing, raking; or on vegetables, as cutting, clipping, &c.

796. *Picking*. The pick, as we have seen (610. *fig.* 1.) is a blunt wedge, with a lever attached to it at right angles, and the operation of picking consists in driving in the wedge perpendicularly, so as to produce fracture, and then causing it to operate horizontally by the lever or handle, so as to effect separation, and thus break up and loosen hard, compact, or stoney soils. It is also used to loosen stones or roots; and the pick-axe is used to cut the latter. For breaking and pulverizing the soil, the most favorable conditions are, that the earth should be moderately moist, to facilitate the entrance of the pick, but in tenacious soils not so much so as to impede fracture and separation.

797. *Digging*. The spade is a thin wedge, with a lever attached in the same plane, and the operation of digging consists in thrusting in the wedge by the momentum (or weight and motion) of the operator, which effects fracture; a movement of the lever next effects separation, whilst the operator, by stooping and rising again, lifts up the spitful or section of earth on the blade or wedge of the spade, which, when so raised, is dropt in a reversed position, and at a short distance from the unbroken ground. The separation between the dug and undug ground is called the trench or furrow; and

when a piece of ground is to be dug, a furrow is first opened at that end of it where the work is to commence, and the earth carried to that end where it is to terminate, where it serves to close the furrow. In digging, regard must be had to maintain an uniform depth throughout, to reverse the position of each spitful, so as what was before surface may now be buried; to break and comminute every part where pulverization is the leading object; to preserve each spitful as entire, and place it separate, or isolated as much as possible where aëration is the object; to mix in manures regularly where they are added; to bury weeds not injurious; and to remove others, and all extraneous matters, as stones, &c. in every case. For all these purposes a deep open trench is requisite, and that this may not be diminished in the course of the operation, it must never be increased in length. If allowed to become crooked by irregular advances in the digging, it is thus increased in length, and necessarily diminished in capacity, unless, indeed, the dug ground is allowed to assume an uneven surface which is an equally great fault.

Digging for pulverization and mixing in manures, is best performed in dry weather; but for the purposes of aëration, a degree of moisture and tenacity in the soil is more favorable for laying it up in lumps or entire pieces. The usual length of the blade of a spade is from ten inches to a foot, but as it is always inserted somewhat obliquely, the depth of pulverization in gardens attained by simple digging seldom exceeds nine inches, and in breaking up firm grounds it is seldom so much.

798. *Shoveling* is merely the lifting part of digging, and the shovel being broader than the spade, is used to lift up fragments separated by that implement or the pick.

799. *Excavating* is the operation of working out pits, furrows, or other hollows in grounds, either for the commencement of other operations, as digging or trenching, or for planting, burying manures, inserting roots; or on a large scale, for forming pieces of artificial water, &c.

800. *Levelling*, in the ordinary sense of the term, as used in gardening, consists in spreading abroad the soil in such a way that its surface may be nearly in one uniform plane, either level or nearly so; to be correct, this plane ought to be parallel with that of the horizon; but very generally an *even* surface, if not very far from level, answers all its purposes. The terms *level* and *even*, in ground-work however, ought to be considered as quite distinct: the former should be like the surface of still water, and the latter merely free from inequalities.

801. *Marking with the Line* is an operation preparatory to some others, and consists in stretching and fixing the line or cord along the surface by means of its attached pins or stakes, in the direction or position desired, and cutting a slight continuous notch, mark, or slit in the ground, along its edge with the spade.

802. *Trenching* is a mode of pulverizing and mixing the soil, or of pulverizing and changing its surface, to any greater depth than can be done by the spade alone. For trenching, with a view to pulverizing and changing the surface, a trench is formed like the furrow in digging, but two or more times wider and deeper; the plot or piece to be trenched is next marked off with the line into parallel strips of this width; and beginning at one of these, the operator digs or picks the surface stratum, and throws it in the bottom of the trench. Having completed with the shovel the removal of the surface stratum, a second, and a third, or fourth, according to the depth of the soil and other circumstances, is removed in the same way; and thus, when the operation is completed, the position of the different stratums is exactly the reverse to what they were before.

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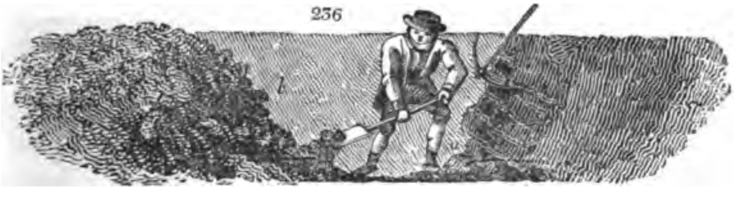

In trenching, with a view to mixture and pulverization, (*fig.* 236.) all that is necessary is to open, at one corner of the plot, a trench or excavation of the desired depth, three or four feet broad, and six or eight feet long. Then proceed to fill this excavation from one end by working out a similar one. In this way proceed across the piece to be trenched, and then return, and so on in parallel courses to the end of the plot, observing that the face or position of the moved soil in the trench must always be that of a slope, in order that whatever is thrown there may be mixed, and not deposited in regular layers, as in the other case. To effect this most completely, the operator should always stand in the bottom of the trench, and first picking down, and mixing the materials, from the solid side (*a*), should next take them up with the shovel, and throw them on the slope or face of the moved soil (*b*), keeping a distinct space of two or three feet between them. For want of attention to this, in trenching new soils for gardens and plantations, it may be truly said that half the benefit derivable from the operation is lost. In general in trenching, those points which were mentioned under digging, such as turning, breaking, dunging, &c. require to be attended to, and sometimes an additional object, that of producing a level from an irregular surface is desired. In this case double care is requisite to avoid forming subterraneous basins or hollows, which might retain water in the substratum, at the bottom of the moved soil, and also to mix inferior with better soil, &c. where it becomes requisite to penetrate into depositions of inferior earthy matters.

803. *Ridging* is a mode of finishing the surface, applicable either to dug or trenched grounds, which, when so finished, are called ridge-dug or ridge-trenched. Instead of being formed with an even surface, ridged grounds are finished in ridges or close ranges of parallel elevations, whose sections are nearly equilateral triangles. Hence, supposing the triangles to touch at their bases, two-thirds of more surface will be exposed to the influence of the atmosphere and the weather, than in even surfaces.

804. *Forking.* The fork is composed of two or three separate, parallel, and uniform wedges, joined so as to form one general blade, which is acted on like the spade, by means of a shoulder or hilt, for thrusting it into the matters to be forked, and a lever or handle for separating and lifting them. In gardening, forking is used for two purposes; for pulverizing the soil among growing crops, and for moving vegetable manures. In the first case the operation is similar to digging, the only difference being that pulverization is more attended to than reversing the surface; in the other, the fork separates chiefly by drawing and lifting; hence for this purpose a round-pronged (or dung) fork (*fig.* 8.) produces least friction during the discharge of the fork-full and re-insertion; and in the other a broad-pronged (or garden) fork (*fig.* 9.) separates and lifts more readily the soil. Dry weather is essentially requisite in forking soils, and most desirable for spreading manures; but dung-hills may be turned, and hot-beds built, during rain, with no great injury.

805. *Hoeing* is performed by drawing or thrusting the wedge or blade of the draw or thrust-hoe along the surface of the soil, so as to cut weeds at or under the surface, and slightly to pulverize the soil. It is used for four purposes, sometimes together, but commonly separate; first, to loosen weeds so as they may die for want of nourishment, or be gathered or raked off, for which purpose, either the thrust or draw-hoe may be used; the second, to stir the soil, and for this purpose, when no weeds require killing, the pronged hoe is preferable, as being thrust deeper with less force, and as likely to cut the roots of plants; the third, is to draw up or accumulate soil about the stems of plants, for which purpose a hoe with a large blade or shovel will produce most effect; and the fourth is to form a hollow gutter or drill, in which to sow or insert the seeds of plants, for which a large or small draw-hoe may be used, according to the size of the seeds to be buried. The use of the hoe for any of the above purposes requires dry weather.

806. *Raking* is performed by drawing through the surface of the soil, or over it, a series of small equilateral wedges or teeth, either with a view to minute pulverization, or to collecting weeds, stones, or such other extraneous matters as do not pass through the interstices of the teeth of the rake. The teeth of the rake being placed nearly at right angles to the handle, it follows that the lower the handle is held in performing the operation, the deeper will be the pulverization, and on the contrary, that the higher it is held, the interstices being lessened, the fewer extraneous matters will pass through the teeth. The angle at which the handle of the rake is held must therefore depend on the object in view; the medium is forty-five degrees. For all raking, excepting that of new mown grass, dry weather is essentially requisite.

807. *Scraping* is drawing a broad and blunt wedge along hard surfaces; in gardening, generally those of lawns or walks, to remove excrementitious matters thrown out of the soil by worms. Moist weather best suits the operation on lawns, and dry weather on gravel.

808. *Sweeping*, mechanically considered, is the same operation as scraping. In gardening, it is chiefly used after mowing, and for collecting leaves; for both which purposes dewy mornings are preferable, as at such seasons the leaves or grass being moist, conglomerate without adhering to the dry soil.

809. *Wheeling* is a mode of carrying materials in which the weight is divided between the axle of the wheel and the arms of the operator. The arms or shafts of the barrow thus become levers of the second kind, in which the power is at one end, and the fulcrum at the other, and the weight between them. The weight is carried or moved on by the continual change of the fulcrum with the turning of the wheel; and this turning is produced by the operator throwing forward his centre of gravity so as to push against the wheel by means of the moveable axle, &c. The chief obstacles to wheeling are the

roughness or softness of the surface to be wheeled on. Where this is firm, there wheeling will be best performed with the greater part of the load resting on the axle; but when soft and deep, the centre of gravity should be nearest the operator, who will find it easier to carry than to overcome excessive friction. Dry weather is obviously preferable for this operation. "With wheelbarrows," Dr. Young observes, "men will do half as much more work as with hods."

810. *Beating* is the application of pressure to surfaces or to materials, with a view to render them more fit for particular uses. Thus, in new-laid turf-verges, or gravel allies, compactness and adhesion are required and obtained by beating; in working clay for puddling or claying the bottoms of ponds or cisterns, intimate mixture, exclusion of air, and of hard particles, are effected by the same means.

811. *Rolling* is the application of pressure to surfaces on a large scale, and chiefly to turf and gravel. The roller, mechanically considered, is the second mechanical power, or wheel and axle, to which the handle becomes a lever of the second kind, as in the wheelbarrow. The amount of its action is as the breadth of the wheel and joint weight of it and of the axle; it is drawn over the surface, and produces by far the greatest effect when the ground is saturated with moisture below, but dry on the immediate surface.

812. *Sifting, or Screening,* are operations for separating the coarser from the finer particles of earth, gravel, tanners' bark, &c. The materials require to be dry, well broken, and then thrown on the screen (*fig.* 86.), which being a grated inclined plane, in sliding down it, the smaller materials drop through while the larger pass on. In sifting, the same process is effected by motion with a sieve or circular and flat grating of limited extent. The screen is calculated for coarser operations, as with gravel and bark on a large scale, and the sieve for finer operations with plant moulds and composts.

Sect. III. *Garden Labors with Plants.*

The simple operations, or labors performed on vegetables, are sawing, cutting clipping, splitting, mowing, and weeding.

813. *Sawing.* The saw is a conjoined series of uniform wedges, which, when drawn or thrust in succession across a branch or trunk gradually wear it through. In performing the operation, the regularity of the pressure and motion are chiefly to be attended to. In green or live shoots, the double-toothed saw produces less friction on the sides of the plate, by opening a larger channel for its motion. Where parts are detached from living trees, the living section ought generally to be smoothed over with a knife, chisel, or file; and a previous precaution in large trees, is to cut a notch in the lower part of the branch immediately under and in the line of the section, in order to prevent any accident to the bark, when the amputated part falls off. Sawing is a coarser mode of cutting, mowing, or shaving; or a finer mode of raking, in which the teeth follow all in one line.

814. *Cutting* is performed by means of a very sharp wedge, and either by drawing this through obliquely or across the body to be cut, as in using the knife; or by pressing or striking the axe or hedge-bill obliquely into the body, first, on one side of an imaginary line of section, and then on the other, so as to work out a trench across the branch or trunk, and so effect its separation. The axe, in gardening, is chiefly used in felling trees, and for separating their trunks, branches, and roots into parts. The knife is extensively used for small trees, and the hedge-bill and chisel for those of larger size. In amputating with the knife, one operation or *draw-cut* ought generally to be sufficient to separate the parts; and this ought to be made with the knife sufficiently sharp, and the motion so quick as to produce a clean, smooth section, with the bark uninjured.

Every *draw-cut* produces a smooth section, and a fractured or bruised section; and one essential part of cutting living vegetables, is to take care that the fractured section be on the part amputated. Another desirable object is, that the section of the living or remaining part should be so inclined (*a, fig.* 237.) as not to lodge water or overflowing

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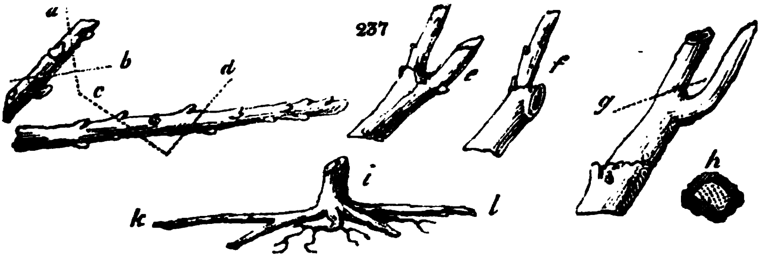

sap, and so far turned to the ground (*d*) or to the north, as not to be struck by the direct rays of the sun. To accomplish both these purposes, as well as to make sure of having the fractured section on the part amputated, the general practice is to cut from below or from the under edge of the branch or shoot, unless the position of the leading bud occasions a deviation from the rule (*b*). The cut should also be made in all shoots of not more than three or four years old, within from one-fourth to half an inch, or a little more of the bud intended to take the lead; when this is not done, and half an inch or more of shoot left without a bud (*c* and *e*) the consequence is, the stump dies back to the bud in the course of the season (*g*), and if not carefully cut off (*f*), will end in a decaying orifice both unsightly and injurious. The bud selected for a leader ought always to be a leaf-bud, and in general the plane of the section ought to be parallel to the angle which the bud makes with the stem (*d*). Exceptions occur in the case of plants with much pith, (*h*) as the vine, elder, &c. in cutting the year-old shoots of which, an inch or more ought to be left, as these always die back a few lines; and thus the leading bud might be injured, if this precaution were not taken. In pruning roots, the same principle, as far as applicable, ought to be attended to; the trunk or stem when cut over ought to be sloped to the north (*i*), and the lateral roots cut so as the section may be on the under side (*k*), and therefore less likely to rot than when the cut faces the surface of the ground (*l*), or is bruised by neglecting to form the smooth section on the attached extremity.

In like manner, when pruning a large tree, the section of amputation ought to be made so oblique as to throw off the rain; as generally as possible, it should be turned from the sun, and rather downwards as upwards, in order to shield it from heat and cracking; and whenever it can be done, it should be made near a branch, shoot, or bud, which may take the lead in the room of that cut off, and thus, by keeping the principle of life in action at the section, speedily heal up the wound.

In cutting with the chisel, the blade is applied below the branch to be amputated, so as to rest on the trunk or main branch, and so applied, a quick blow with a mallet is applied to the handle of the chisel by the operator or his assistant. If this does not effect a separation, it is to be repeated. In forest pruning it is often advantageous to apply one cut of the chisel on the underside of the branch, and then saw it through with the forest-saw from the upper.

815. *Clipping* is an imperfect mode of cutting adapted for expedition and for small shoots. The separation is effected by bruising or crushing along with cutting, and, in consequence, both sections are fractured. In gardening it is chiefly applied for keeping hedges and edgings in shape; but the hedge-knife (*fig.* 38.), which operates by clean, rapid, draw-cuts given always from below, is generally preferable, as not decreasing the live ends of the amputated shoots.

The new pruning shears (*fig.* 45.), and the averuncator (*fig.* 44.), it is to be observed, by producing cuts much more like the draw-cuts of knives, are greatly to be preferred to the common hedge-shears.

In respect to the seasons for sawing, cutting, or clipping living trees, the best seem early in spring, and in midsummer. Early in autumn, trees are apt to bleed; later, and in winter, the section is liable to injury from the weather; but trees pruned early in spring remain only a short period before the wound begins to heal; and in those pruned at midsummer wounds heal immediately. There are, however, exceptions as to spring-pruning in evergreens, cherries and other gummiferous trees; and summer-pruning is but ill adapted for forest work or trees in crowded scenery.

816. *Splitting*, as an operation of gardening, is generally performed on roots of trees remaining in the soil, for the purpose of facilitating their eradication. The wedge in its simplest form, and of iron, is driven in by a hammer or mallet, till it produces fracture and separation, when the parts are removed as detached, &c.

817. *Mowing* is performed by the rapid motion of a very sharp wedge across the matters to be cut or mown, and at an oblique angle to them. In gardening it is applied to grassy surfaces, in order, by repeated amputations, to keep the plants short, spreading, and thick, and by always admitting light and air to the roots or stools, to render the surface green. This operation requiring great force, and also a twisting motion of the body, brings almost every muscle into action, and is, in fact, one of the most severe in vegetable culture.

Weeds in rivers and ponds are mown in the usual way from a boat, in which the operator stands, and is rowed forward by another, as required. Sometimes scythe-blades are tied or rivetted together, and worked by means of ropes like a saw from one shore to the other; but the first mode is generally reckoned the best, even in public canals, and is unquestionably so in gardening.

818. *Weeding* is the operation of drawing or digging out such plants from any given plot as are foreign to those cultivated there. In this sense every plant may become a weed relatively; but absolute or universal weeds are such as are cultivated in no depart-

ment of gardening, excepting in that purely botanical. Weeds are drawn out of the ground by the hand or by pincers (*fig.* 64.), or they are dug or forked out by weeding tools. Aquatic weeds are necessarily drawn up by pincers. The best season for weeding is after rain.

Chap. II.

Operations of Gardening in which Skill is more required than Strength.

The operations which we have enumerated in the foregoing chapter, may almost all be performed by the laborer without reference to any plan or design; but those which come next to be enumerated, require the end to be known and kept in view by the operator during the operation. Of this, even the simple operations of digging a drain to carry of water, planting in a row, or forming a bed of earth, may be mentioned as examples. Previously to proceeding to these operations, it becomes necessary to consider the subject of transferring designs from ground to paper, or to memory, and from paper or memory to ground; we shall then be prepared to treat of executing designs.

Sect. I. *Of transferring Designs from Ground to Paper or Memory.*

This subject is to be considered as part of a gardener's general education, since none, who aspire to any degree of eminence in their art, ought to be ignorant of the first principles of geometry, land-surveying, and drawing plans. We shall merely, therefore, touch on a few points with a view to assisting a gardener in bringing the knowledge he has so acquired into action.

A gardener may require to take plans of gardens, or parts of gardens, or of implements or buildings, for his own instruction, or to execute similar objects for his employer. It is as much requisite, therefore, that a gardener should be able to copy a garden, as a carpenter a gate or a roof.

819. The *dimensions of simple objects,* as of a bed of earth or dung, border or other plot, he may retain in memory, and transfer from memory to the imitation or copy; but in general he will require the assistance of graphic memoranda, either of the pen or pencil, or both. The instruments necessary for taking measurements and angles so as to transfer plans from the ground to paper, are the measuring-line or chain, the measuring-rod, and occasionally the theodolite; but for all ordinary purposes the chain and rod is sufficient.

820. The *simplest form* of surface plan to transfer from ground to paper is a circle; for here it is only necessary to find the diameter. The next is a parallelogram or bed, in which it is only requisite to take the length and breadth. Most of the details of the plans of kitchen gardens, may be reduced to parallelograms, so that they are transferred to paper, or even taken down arithmetically, as in the land-surveyor's field book, with great ease.

821. *Irregular figures,* as parterres, outlines of picturesque plantations (*fig.* 238.), or water; or the plans of winding walks, require greater nicety. In such cases, temporary or imaginary lines (*fig.* 238, *a, b, c,*), forming parts of regular figures, (as *d.* with *b. fig.* 238.) are first to be formed, or partially indicated around, or through the plot to be transferred; and dimensions are next to be taken relatively to those known, and simple lines or figures. Of all temporary or skeleton figures, the triangle is the most simple, the most correct, and the most generally used. The skeleton or temporary figure (*e*) or line (*a b,* &c.) being transferred to paper, the dimensions (*b*) are set off from it, and the irregular plot and all its details are thus correctly protracted.

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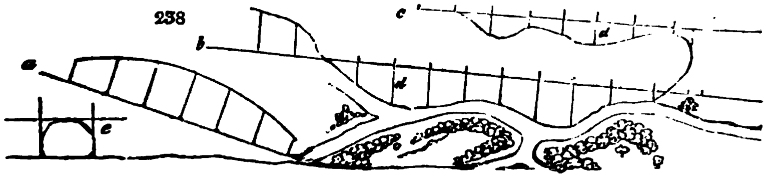
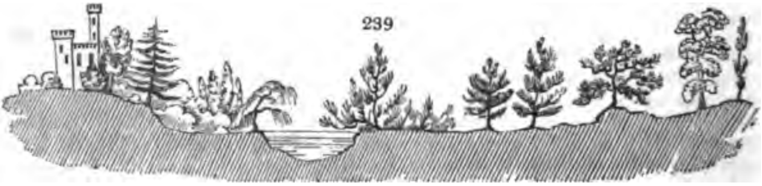


822. Thus far as to flat or simple surfaces; such as are *raised* or *depressed,* whether naturally or artificially, require a sort of double measurement; first, horizontally, by true horizontal lines, to get the surface plan; and next, to measure their elevations or depressions from these lines, in order to find their height or depth. Few gardens of any description are made perfectly flat; the borders of the kitchen departments generally

rise on each side of the walks; and in large parterres, one of the chief beauties arises from the inequalities of the surface. The depth of ponds, excavations for dung, earth, &c. ridges, hot-beds, rock-works, even houses, trees, &c. are all to be measured with reference both to their horizontal and perpendicular extensions. Four persons are required in performing such operations accurately; two to hold the chain or line in a horizontal position, or in the plane of the general surface; one to take the dimensions downwards or upwards from this with the measuring-rod, and one to mark down the dimensions.

In protracting elevations and depressions on paper, the simplest way is to introduce sections, in dotted or otherwise distinguished lines, to prevent their being mistaken for surface-lines; or in wavy surfaces, figures may be introduced, thus $\overline{4}$ or $\underline{4}$, to denote their elevation above, or depression below, some piece of water, or other surface fixed on as a medium. Where it is in contemplation to form pieces of water, the elevations and depressions or levels must be taken and recorded either by sections or arithmetically with the greatest accuracy; and, in some cases, sections may require to be taken to shew particular trees, buildings, the depth of water, or other objects, (*fig.* 239).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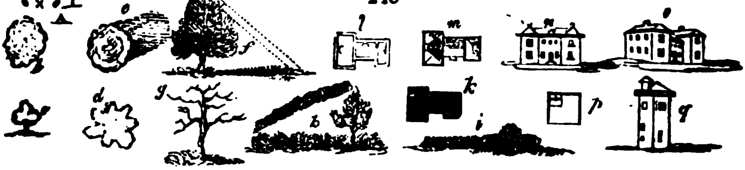
With respect to the elevation and shapes of hills and mountains which may lie within parks or plantations, they are only to be measured correctly by the quadrant and theodolite, in the hands of regular land-surveyors; and, therefore, are not considered as here included. Their shape and dimensions are laid down in maps in the same manner as those of smaller deviations from the flat surface.

Inaccessible dimensions of height, as of trees or buildings, are obtained by the quadrant, or by relative comparisons of shadows; of depth, as of water or wells, by rods; of breadth or length, by finding the two angles of a triangle whose base shall be in one extremity of the distance; and apex in the other. These, and many other equally simple problems in trigonometry, need not be enlarged on, because they must be supposed to form a part of general education.

In transferring plans of garden-scenery to paper, not only the mere ground-lines are to be transferred; but to form a complete plan, the distances between scattered trees or trees in rows, or otherwise regularly disposed, ought to be marked, the situations of their stems indicated, and, where they are of considerable size, representations of the horizontal extension of their heads (*b fig.* 240.) should also be given. The same ought to be done in the case of walls, buildings, and all other raised objects. The intention of a ground plan is to give an idea of the superstructure; and without such additions as these and others of a pictorial nature (*fig.* 240.), to the mere ground-lines, that idea must be very imperfect, at least in plans of mixed scenery.

Various modes have been adopted by land-surveyors for protracting rural objects; trees are sometimes shewn by small crosses or cyphers, triangles or dots (*a fig.* 240.);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by an orbiculate line representing the extension of the branches or head, and a dot in the place of the trunk (*a* and *c*); by the same, with the addition of a shadow, taken when the sun is south or south-west, and his elevation exactly 45°, by which the points of the compass are readily ascertained throughout the plan, and the shape of the head, and the height of the tree exhibited (*e*); sometimes an elevasion or profile of the tree is given, either in foliage (*f*), or to shew the form of the trunk and branches (*g*), or merely to give a rude idea of a tree (*c*). Hedge rows, whether with or without trees, are either shewn in elevation or profile (*h*), or in vertical profile or bird's-eye view (*i*). They may be delineated either in skeleton or foliage. Buildings may be shewn either in general plan (*k*), detailed plan (*l*), vertical profile of the roof (*m*), elevation (*n*), perspective view (*o*); or a plan may be given (*p*), and a diagonal elevation (*q*), taken and placed opposite the plan in the margin of the map. A pictorial surveyor, who understands perspective, and is desirous of conveying a correct idea of the subject he is to measure and delineate, will readily find expedients for attaining success.

823. Different modes have been adopted by modern land-surveyors for pourtraying the surfaces of landed estates. The first we shall mention is the old mode of giving what may be called the *ground lines only;* as of roads, fences, water-courses, situations of buildings and trees. (*fig.* 241.) This mode has no other pretensions than that of accuracy of dimensions, and can give few ideas to a stranger who has not seen the property, beside those of its contents and general outline.

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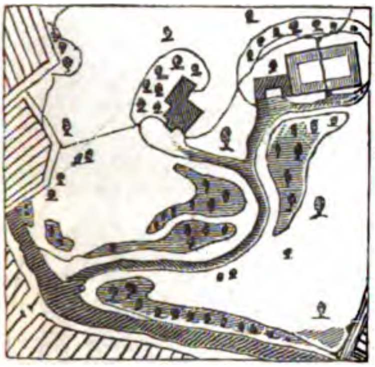

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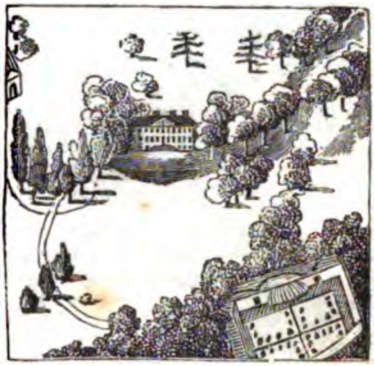

824. In the second, elevations of the objects are added to these lines; but which, in crowded parts, tends much to obscure them. (*fig.* 242.) This mode is perhaps the best calculated of any to give common observers a general notion of an estate; more especially if ably executed. Very frequently, however, this mode is attempted by artists ignorant of the first principles of drawing, optics, or perspective, and without taste.

825. In the third, a vertical profile, or geometrical bird's-eye view, (that is, a bird's-eye view in which all the objects are laid down to a scale,) is presented, in which

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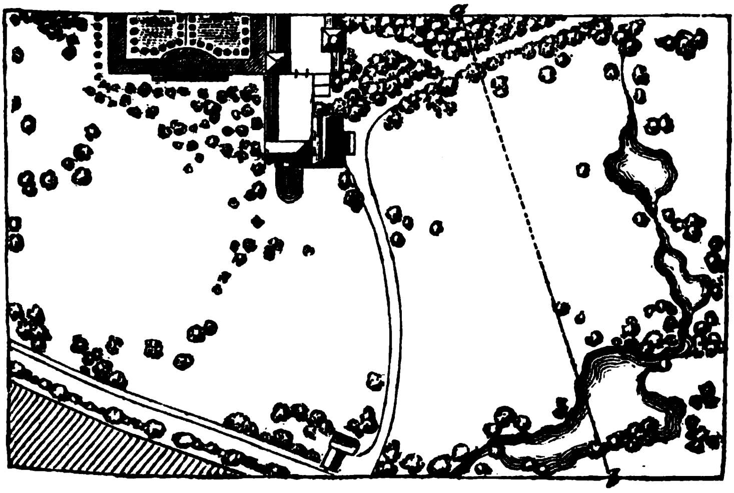

the upper surface of every object is seen exactly as it would appear to an eye considerably elevated above it, and looking centrically down on it. (*fig.* 243.) This mode, properly executed, is calculated to give a more accurate idea of the furniture or surface objects of an estate than any other; and if the declivities be correctly indicated, and the shade of the hollows and eminences be laid on with reference to some medium elevation, referred to or illustrated by sections (*a*...*b*), it will give an equally correct idea of the variations of the ground. In short, it is the best mode for most purposes, and is now coming into general use.

A very complete method of giving the plan of an estate in this way, is to include such a portion of the plans of the adjoining estates or country, as shall be contained within a circle of moderate extent (*fig.* 244.), the centre of which may be the centre of the demesne lands, family mansion, or prospect tower. Around a map so formed, the distant scenery, as seen from the roof of the house, or prospect tower, may form a panoramic circumference, or margin of prospects.

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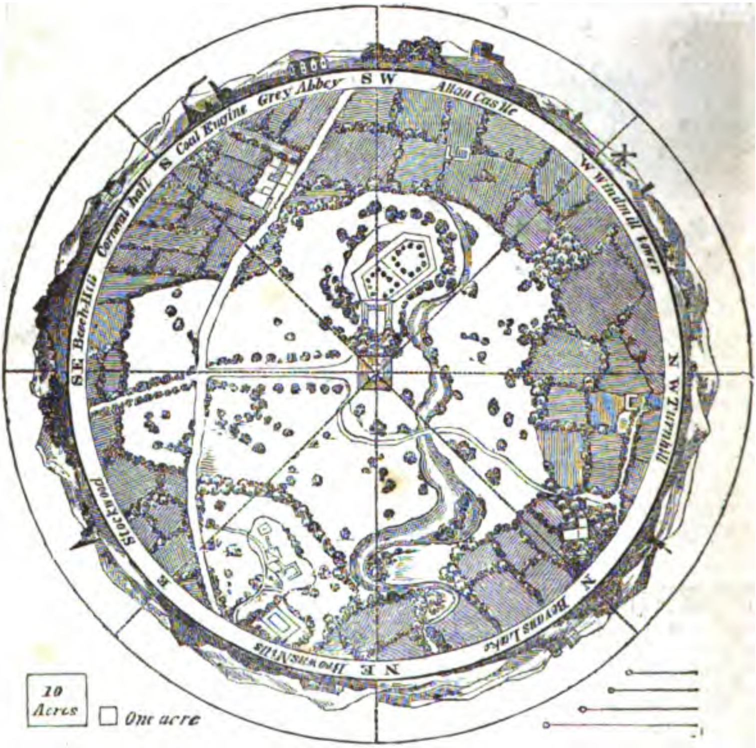

In all these modes, dimensions and contents are given or obtainable along with effect; in those which follow, effect or general appearance only is obtained.

826. The first delineation, the object of which is to give a general idea of the external appearance of an estate, is the *natural bird's-eye view*. In this the eye of the spectator is supposed to be considerably elevated above the centre of the estate, and all the objects are pourtrayed exactly as they would appear to him in that situation; largest in the centre, and gradually diminishing to the circumference of the circle of vision. In such a delineation, parts of other adjoining estates may often require to be included, in order to complete the circle; but these are necessary to the general idea, and can easily be distinguished from the principal property by minute marks on the delineation.

827. The next is the *panoramic view*, in which the delineator places himself on an eminence, the roof of the mansion, where centrical, is most desirable, and, looking round, delineates all that he sees on every side. Where there is a prominent hill, or

where the mansion is on an eminence, this is a very desirable mode of giving a general idea of a domain, and by the aid of horizontal lines and lines from the centre of vision; some idea may be had, on flat surfaces at least, of the relative heights and distances of objects.

828. The last mode is to give *a general view, or distant prospect* of the estate, or its principal parts (*fig.* 245.), as seen from some elevated conspicuous hill, building, or object near it; or if the estate, as is frequently the case, is situated on the side of a hill, or range of hills, a situation on the plain, or flat grounds opposite to it, will be sufficient.

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Great improvements have been made in the art of delineating estates by T. Hornor; an elegant and scientific chorometer and draughtsman. See his *Mode of Delineating Estates*, 8vo. 1813.

Sect. II. *Of transferring Designs from Paper or Memory to Ground.*

This is a subject requiring much greater skill than the last, on account of the inequalities and other obstructions met with on the ground's surface. It may be considered; 1, as to transferring figures to plane surfaces; 2, to irregular or obstructed surfaces; and 3, arranging quantities.

Subsect. 1. *Transferring Figures and Designs to plain Surfaces.*

The transferring of plain or regular figures to even ground is nothing more than performing the elementary problems of geometry on a large scale. The subject has been amply illustrated by Switzer, Le Blond, and other writers of their day; but a very few examples will here suffice, as the school education of gardeners is now superior to what it was in those times.

829. A *perpendicular* to any line may either be found by taking a garden line, doubling a portion of it, and applying the extremities at equal distances from the point whence the perpendicular is to proceed (*fig.* 246. *a*); or more simply, but on a large scale with less accuracy, by applying the garden square (*b*), or on any scale by the use of a rope or line united at the extremity, and divided in the proportions of 6, 8, and 10 (*c*). The 6 is to be placed as the perpendicular of a right-angled triangle, the 8 as the base, and the 10 as the hypothenuse; or three rods of similar proportions, or divided into feet, and the proper numbers taken, may be used for this purpose. Switzer informs us this was the mode in which all right-angled figures in gardens, and all other works, were set out in his time.

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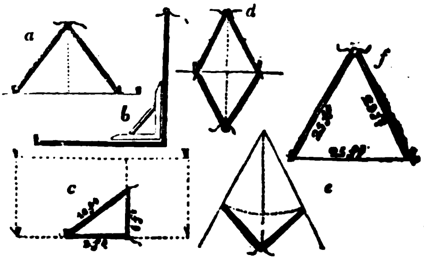

830. A line united at the extremities, and divided into four equal parts (*d*), may readily be so applied to any *angle* as to *divide it equally*; or the same thing may be done by a portion of line bisected, and its extremities applied at equal distances from the angle, (*e*).

831. A line divided into three equal parts readily forms an *equilateral triangle*, (*f*, *fig.* 246.).

832. To describe *an oval within a given length*, the length may be divided into three equal parts; then let the two inner points so found be the centres of two circles, which shall form the ends of the oval, and the sides may be formed by segments, whose centres are the intersecting points of the circles, (*a*, *fig.* 247.).

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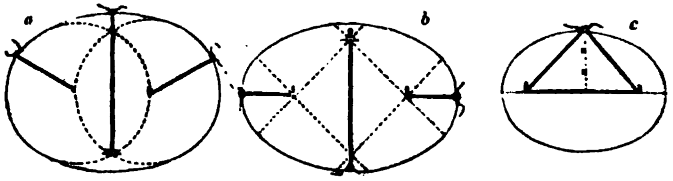

The same oval may be formed by dividing the given line into four parts; forming the ends by segments, of which the two outermost points are the centres, and the sides by segments, proceeding from a line passing at right angles through the centre of the given line, (*b*, *fig.* 247.).

833. *The gardener's oval*, or one in which both diameters are given, is thus formed. Bisect the long diameter by the transverse one, itself thus bisected by the other. Divide half the transverse diameter into three parts. Take one of these parts, and set it off from both extremities of the long diameter. Fix there two pins or stakes, and fix a third stake one part from the end of the transvere diameter; double a line and put it round these stakes, of such a length, that when stretched, it may touch the extremities of one of the diameters. Then, with a pin in this extremity, move it completely round, and so strike out the oval (*c*, *fig.* 247.).

The long and short diameters are more easily divided arithmetically; thus supposing the given length of the oval be ninety feet, and its width sixty feet; then the third part of half of the width is ten feet, and this distance set back from the extremities of the diameters, gives the situation of the stakes at once.

834. *A spiral line*, or volute, may be sometimes required in gardening, for laying out labyrinths or curious parterres. The width or diameter of the spiral being given, (I, H, *fig.* 248.) bisect it, and divide each half into as many parts as the spiral is to form revolutions, (G to H, *fig.* 248.) Then, from the centre draw all the halves of the spirals which are on one side of the diameter line, (BC, DE, FG, HI,); and from the point where the first semi-spiral intersects the diameter line (B), as a centre, draw all the others (DC, FE, HG, LI.)

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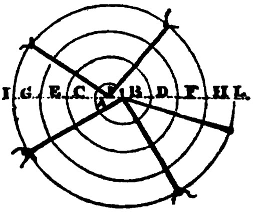

835. A very useful problem both in laying down plans on paper, and transferring them to gardening, is that which teaches how, *from any three points* (*a*, *b*, *c*, *fig.* 249.) *not in a straight line, to find the centre of a circle whose circumference shall pass through them.* Imagine the three points connected by two straight lines; bisect these lines by others (*g* and *e*,) perpendicular to them, and where these intersect (at *g*,) will be found the centre of the circle *whose circumference*, *&c.*

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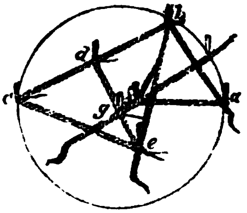

836. The method of laying out on even ground *polygons*, or any geometrical figure, will be perfectly simple to such as can perform the problems on paper; all the difference on the ground is, that the line is used instead of the compasses, with or without the assistance of the square and arithmetical calculation.

837. Laying out the ground-lines of *gardens*, *parterres*, or any large figures on plain surfaces, is merely a mixed application of geometrical problems. It is only necessary to premise, that a straight line is found by placing rods upright, so as they may range one behind the other at convenient distances, and so accurately adjusted, that the one next the eye may conceal all the rest.

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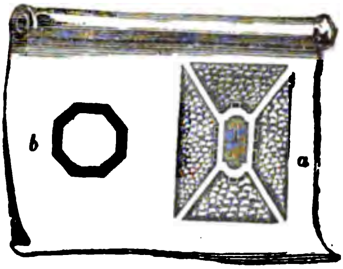

A plan of a garden, &c. (*a*, *fig.* 250.) being given with a scale and compass attached, first find its extreme dimensions, and supposing you have space sufficient for laying it out, find the central lines (*a*, *a*, *b*, *b*, *fig.* 251.) and lay them down first, distinguishing them by rows of stakes; then from these set off the lines of the central plot, if any, the walks, alleys, walls, &c., distinguishing them by strong stakes, which may remain till the ground is put into proper form.

838. In laying out *polygonal gardens*, or plots, or ponds, (*b*, *fig.* 250.) when the dimensions are too great for inscribing a circle of the full size with a line; the obvious mode is to form a small circle in the centre, and mark the figure on its circumference; then from the points where the sides intersect radii can be extended as far as required, and the length of one being found, the rest can be adjusted accordingly, and the plat thus laid out of the required size, (*fig.* 252.).

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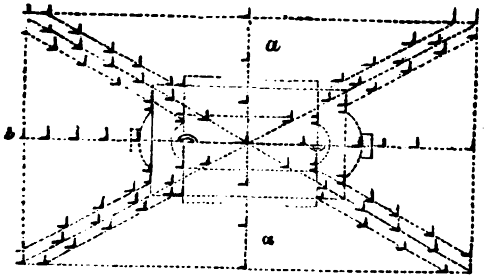

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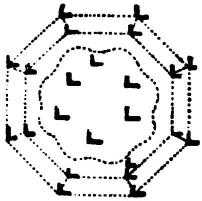
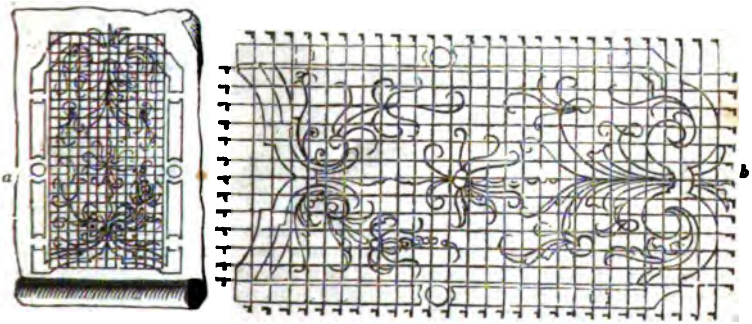


839. *Intricate and fanciful figures of parterres* are most correctly transferred to ground, as they are copied on paper, by covering the figure to be copied with squares (*a*, *fig.* 253.) formed by temporary lines intersecting each other at equal distances and right angles, by tracing on the ground similar squares, but

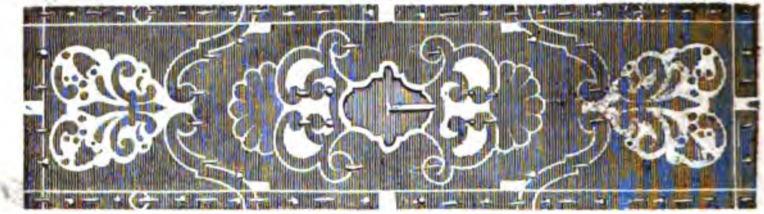
253



much larger, according to the scale, (*b*, *fig.* 253.). Sometimes the figure is drawn on paper in black, and the squares in red, while the squares on the ground are formed as sawyers mark the path of the saw in sawing up a log of timber; that is, by stretching cords rubbed with chalk, which, by being struck on the ground, (previously made perfectly smooth,) leave white lines. With the plan in one hand and a pointed rod in the other, the design is thus readily traced across these indications.

The French and Italians lay out their most curious parterres (*fig.* 254.) in this way.

254

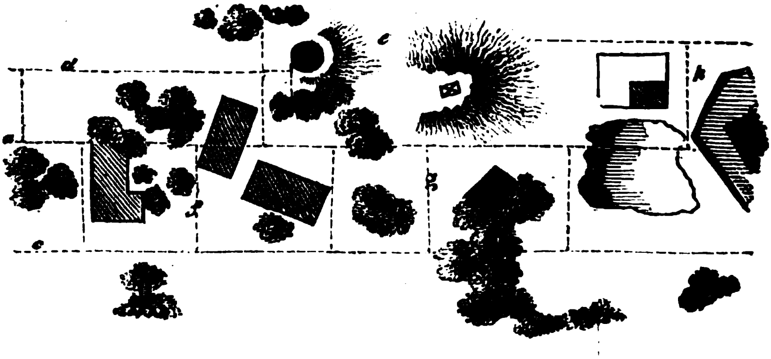


Subsect. 2. *Transferring Figures and Designs to irregular Surfaces.*

This constitutes the most difficult part of laying out new plans, whether in arranging grounds in the country, or streets, or other improvements in towns. These difficulties do not arise from the intricacy of the principles of action; but from the variety of operations often requisite to overcome the obstructions. They may be all classed under three heads, that of transferring a straight line, a curved line, and a level line.

840. Where a *straight line* is to be indicated among objects or inequalities not more than fifteen or twenty feet high, its plan or tract on the earth (*a ... b, fig.* 255.) may be found by the use of poles, a few feet higher than the elevation of the obstructions, the director being placed on a step-ladder, or other elevation at one end. Where this method cannot be adopted on account of the height of the inequalities, the line must either be formed along the summits of these inequalities, which may be done if they are houses, hills, or trees; or parallel lines (*c, d, e,*) formed where practicable, and the main line found by offsets (*f, g, h,*) from those collateral lines at such places as are suitable. A third method, but one not always perfectly accurate, is to take a plan of the field or scene of operations, and on this to set out the proposed line; then by ascertaining its bearings and distances relatively to the obstructions, it may be transferred from the paper to the ground. In carrying straight lines through woods, lanterns have been used; but a much more correct method is to elevate poles above the surface of the wood.

255



841. *Continuous lines* may always be made perfectly straight, however irregular the surface by following the same parallel as indicated by points of the compass; or by the shadow of the operator during sunshine. If the needle does not move, or the shadow of the spectator is always projected at the same angle to his course, the direction in which he walks, in either case, must be straight.

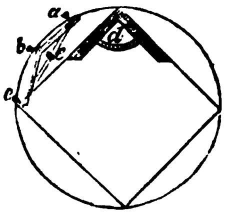
The mode of forming right-lines in such circumstances being understood, the formation of right-lined figures is merely a repetition of the process, uniting each side by the required angle.

842. *Curved lines* on irregular surfaces, are in general only to be laid down by the previous establishment of straight lines; first, leading straight lines, (*a, b, c, fig.* 238.) and next secondary straight lines, (*d, d, fig.* 238.), which shall form skeletons to the curves. A second mode, and, on a large scale by much the most certain, is to find the leading points of the curves, by triangles from a known base or known bases; but as both modes are rare in the practice of gardening, they need not be enlarged on.

Circles, ovals, and every description of curvilinear figure may be laid down by either of the above modes; but where the obstructions are not great, circles, or parts of circles, may be transferred more expeditiously by the following method.

The diameter of the circle (*fig.* 256.), and any two points (*a* and *c*) which its circumference is to touch, being given, next ascertain the side of the largest square which the circle will contain. Then, if the director place himself in the given point of the circumference, and look either through the sights of a theodolite, or along the edge of a common carpenter's square (*d*), or any right-angled board, the straight line traced by his eye will intersect the situation of the circumference of the circle; if he then causes to be measured along that straight line, the length of the side of the square contained within the circle, the extent of the dimension will determine a point in the circumference. Then looking along the other side of the square, or through the sights of the theodolite at right angles to the former observation, he will by a similar process determine another circumferential point; and now, by changing his position either to the right or left, taking care to set off always the same dimension from the side of the square, he will trace out the circumference of the circle, or any portion of it. It is evident to any person in the slightest degree acquainted with practical geometry, that the same object may be attained by an adjusted triangle (such as *e*), the extremities of which will indicate points in the circumference without farther trouble.

256



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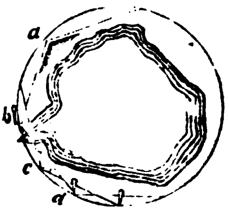
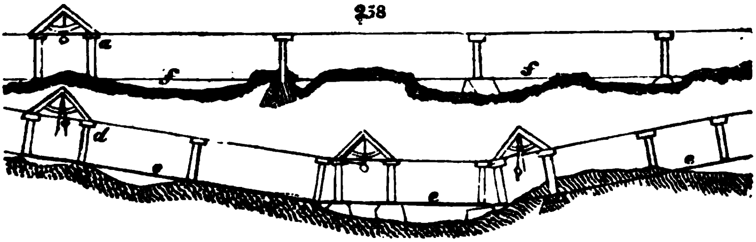


This, and other modes on similar principles, well known to land-surveyors, are occasionally resorted to in laying out gardens, especially in the geometric style, and in preparing the foundations of farmeries, and other rural offices and appendages. A very obvious application of it is that of reducing an irregular basin of water to a circular figure. The director moves round with the adjusted triangle (*a*, *fig.* 257.); his assistant sets off the dimensions, and as each point in the circumference is ascertained, it is marked by a stake (*b*, *c*, *d*).

843. A *level line*, (*fig.* 258. *f*, *f*,), whether straight or curved in direction, can only be determined on an irregular surface by measuring down from an elevated level line (*a*), or from level lines in parallel directions, and so transferring the points by horizontal levels to the proper line. Straight rods are the ready means of measuring down, and the points must be marked by hillocks or hollows (*b*); or by smooth-headed stakes driven into the surface, and protruding above, or sunk under it, according to the obstructions.

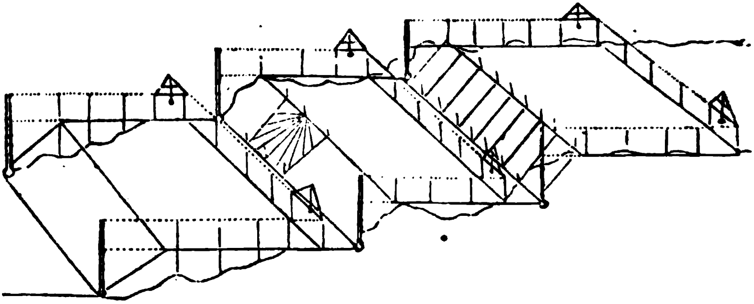
258



Lines of uniform declivity or acclivity (*fig.* 258. *e e e*) are readily formed on the same principle. In this and the former case, the common level and the borning-pieces (*a* and *d*), with measuring-rods and stakes, are all the instruments required. The formation of level lines and uniform slopes, by the borning-pieces and common level, ought to be familiar to every working-gardener; for, without considerable adroitness in this department of gardening operations, none can be considered as fit to form a walk, or even plant a box-edging.

Levelling for terrace slopes (*fig.* 259.), or for geometrical surfaces, however varied, is performed by the union of both modes, and requires no explanation to those who have acquired the rudiments of geometry, or understand what has been described.

259



Subsect. 3. *Of the Arrangement of Quantities.*

844. The *dividing and subdividing of lands* is generally the business of the land-surveyor, but it sometimes comes under the practice of the gardener, on a small scale, and on simple principles. Thus it may be required to determine the dimensions of a square, circle, of an oval, or of a mixed figure of a kitchen garden, which shall contain a certain number of acres, or acres, and parts of acres. Or, on a certain quarter in a garden of given breadth and length, it may be required to sow, or plant a certain number of poles of any given crop.

845. Where the figures are simple and regular, as squares, parallelograms, triangles, circles, &c. these problems are easily solved; but where they are irregular, the safest way for practical gardeners, not much in the habit of calculation, is by *trial and correction*

Thus, supposing it required to find the dimensions and ground-plan of a garden-wall, which shall enclose two acres, the north and south walls to be straight and parallel, and the two ends parts of elipses. Try a parallelogram, which shall contain $1\frac{3}{4}$ acres, and try and adjust two curves to its ends, which shall each contain $\frac{1}{8}$ of an acre. If an eighth of an acre does not give sufficiently curved ends, narrow the parallelogram part a little, which will admit an increase to the curved ends. All this being laid down on paper to a scale, when the figure is completed, ascertain its contents by the scale, and vary it as above, till it corresponds exactly with what is required.

For more intricate figures, first cover the paper with squares, each containing a certain area; say a yard, a pole, &c. according to the magnitude of the design to be adjusted. Then, on these squares adjust the form and the contents of the given figure, by alternate delineations of the desired shape, and numbering the squares for the desired contents. When the end appears to be attained, prove the whole by measuring from the scale.

846. With respect to *cropping quarters or borders*, supposing it is desired to sow three poles of turnips on a quarter 60 feet broad, then the first question is simply, given 60 feet as one side, required the length of another requisite to form a pole. A pole contains $30\frac{1}{4}$ square yards, or $273\frac{1}{4}$ square feet; dividing the last sum by 60, the quotient, 4 feet $6\frac{2}{3}$, is the length of one pole at this breadth. Or, if by links, then 60 feet = 136.2 links, and 625 square links = 1 square pole; hence 625 + 136.2 = $6\frac{2}{10}$ links. 3 × 4 feet $6\frac{2}{3}$ inches, or 3 × $6\frac{2}{10}$ links = 13 feet 8 inches, or 20 $\frac{1}{10}$ links, the length of three poles of the given breadth.

847. For arranging work done by contract, it is necessary for the gardener to be able to determine *the superficial and solid contents of ground*, whether it is to be cultivated on the surface as in digging or hoeing; turned over to a considerable depth as in digging drains, or trenching; or removed from its place, as in forming excavations for water or foundations. All this is abundantly simple, where the first rudiments of mensuration are understood. The most important part is what relates to digging out large excavations, and wheeling the earth to different distances; and to guide in this, the following rules, known to every canal contractor, may be worth attending to by the gardener.

In soft ground, where no other tool than the spade is necessary, a man will throw up a cubic yard of 27 solid feet in an hour, or 10 cubic yards in a day. But if picking or hacking be necessary, an additional man will be required; and very strong gravel will require two. The rates of a cubic yard, depending thus upon each circumstance, they will be in the ratio of the arithmetical numbers 1, 2, 3. If, therefore, the wages of a laborer be 2s. 6d. per day, the price of a yard will be 3d. for cutting only, 6d. for cutting and hacking, and 9d. when two hackers are necessary. In sandy ground, when wheeling is requisite, three men will be required to remove 30 cubic yards in a day, to the distance of 20 yards, two filling and one wheeling; but to remove the same quantity in a day, to any greater distance, an additional man will be required for every twenty yards.

To find the price of removing any number of cubic yards to any given distance:

Divide the distance in yards by 20, which gives the number of wheelers; add the two cutters to the quotient, and you will have the whole number employed; multiply the sum by the daily wages of a labourer, and the produce will be the price of 30 cubic yards.—Then, as 30 cubic yards is to the whole number, so is the price of 30 cubic yards to the cost of the whole.

Example.—What will it cost to remove 2750 cubic yards to the distance of 120 yards, a man's wages being three shillings per day? First $120 \div 20 = 6$, the number of wheelers; then $+ 2$ fillers $= 8$ men employed, which, at 3 shillings per day, gives 24 shillings as the price of 30 cubic yards; then $30 : 24 :: 2750$ and $24 \times 2750 \div 30 = 110l.$

For elementary instructions in this department, see Hutton's *Mensuration*. Nicholson's *Architectural Dictionary*, and the article *Canal*, in the principal Encyclopædias.

Sect. III. *Of carrying Designs into Execution.*

Projected alterations being marked out on the ground, the next thing is to realise them by the mechanical operations of gardening. These require to be directed to the following objects. Removing surface-incumbrances, smoothing surfaces, draining off superfluous water, forming excavations for retaining water, forming artificial surfaces, and forming walks and roads.

848. *Removing surface incumbrances* is one of the first operations of improvement in reclaiming neglected lands, or preparing them for ulterior purposes. The obstacles are generally large blocks of stone, bushes, roots of trees, and sometimes artificial obstacles, as parts of walls, hedges, buildings, &c. Where the stones cannot ultimately be rendered useful or ornamental near to where they lie, they are to be loosened by levers, and placed on sledges and dragged off; and to facilitate this, they may be previously blown in pieces by gunpowder. Or large pits may be dug, and they may be buried near to where they lie. The other obstacles are easily got rid of; large roots may be split with wedges; reft with gunpowder, and drawn out by wrenches; or, the hydrostatic press applied, as for drawing piles. The use of gunpowder was formerly often attended with accidents to the operators; but the risk is now greatly lessened, since it has been discovered that sand may be poured in, instead of ramming clay and stoney matters over the charge. See *Suppl. Encyc. Brit.* art. *Blasting*.

849. *Smoothing surfaces.* Whatever be the nature of the future improvements, this operation generally takes place to a certain extent after the removal of obstacles. Pits, quarries, pools, &c. are to be filled up; banks, dykes, artificial mounds, and excrescences, to be broken down and scattered about, before the natural surface can be duly understood and appreciated, and before drains and other preliminary improvements, as roads, fences, &c., can be conveniently marked out.

850. *Drawing off superfluous water by subterraneous drains.* The theory of this subject has been already noticed (569.), and as it more properly belongs to agriculture than gardening, we shall confine our remarks to execution. The designer or director of the improvements, having, by the aid of levelling, and consideration of the causes of the superfluous moisture, marked out by proper stakes the main drain and lateral cuts, the lowest point or outlet of the former is first to be begun on, and excavated to the proper width and depth. If the soil is very soft, the materials for filling in, or forming the channel, or drain, should have been previously carted there, as this operation, performed on soft ground after the excavation is made, is apt to damage the sides of the drain. No part of the drain ought to be filled, till the whole has been completed, and any errors in the level of its bottom or water-way corrected. The height to which the materials are to be laid, must be regulated by the use to which the surface is to be applied. For permanent pastures, as in lawns and parks, they may be brought near the surface, but in kitchen-gardens, or scenery where digging or trenching are occasionally to take place, they should not come within six inches of the bottom of the loosened strata. As to materials for drains, whatever will form a porous, or hollow stratum, or vein, may be employed; but round stones are unquestionably the most durable for collecting drains; and tubes of earthenware, or built drains of stone or bricks, for drains of conveyance. The most complete description of master drain, is one with a built cylinder or barrel of stone or brick below, covered by a vein or vertical stratum of round stones, terminating near the surface in coarse gravel. Wherever much draining is to be done, all the various methods should be considered as detailed in the county surveys, and collected in Marshall's "Treatise on Landed Property," and Johnston's "System of Draining;" and those fixed on which may be considered as most suitable to the particular case.

851. *Drawing off superfluous water by surface drains* is seldom admissible with good effect in garden scenery. Ridges, whether broad or narrow, communicate a vulgar field-like character to parks or lawns; and large open gutters are only ditches. Perhaps the least objectionable mode is to use the mole-plough, or to form underground gutters with the spade on a similar principle. The blade of the spade should be in the form of the letter *V*, rather blunt at the point, and as each spitful is dug out, half its lower part is to be cut off, and the upper part returned to the gutter, so that no external deformity is produced. Such drains, as well as the channels made by the mole-plough, require to be renewed every three or four years, especially if cattle and horses are admitted on the grounds in winter. Hence, many use straw or small faggot wood to fill the gutters as in Norfolk, or flints as in Kent, gravel as in Berkshire, or cinders, and scoriæ, as in some parts of Lancashire.

852. *Forming excavations for retaining water.* Previously to commencing this operation, the levels must be staked out with great accuracy, as well as the places indicated to which the larger masses of earth are to be moved from and taken to. Excavations for water vary in respect to the difficulties and manner of execution, according as they may be intended for running or stagnated water; for water already existing on the spot, or to be brought there, or according to the nature of the soil and surface.

For *running water* more depends on the design than on the execution; for a current, if well directed, will, in a short time, form a suitable bed and banks for itself; but for *stagnated* water all depends on art, both in the design of the shape and the execution of the bed and margin. Water already existing in a body on the spot generally implies a suitableness of soil for retaining it, and the existence of springs for an increased supply, and these serve as useful guides in the course of execution: but where water is to be brought to a situation, it generally implies an unsuitableness both of soil and surface to retain it, and hence requires the greatest attention in the application of art, both as to design and execution. The most suitable surface for water is a hollow or level, and the best soil a clay or strong loam.

In all these cases the executive part reduces itself to three operations; the removal and disposal of the earth, the formation of the bed and margin, and the formation of the dam or head and sluice.

853. In the *removal and disposal of the earth*, regard should be had to preserve the best soil for what is to be future surface; and, in poor lands, it may often be advisable to dig or pare off the surface of the spots to be covered by the excavated earth, and preserve them for the same purpose. Where the new soil is to be thinly scattered over the old, fallowing, trenching, or digging, may effect the proper mixture. When large masses of new earth are to be laid down, that of worse quality must be farthest removed from the probable reach of the roots of future trees; or, if the roots of trees will penetrate the whole mass, then the whole soil should be mixed. Gravelly materials should be kept at such a distance from the margin of the water, as not to act as a drain from it; and, in forming the mass of earth requisite at most dams or heads, the less gravel or porous matter used alone, the more compact and retentive will be the head. In every mode in which excavated earth is disposed of, care is requisite to blend its outlines with those already existing, so as to avoid all appearance of patches laid on, bumps, warts, or excrescences, than which nothing is more disagreeable in surfaces.

854. In the *formation of the bed*, where the excavation has been made in a level surface, no farther attention is requisite than attending to the depths indicated in the design, which will generally be greatest towards the middle, and diminishing to the sides, as in nature. Few pieces of water require to be deeper in the middle than ten feet, which will generally deter cattle from wading across them, and prove unfavourable for the growth of most aquatic plants. Where water is formed by damming up, or throwing a head across a hollow, of which, perhaps, the most notable instance on record is that of Blenheim, the bottom does not require any attention, excepting adjoining the head; the mass of materials forming which should form an inclined plane under the body of water for the sake of securing the head; and to prevent the water from penetrating into this mass of materials, its surface should be regularly clayed or puddled over, as well as a part of the firm ground on all sides, and even in the bottom of the excavation. For if this firm ground is of a sandy or gravelly nature, the water may, by entering it, find its way to the mass of new and not yet consolidated earthy matters, and by softening them, speedily ruin the whole mound or head. A safe mode is to leave the head to consolidate for a year or more before filling with water. This was Brown's practice at Blenheim, Harewood-hall, and other places.

When water is formed on the side of a hill, the lower part of the excavation must be raised and clayed with equal care, as in the case of the head or dam, and for the same reasons. It is almost needless to mention, that claying must never be omitted where the bottom or sides are either newly formed, or not naturally retentive of water. Where clay cannot be had, loamy, or calcareous, and even somewhat sandy earth, by abundant working, becomes retentive of water. — This the celebrated engineer Brindley first discovered and practised.

The *margin* of all water, where nature is imitated, ought, as much as possible, to be formed of stony or gravelly materials, as most likely to give a dry appearance quite to the edge of the water, to admit of walking there, of cattle drinking without poaching and bemiring themselves, and to prevent the growth of such grasses and aquatics as communicate a morassy or marshy appearance; and finally, as being more natural and picturesque than banks of mud.

For this purpose, during the excavation, all, or a suitable quantity of such gravelly or stony materials as occur, should be reserved for depositing along the margin, for at least one yard beyond the edge of the water, and two yards down the slope of the bed. If suitable materials are not to be had from the excavation, they should be procured; for without them there can be but little beauty in the margins, at least of stagnated water.

The margins of rivers may be left in a great degree to nature, watching every proper opportunity after floods or winds, to heighten indications of picturesque effects, not materially inconsistent with local character and utility.

855. In the *formation of the head*, or dam, (*d*, *fig.* 260.) the points requiring particular attention are the claying, and the forming the sluice or valve for emptying the pond. Claying should either be performed over the whole of the inner surface of the head, or by a perpendicular stratum of clay in the middle of the bank. The last mode is the most simple of execution; but if the great body of loose materials are of a sandy or porous nature, the former will be found the safest; either, however, well executed, will suffice; and, in this point of practice, execution is certainly of more consequence than design.

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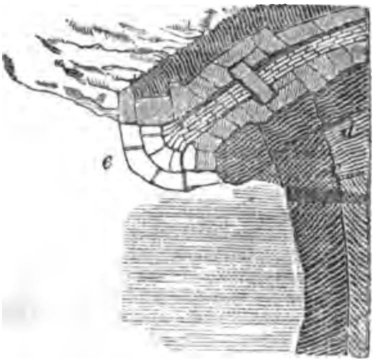

856. The *Sluice* is the stopper or valve to a drain (*e*, *fig.* 260.), carried through the bank of a piece of artificial water at the lowest part of its bed, in order to be able to empty it at pleasure. It is formed of a plate of boards, generally two or thee feet wide, and six or eight feet high, attached to a stalk, and worked by means of a pinion and ratchet in a frame of timber. The sluice is built vertically into the drain as a damper is into a flue, and the length of the stalk and frame is always such as to reach somewhat above the ground's surface for conveniency of working. The grand object as to the sluice is to construct it so as to admit the least possible escape of water. This will generally be best attained by forming the tunnel, in which the sluice is to be built, in the solid ground at the side of the head, and not in the new and loose earth, building it of masonry or brick set in cement, claying it completely on all sides, and fitting in the sluice with the greatest nicety.

As it is practically impossible to form sluices and drains that do not lose more or less water, owing to the great pressure of the volume in the lake or pond, it is better, where the supply is very limited, to have no drain or sluice, and to draw off the water, when required, by a large syphon, which may easily be formed of boards; or a drain may be formed, and, instead of a sluice, a well of clay adopted as a stopper. The power of drawing off the water is seldom used, and, unless in fish-ponds, or where frequent clearing is necessary, sluices are of little use.

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The superfluous water which escapes over the head, when abundant, may form a cascade or waterfall; but where the waste is small, it may escape at one side (*a*, *fig.* 261.) as a small gurgling rill over a bed formed of well-worked clay, to prevent its working out hollows, and covered by gravel, stones, &c. to give it a clear and natural-like appearance. As the head is generally a straight mound, destitute of natural beauty, it should be disguised by small islands (*b, c, fig.* 261.), or varied by planting on the margin, or both; but as our present business is merely to describe the operations requisite to the formation of pieces of water, we must refer, for what concerns it as a material of landscape, to *Landscape Gardening*, (Part III.).

857. *Surfaces, to imitate nature*, such as hills, knolls, and all the variety of raised surfaces in pleasure-grounds, are formed by heaping up materials in the indicated shapes; and hollows, of equal variety, by hollowing them out; in both cases, studying to keep the best earth at the surface, and so to blend the forms with those to which they are united, that no line of demarcation may ever afterwards be discoverable.

858. *Surfaces avowedly artificial*, as levels, terraces, slopes, banks, beds of earth, or dung-beds, being once distinctly marked out, are executed with equal facility and greater certainty of attaining the end or effect. Formerly the geometric style of gardening afforded an ample field for the exercise of this class of operations; but at present they are chiefly confined to the kitchen-garden, the scites of buildings, and a limited space around the mansion. Whatever may be the surface destined for a court or square of buildings, as a stable-yard or farmery, it must be reduced to a plane or planes connected in such a way as not to interfere with utility or effect. It is not essential that the surface be formed to a perfect level, or to any one slope, but that order and connection should enter into the choice of the slopes, whatever that may be.

In kitchen-gardens it sometimes happens that a level, or one general slope, may be adopted; but much more frequently that different slopes enter into the composition of the inclosed surface. These subordinate planes or surfaces are all so connected as to balance, and harmonize, and present to the intelligent eye a work, not of chance, but of design and reflection. In a seemingly level garden, it often happens that not one of the quarters are level; but each quarter of itself forms one plane, diverging from the centre, north wall, or some other point of the garden, and terminating on the same level, at the extreme corners of the quarters, or at the lower extremity of the garden. Besides these means, the formation of raised borders, and the furniture of gardens, such as espaliers, bushes, &c., enable the designer to harmonise forms and surfaces seemingly the most incongruous and unsuitable for a scene of culture.

There are two modes of reducing an irregular surface to one plane. The first is by taking sections of the surface in parallel lines at every ten or twenty feet distance, according as the surface may be more or less irregular; laying down these sections on paper geometrically, and from the whole finding a mean section. The stakes of all the parallel lines of levels still remaining in the ground, it will be easy to transfer the mean section by raising these stakes in some places, and lowering them in others, as the scale of the diagram will direct.

The second and more general mode is by approximation, or trial and correction, which, in all ordinary cases, is sufficiently correct. Suppose an irregular surface, 100 feet square, is to be reduced to a level or plane. The degree of slope is first ascertained (by the American or any other level) from the highest side of the square to the lower, and it is found, we shall suppose, that the ground will not easily reduce to a horizontal surface. It is, therefore, determined to reduce it to a slope; and for this purpose a certain height is determined on by the eye for the extremities of the slope; in fixing on which, the object is to adjust the slope to the earth, so as the former may be completed without exterior aid or superfluity. Supposing the lower side of the plot to be twenty-five inches below the level of the upper side, then the fall is a quarter of an inch in each foot, and a few lines of stakes can be run across the ground in the direction of the slope, with their tops adjusted to this declivity. Or this may be omitted, and the same end attained by borning-pieces used after the ground has been roughly levelled. But this is one, among many parts of the business of a gardener, which can more readily be acquired by practice than verbal instruction.

859. *Walks* are spaces in gardens formed for the purposes of inspecting the garden, recreation, and carrying on the operations of gardening. As one grand requisite is, that they should always be dry, the bottom of the walk in most cases forms a drain. There are three descriptions of walks common to gardens, those of *gravel*, *sand*, and *grass*.

All walks consist of two parts, their substrata and surface covering. The substratum is generally placed in an excavation, the section of which is a segment of a circle, or an inverted pointed arch, being deepest in the centre, where, in wet soils or situations, a notch or drain is often formed to carry off the water which oozes from the sides of the bottom, or sinks through the gravel. In all ordinary cases, however, the water will run off without this notch, provided the general levels of the bottoms of the walks, or the drains which cross them, or lead from them, be contrived accordingly. The foundation of the walks is to be filled with stones, the largest at bottom; or with rubbish of old buildings, flints, or any other similar materials, observing always to place the smallest at top. When this is done, before the covering of gravel or sand, or turf is laid on, the substratum should be well rolled, so as it may never afterwards vary its position, either with the weight of the covering, or any weight which may pass over it.

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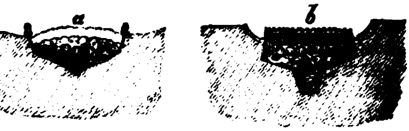

The covering of *gravel* (*a*, *fig.* 262.) need seldom be thicker than six inches, and generally four inches will be sufficient. That this gravel may bind in so thin a stratum, it is requisite that it be free from larger stones than those the size of a pigeon's egg, that the general size be that of large gooseberries or plums, and that there be about a sixth part of rusty sandy matter to promote its binding. The choice of gravel is seldom within the power of the gardener; but, in general, pit-gravel is to be preferred to river gravel, as binding better, and having a better color. Gravel abounding in oxyde of iron, if laid down where it is finally to remain, when newly taken out of the pit, and well-watered and rolled, will often bind into one compact body like what is called pudding-stone. Such gravels, however, are seldom well coloured. The best in this respect in England, and also a good gravel for binding, is the gravel of Kensington, to which good qualities it adds that of being the most beautiful in the world.

There are some very agreeable sea-gravels, formed chiefly of small shells, or fragments of larger ones. The way to make a handsome walk with this gravel is to mix it with about a tenth part of a mixture, consisting of equal parts of brick-dust and puzzolana earth or Roman cement. This done, and the gravel laid down in a wet state, and well rolled, it will form a surface like that of shell marble.

Where a covering of *sand* is adopted, its thickness must depend on its qualities, and whether sand is taken from preference or necessity. When sand is taken from preference, the intention is to produce soft walks, which shall yield to the feet like turf, in which case its thickness may be from three to six inches; but if sand is used because gravel cannot be procured, then little more should be laid on than what is sufficient to fill up the interstices of the upper surface of the substrata. Sometimes an attempt is made to bind such sand, by mixing it with dried clay in a state of powder, or with the scrapings of stone roads, and then watering and rolling; but it is not often that this succeeds; and it may certainly be considered as unfortunate where the best walks about a residence are covered with sand.

The covering of *turf* and *earth* (*b*, *fig.* 262.) should not be less than six inches in thickness, that there may be sufficient pasturage and moisture for the roots of the grasses in the dry season. For this purpose, the soil laid under the turf should be a medium between a stiff clayey and a loose sandy soil, so as more completely to serve as a sponge than either.

860. The *form of the surface* of gravel, sand, and grass walks, should almost always be flat; or, in the case of gravel, gently raised in the middle, so as to throw the water towards the sides, in approaching which it may sink gently into the substrata. But in turf-walks this should never be attempted; as it is desirable, on account of equally watering the plants, and retaining an equal firmness throughout their surface, that the water should sink in where it falls. It is a common practice to form turf-walks of solid earth, without any regard to the substrata; and this succeeds very well in dry soils, and where such walks are little used, excepting in summer; but whenever turf-walks are to be in constant use, the above is much the best way of forming them. Gravel and sand have, in like manner, been laid on the surface of the soil in small gardens, and in very dry subsoils, and where this can be done with the attainment of the desired objects, it has this advantage, that the roots of trees may range under the walks, as indeed always happens in shrubberies and plantations. The scoriæ of metals, coal-ashes, the refuse of mines and glass-works, and other similar matters, are often used instead of gravel; but their color seldom harmonises well with that of vegetation.

The *breadth of walks* generally depends on the extent or scale of the whole residence, and not of the particular garden or scene, which may be small, and yet connected with greater. They should never be narrower than is sufficient to allow a party of two to walk abreast, the minimum breadth for which is four feet six inches; but they may be large enough for a party of half a dozen, or in public walks, or walks in extensive pleasure grounds, avenues, &c., for one or two dozen. For the latter number thirty-six feet suffices. The *direction of* walks depends on their particular use, and connection with the different scenes or subjects of gardening.

Alleys are smaller walks generally covered with a thin coat of sand, gravel, or shells. In parterres they are sometimes of various widths, to suit the particular forms which constitute the design; and there also they are sometimes covered with different sorts of gravels, shells, scoriæ, &c., or paved with flints, pebbles, &c.; but the alleys of separation, in walled gardens, are generally two feet wide, and formed in right lines, parallel to the main walks, or borders. Sometimes they are not gravelled, and at other times they are covered with road grit, or the scrapings of roads; which, of course, is to be considered as the powder of the material of which the road is made, mixed with vegetable matter from the droppings of horses and cattle, and is considered as well adapted for binding or forming a compact surface.

861. *Roads* are walks on a large scale; they are formed on the same general plan; but when of fifteen or twenty feet in breadth, and on a wet or retentive soil, they have generally a drain on each side instead of one in the centre. On the sides of slopes, where, during heavy rains, these roads intercept the water from the upper grounds, they should have frequent gratings, or pierced stones, communicating with the drains on the upper side, (*fig.* 263.) unless provision is made for intercepting the water before it comes on the gravel, by a gentle hollow (*a*,) running parallel and close to the road, and communicating in like manner with the drains.

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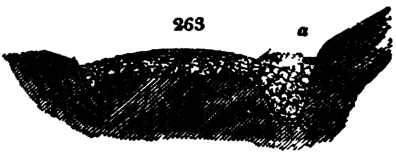

862. Roads and walks should be calculated to *resist the action of animals* walking on them, of machines being rolled over them, of weather, and of vegetation. A dry, firm substratum is necessary for all these purposes; and this, as already observed, is to be obtained by draining either in the centre or in the sides, and by a stratum of rough stones, the largest in walks, of two or three pounds each; and in roads, of six or eight pounds; in both cases covered with smaller stones, only a size or degree larger than the stratum of gravel. For resisting animals, a degree of compactness, solidity, and homogeneous texture of surface is requisite, according to the weight of the animals and their burdens, and the area of their feet. Thus, supposing a man to weigh seven hundred weight, and to carry a load of two hundred weight, and the area of one of his feet to be twenty-five inches, then the walk or road will require to bear at least forty pounds per square inch, and so on.

But an animal not only presses vertically on a walk or road, but his feet, the foot of man singly, and of quadrupeds relatively to each other, acting as levers of the third kind, have a tendency to force up and derange the materials under the point of the foot in the action of walking, in the same way as the lower end of a ladder, when rearing up against a wall, has a tendency to press into and derange that part of the ground which acts as a fulcrum. Hence an additional reason for firmness of surface, and also for using small materials; for if the end of a ladder, or the extremity of the foot, or any point of pressure, were to exert itself on one end or extremity of a stone, it would act as a weight on the end of a lever; and, depressing one end and raising the other end, would derange at once the substratum and the surface. During rain, or when the surface of the road was moist, this operation would go on in at least a duplicate ratio.

Whatever may be the weight of a four-wheeled carriage or waggon, it presses on the road on four points only, whose united areas seldom exceed one foot; hence the necessity of firmness, and also of materials reduced to a size, whose areas are less than the separate areas of the four pressing points, in order to prevent derangement from leverage or compound action. This subject has been ably illustrated by R. L. Edgeworth, and practically exemplified, to a great and beneficial extent, by J. L. M'Adam, (*Rules for repairing Roads, &c.* 1818.) and bids fair to effect an entire change in the system of public road-making followed in this country.

863. To *resist weather*, the grand object is to get rid of superfluous water; subterraneous sources are to be cut off by drains, and surface-water is not to be allowed to sink into the road, but the surface gently raised, and rendered and kept, by rolling and continual obliterating foot or machine marks, so smooth and impervious, as to throw the water entirely to the sides. By this means, the effects of frost, heavy carriages, and narrow wheels, is greatly lessened.

Vegetation will seldom be found very troublesome on a well-used walk or road; but firmness is useful even in this point of view, and also the exclusion of vegetable earths from the gravels or other materials used in forming the surfaces of garden-walks and approach-roads.

Chap. III.

Scientific Processes and Operations.

Under this chapter are included the master operations of gardening as an art of culture. These operations are all mechanical; but some depend, for their beneficial result, on chemical changes, as in the preparation of composts and manures; others depend on the prevention of chemical changes, as in the preserving and keeping of fruits and roots; some on imitations of climates, as in the management of hot-houses; but the greater number are dependant on the laws of vegetable life, as in the operations of propagation, rearing, accelerating, and retarding vegetables. Other processes to be treated of are of a mixed nature, and some depend on the laws of animal life, as in the operations for destroying vermin and insects.

Sect. I. *Preparation of fermenting Substances for Hot-beds, Manures, and Composts.*

864. The *fermenting substances used in forming hot-beds* are stable litter or dung in a recent or fresh state, tanners' bark, leaves of trees, grass, and the herbaceous parts of plants generally.

Stable dung is in the most general use for forming hot-beds, which are masses of this dung after it has undergone its most violent fermentation. These masses are generally in the form of solid parallelograms of magnitude proportioned to the frames which are to be placed on them, the degree of heat required, and the season of the year in which they are formed.

865. *Tanners' bark* is only preferred to dung because the substance which undergoes the process of putrid fermentation requires longer time to decay. Hence it is found useful in the bark-pits of hot-houses, as requiring to be seldomer moved or renewed than dung, or any other known fermentable substance that can be procured in equal quantity.

866. *Leaves*, and especially oak leaves, come the nearest to bark, and have the additional advantage, that when perfectly rotten like dung, they form a rich mould or excellent manure; whereas rotten tanners' bark is found rather injurious than useful to vegetation, unless well mixed with lime and earth.

867. The object of *preparation* in these three substances being to get rid of the violent heat which is produced when the fermentation is most powerful; it is obvious that preparation must consist in facilitating the process. For this purpose, a certain degree of moisture and air in the fermenting bodies are requisite; and hence the business of the gardener is to turn them over frequently, and apply water when the process appears impeded for want of it, and exclude rain when it seems chilled and impeded by too much water. Recent stable-dung generally requires to lie a month in ridges or beds, and be turned over in that time thrice before it is fit for cucumber-beds of the common construction; but for M'Phail's hot-beds, or for linings, or for frames with moveable bottoms, three weeks, a fortnight, or less, will suffice; or no time at all need be given, but the dung formed at once into linings. Tan and leaves require in general a month; but much depends on the state of the weather, and the season of the year. Fermentation is always most rapid in summer; and if the materials are spread abroad during frost, it is totally impeded.

In winter, the process of preparation generally goes on under the back-sheds; which situation is also the best in summer, as full exposure to the sun and wind dries too much the exterior surface; but where sheds cannot be had, it will go on very well in the open air. A great deal of heat is undoubtedly lost in the process of fermentation; and some cultivators have recently devised plans to turn it to some account, by fermenting dung in vineries, which are just beginning to be forced, or in vaults under pine-pits or plant-stoves.

The latter mode seems one of the best in point of economy, and is capable of being turned to considerable advantage where common dung-beds are extensively used; but the most economical plan of any seems to be that of employing only M'Phail's pits, or such as are constructed on similar principles.

868. The *formation of dung-beds* is effected, by first marking out the dimensions of the plan, which should be six inches wider on all sides than that of the frame to be placed over it, and then, by successive layers of dung laid on by the fork, raising it to the desired height, pressing it gently and equally throughout.

In general, such beds are formed on a level surface; but T. A. Knight's plan (*fig.* 264.) is to form a surface of earth as a basis, which shall incline to the horizon to the extent of fifteen degrees; on this he forms the dung-bed to the same inclination;

and, finally, the frame, when placed on such a bed, if, as is usual, it be deepest behind, will present its glass at an angle of twenty degrees instead of six or eight, which is undoubtedly of great advantage in the winter season. This seems a very desirable improvement where light is an object, which it must be, in a high degree, in the case of the culture of cucumbers and melons, as well as in forcing flowers.

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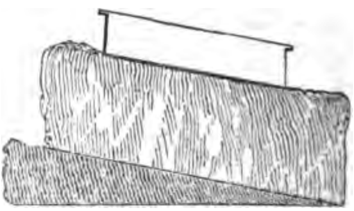

869. *Ashes* are often mixed with the dung of hot-beds, and are supposed to promote the steadiness and duration of their heat; and at first to revive it, if somewhat decayed. Tan and leaves have also been used for the same purpose; and it is generally found that about one-third of tan and two-thirds of dung will form a more durable and less violent heat than a bed wholly of dung. The heat of dung-beds is revived by linings or collateral and surrounding walls or banks of fresh dung, the old dung of the bed being previously cut down close to the frame. These linings, as before observed, require less preparation than the dung for the beds. The dung-bed being formed, and having stood two or three days with the frame and lights placed over it to protect it from rain, is next to be covered with earth, of quality and in quantity according to the purpose to which it is to be applied. In severe weather, the sides of the bed are often protected by bundles of straw or faggots, which tend to prevent the escape of the heat.

870. *Collecting and forming composts for manure* is an essential part of the economy of the garden, no less than of the farm. The following judicious observations on this subject, by Bishop, merit attention.

"Without enumerating the various means that, with careful economy, may be used for increasng the stock of garden manure, such as collecting the urine of animals, chamber-lye, soap-suds, or mixing fresh soils of opposite qualities, I shall confine myself to a plain statement of a method I have practised for these several years past with much success.

"Situated the same as many others, to whom the produce of the stable-yard is the only allowance of dung that can conveniently be allotted for the garden, which, although every way advantageous for hot-beds, and other purposes of forcing, yet, to use it as a manure for garden crops, without having its qualities altered by fermentation, or blended with substances of a heavier nature, would, in many cases, be more injurious than beneficial; I therefore, during the summer and autumn, have all the offals in the garden, such as weeds, leaves of strawberries and other vegetables, short grass, peas and asparagus haulm, with the foliage of trees and shrubs when newly shed, carefully collected into a heap. These are all turned over and mixed during the winter, that they may be sufficiently rotted to mix with the dung against the end of summer. I have also another heap formed with the prunings from gooseberry and currant bushes, fruit-trees, raspberry-shoots, clippings of box-edgings, and loppings from shrubs; also the roots of greens and cabbages; which are generally burnt at two different periods in the year, viz. in spring and autumn; but previous to each burning, I endeavour to pare up all the coarse grasses around the garden, with a portion of the soil adhering thereto, and whenever these are sufficiently dried, have them collected to the heap intended to be burnt. The fire is kindled at a convenient distance from the heaps, and a portion of such as burn most easily is first applied, until the fire hath gained a considerable power. After this, the process of burning is continued, by applying lighter and heavier substances alternately, that the one may preserve the action of the fire, and the other prevent it from reducing them too much to ashes. When the whole are thus consumed, a quantity of mould is thrown over the heap to prevent the fire from breaking through; and whenever it can be broke into with safety, it is then mixed up into a dunghill with the rotted vegetables, moss-earth, and stable-yard dung, in such proportions as is likely to insure a moderate fermentation, which is generally completed in three or four weeks; at which time, I think, it is most advantageously applied, in having it carried to the ground, and instantly dug in." *Mem. Caled. Hor. Soc.* i. 443.

871. T. A. Knight is a warm advocate for *liquid manures*, which are formed by infusing rich vegetable manures, as dung of fowls, sheep, pigs, &c. or blood, in three or four times their bulk of water; and the application of the extract so procured is made at the usual seasons of watering, taking care to apply it only to the roots. He applies this mode of manuring chiefly to plants in pots, and is convinced, from experience, that trees and shrubs may grow and bear fruit in very small pots, if abundantly supplied with nourishment in this manner. (*Hort. Trans.* vol. ii. p. 127.) For some plants, as the pine, vine, cauliflower, cucumber, and others which gardeners consider as *gross*

feeders, liquid manures may be applied during their full vigor of growth; but the practice, we think, would be dangerous, if so applied to culinary or fruit-bearing plants in general, as producing too great excitement.

872. *Collecting and forming composts for mould.* Composts are mixtures of several earths, or earthy subtances or dungs, either for the improvement of the general soil under culture; or for the culture of particular plants.

In respect to *composts for the amendment of the general soil* of the garden, their quality must depend on that of the natural soil; if this be light, loose or sandy, it may be assisted by the addition of heavy loams, clays, &c. from ponds and ditches, cleanings of sewers, &c. On the other hand, heavy, clayey, and all stubborn soils, may be assisted by light composts of sandy earth, drift, and sea sand, the shovellings of turnpike-roads, the cleansing of streets, all kinds of ashes, rotten tanners' bark, rotten wood, and saw-dust, and other similar light opening materials that can be most conveniently procured.

873. *Composts for particular plants* may be reduced to light sandy loam from old pastures; strong loam approaching nearly to brick earth from the same source; peat earth from the surface of heaths or commons; bog earth from bogs or morasses; vegetable earth from decayed leaves, stalks, cow-dung, &c.; sand, either sea-sand, drift-sand, or powdered stone, so as to be as free as possible from iron, lime-rubbish; and lastly common garden-earth. There are no known plants that will not grow or thrive in one or other of these earths, alone or mixed with some other earth, or with rotten dung or leaves. Nurserymen, whose practice may be considered a safe criterion to judge from, have seldom more than three sorts of earth: loam, approaching to the qualities of brick-earth; peat or bog-earth, from heaths or morasses; and the common soil of their nursery. With these, and the addition of a little sand for striking plants, some sifted lime rubbish for succulents, and some well rotted cow-dung for bulbs and some sorts of trees, they contrive to grow thousands of different species in as great or greater perfection (taking the difference between plants in pots and plants in the free soil and air) as in their native countries, and many, as the pine, vine, camelia, rose, &c. in a superior manner.

Cushing, one of the best writers on the propagation of exotics, observes, "Loam, peat, and sand, seem to be the three simples of nature, if I may so call them, most requisite for our purpose; to which we occasionally add, as mollifiers, vegetable or leaf mould, and well rotted dung; from the judicious mixture and preparation of which, composts may be made to suit plants introduced from any quarter of the globe." *Exotic Gardener*, p. 153. 1814. Sweet, (*Botanical Cultivator*, 1820,) concurs in this opinion. See also Haynes, *On Collecting and Forming Composts, &c.*" 1821.

The *preparation* requisite for the heavy and light composts for general enrichment, and of the above different earths, consists in collecting each sort in the compost-ground, in separate ridges of three or four feet broad and as high, turning them every six weeks or two months for a year or a year and half before they are used. Peat earth being generally procured in the state of turves full of the roots and tops of heath, requires two or three years to rot; but, after it has lain one year, it may be sifted, and what passes through a small sieve will be found fit for use. Some nurserymen use both these loams and peats as soon as procured, and find them answer perfectly for most plants; but for delicate flowers, and especially bulbs, and all florists' flowers, and for all composts in which manures enter, not less than one year ought to be allowed for decomposition, and what is technically called sweetening. The French gardeners allow for their rich orange-tree composts from three to six years.

874. *The compost ground* may be placed in any situation concealed from the general view, but at the same time exposed to the free action of the sun, air, and rain. Its size will depend on that of the garden, and on the sorts of culture for which the moulds are adapted. It should generally form a part of the parallellogram enclosure used as hot-bed ground, and where there are hot-houses, both should be situated as near them as possible.

Sect. II. *Operations of Propagation.*

As already observed (458.), plants are universally propagated by seed, but partially also by germs or bulbs, suckers, runners, slips and offsets; and artificially by layers, innarching, grafting, budding and cuttings.

Subsect. 1. *Propagation by natural Methods.*

875. By *Seed.* Here the first consideration is to make sure of live seeds; for some, as we have seen (403 — 405.) lose their vitality very early after being gathered, while others retain it only for one or perhaps two seasons; some seeds also are injured, and others are improved by keeping. The size of seeds requires also to be taken into consideration, for on this most frequently depends the depth which they require to be buried in the soil; the texture of their skin or covering must be attended to, as on this often

depends the time they require to be buried in the soil previously to germination. On the form and surface of the outer coating of seeds sometimes depends the mode of sowing, as in the carrot, and on their qualities in general depends their liability to be attacked by insects. The nature of the offspring expected and the proper climate, soil, and season require also to be kept in view in determining how, where, when, and in what quantity any seed must be sown. Such are the general considerations, their particular applications will afterwards occur. (See the catalogues appended to the three first books of Part III.)

876. *By Germs or Bulbs.* These, whether cauline or radical, require in general to be planted immediately or soon after removal from the parent plant, in light earth about their own depth from the surface. Matured bulbs may be preserved out of the soil for some months, without injury to their vitality; but infant bulbs are easily dried up and injured when so treated.

877. *By Offsets.* This mode is not very easily distinguished from the foregoing and following, and seems in a strict sense only applicable to young radical bulbs, which, when separated or taken off from the parent roots, are termed offsets.

878. *By Slips.* These are shoots (*a*, *fig.* 264.) which spring from the collar or the upper part of the roots of herbaceous plants, as in auricula, and under shrubs, as thyme, &c. The shoot, when the lower part from whence the roots proceed, begins to ripen or acquire a firm texture, is to be slipped or drawn from the parent plant so far as to bring off a heel or claw of old wood, stem, or root, on which generally some roots, or rudiments of roots, are attached. The ragged parts and edges of this claw or rough section are then to be smoothed with a sharp knife, and the slip planted in suitable soil, and shaded till it strikes root afresh, or appears to have recovered from the effects of amputation.

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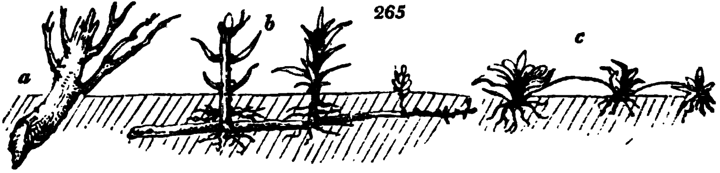

879. *By division of the plant.* This mode is adopted with many species, as most perennial grasses, the daisey, polyanthus, and a great variety of others. The plant is taken up, the earth shaken from its roots; the whole is then separated, each piece containing a portion of root and stem, which may be planted without farther preparation.

880. *By Runners,* (*c*, *fig.* 264.). With certain species this is a very convenient and sure mode of propagation. All that is requisite, is to allow the plantlet on the shoot or runner to be well rooted before being separated from the parent. It may then be planted where it is finally to remain.

881. *By Suckers,* (*b*, *fig.* 264.). These are merely runners under ground; some run to a considerable distance, as the acacia, narrow-leaved elm, sea-lime grass, alkekengi, &c.; others are more limited in their migrations, as the lilac, syringa, Jerusalem artichoke, saponaria, &c. All that is necessary is to dig them up, cut off each plantlet with a portion of root, after which its top may be reduced by cutting off from one-fourth to one-half of the shoot, in order to fit it to the curtailed root, and it may then be planted, either in the nursing-department, or, if a strong plant, where it is finally to remain.

Subsect. 2. *Propagation by Layering.*

We have already observed (462.) that nature indicates this operation, and we shall here point out the improvements of art, and their applications.

882. The roots in *natural layers* are produced by the stimulus of the moist earth on which the shoots from the nature of the tree or plant, or accidental causes recline; art increases the natural stimuli and adds others, especially that of diminishing the resources of the shoot in the parent plant, by incision or fracture.

883. In general, the operation of layering in trees and shrubs is commenced before the ascent of the sap, or delayed till the sap is fully up, and thence the two seasons are early in spring or in midsummer. Autumn and winter are resorted to for convenience in extensive concerns. The shoot, or extremity of the shoot intended to become a new plant, is half separated from the parent plant, at a few inches' distance from its extremity, and while this permits the ascent of the sap at the season of its rising, the remaining half of the stem being cut through and separated, forms a dam or sluice to the descending sap, which, thus interrupted in its progress, exudes at the wound in the form of a granulous protuberance, which throws out roots. If the cut or notch in the stem does not penetrate at least half way through, some sorts of trees will not form a nucleus the first season; on the other

hand, if the notch be cut nearly through the shoot, a sufficiency of alburnum or soft wood is not left for the ascent of the sap, and the shoot dies. In delicate sorts it is not sufficient to cut a notch merely, because in that case, the descending sap, instead of throwing out granulated matter in the upper side of the wound, would descend by the entire side of the shoot; therefore, besides a notch formed by cutting out a portion of bark and wood, the notched side is slit up at least one inch, separating it by a bit of twig, or small splinter of stone or potsherd.

Shoots when layered are often cut and mangled at random, (*a*, *b*, *c*, *fig.* 266.) or buried so deep in the soil (*d*) that they throw out but few roots, or not placed upright, (*e*) by which they make unsightly plants. In order to give some sort of principle to go upon, it should be remembered, that the use of the notch is to prevent the heel or part intended to throw out granulous matter from being bruised, which it generally is, by the common practice of performing this operation by one cut sloping upwards; and that the use of the slit is to render it more difficult for the descending sap to return from the extremity of the heel. In conformity with this idea, T. A. Knight recommends taking up the shoot after it has grown some time, and cutting off a ring of bark below the notch and slit, so as completely to hinder the return of the sap, and thereby force the shoot to employ it in forming roots. (*Hort. Trans.* vol. i. 256.) In burying an entire shoot (*f*) with a view to induce shoots to rise from every bud, notches alone are sufficient without either slitting or ringing. The use of the splinter of wood, or bit of tile or potsherd, is partly to prevent the union of the parts when the bent position of the shoot is not sufficient, and partly, and in some cases principally, to act as a stimulus, like the bottom and sides of pots. On what principle it acts as a stimulus has not, as we think, been yet determined, but its effects have long been very well known to gardeners. In all cases the layer must be held firmly in its place by hooked pegs.

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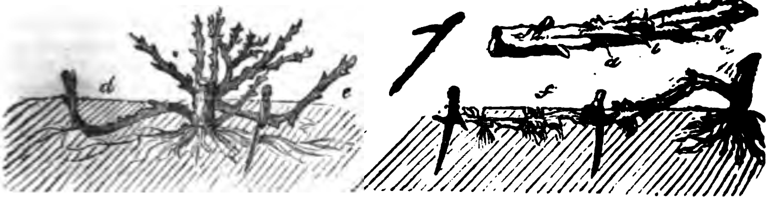


The operation of layering is performed on herbaceous plants as well as trees; and the part to become the future plant is, in both cases, covered with soil about a third of its length.

884. Besides the above modes of cutting layers, the same purpose is sometimes effected by *twisting*, *ringing*, *piercing*, *and wiring*, the shoot intended for the future plant.

Piercing is performed with an awl, or nail, or pen-knife, being thrust through two or three times in opposite directions at a joint, from which wounds, first, granulated matter, and finally, fibres are emitted.

Ringing is cutting off a small ring of bark and part of the wood, by which the return of the sap being wholly prevented, it is, therefore, as it were, compelled to form roots. Care must be taken, however, that the ring does not penetrate far into the wood, otherwise the sap will be prevented from ascending in the first instance, and the shoot killed.

Wiring is performed by twisting a piece of wire round the shoot at a joint, and pricking it at the same time with an awl on both sides of the wire. It is evident that all these methods depend on the same general principle, that of permitting the ascent of the sap through the wood, but checking its descent by cutting off or closing the vessels of the bark.

885. In *layering trees in the open garden, whatever mode be adopted*, the ground round each plant intended for laying, must be digged for the reception of the layers; then making excavations in the earth, lay down all the shoots or branches properly situated for this purpose; pegging each down with a peg or hooked stick; laying also all the proper young shoots on each branch or main-shoot, fixing each layer from about three or four to six inches deep, according as they admit, and moulding them in at that depth, leaving the tops of every layer out of ground from about two or three to five or six inches, according to their length, though some shorten their tops down to one or two eyes. Observe also to raise the top of each layer somewhat upright, especially tongue or slit layers, in order to keep the slit open. As the layering is completed, level in all the mould finally, and

equally in every part close about every layer, leaving an even, smooth surface, presenting only the tops of each layer in the circumference of a circle, and the stems or stools in the centre.

Sometimes the branches of trees are so inflexible, as not to be easily brought down for laying; in which case they must be plashed, making the gash or cut on the upper side; and when they are grown too large for plashing, or that the nature of the wood will not bear that operation, they may be thrown on their sides, by opening the earth about their roots, and loosening or cutting all those on one side, that the plant may be brought to the ground to admit of laying the branches.

886. When layers are to be made from green-house shrubs, or other *plants in pots*, the operation should generally be performed either in their own pots, or in others placed near that of the stool to receive the layer.

After laying in either of the above methods, there is no particular culture requisite, excepting that of keeping the earth as much as possible of uniform moisture, especially in pots; and watering these in the open air in dry weather.

887. *Management of Stools.* When the layers are rooted, which will generally be the case by the autumn after the operation is performed, they are all cleared from the stools or main-plants, and the head of each stool, if to be continued for furnishing layers, should be dressed; cutting off all decayed and scraggy parts, and digging the ground round them. Some fresh rich mould should also be worked in, in order to encourage the production of the annual supply of shoots for layering.

888. *Chinese Laying.* The Chinese method of propagating trees by first ringing, or nearly so, a shoot, and then covering the ringed part with a ball of clay and earth, covered with moss or straw, is obviously on the same general principle as laying; and is better effected in this country by drawing the shoot through a hole in a pot; (such a pot as *fig.* 89.) ringing it to the extent of three-fourths of its circumference, near the bottom or side of the pot, and then the pot, being supported in a proper position, and filled with earth, it may be watered in the usual way. Some plants difficult to strike, and for which proper stocks for innarching are not conveniently procured, are thus propagated in the nursery hot-houses.

Though layers of trees completed early in spring, and of herbaceous plants after the season of their flowering, are generally *fit to remove* from the parent plant the end of the succeeding autumn; yet many sorts of American trees require two years to complete their roots. On the other hand, some sorts of roses and deciduous shrubs, if their present year's wood be laid down when about half grown, or about the middle of August, it will produce roots, and be fit to separate the succeeding autumn.

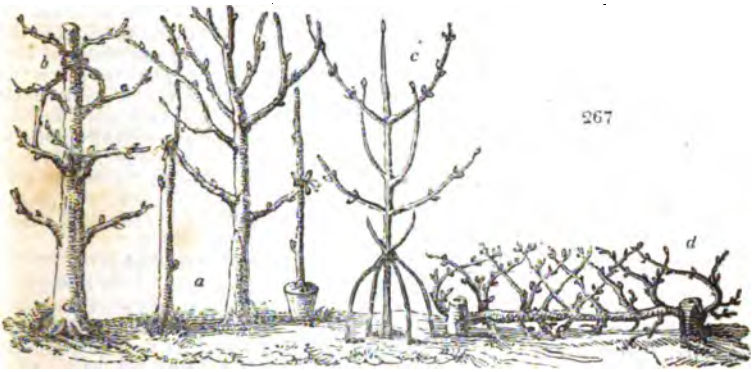
Subsect. 3. *Propagation by Innarching.*

889. This process may be described as a sort of layering, by the common or slit process, in which the talus or heel intended to throw out fibres, instead of being inserted in the soil, is inserted in the wood, or between the wood and bark of another plant, so as to incorporate with it. It evidently depends on the same general principles as layering; and all the difference is, that the granulated matter which exudes between the bark and the wood of the talus or heel, instead of throwing out fibres, unites with the wood of the stock or plant to which it is attached, forming a solid ligneous union, which, when the layer or shoot is separated from the mother plant, supplies it with nourishment as the fibres do the common layer. It is the most certain mode of propagation with plants difficult to excite to a disposition for rooting; and when all other modes fail, this, when a proper description of stock or basis is to be found, is sure to succeed.

Professor Thouin (*Cours complet d'Agricultur, &c.* art. *Greffe*) has enumerated thirty-seven varieties of innarching; but they may all be reduced to two, crown innarching, in which the head of the stock is cut off (*a*, *fig.* 267.), and side innarching (*b* and *c*), in which the head of the stock is left on. With young hardy trees, the first mode is reckoned the best, as the whole effort of the stock is thereby directed to the nourishment of the innarched shoot; the other is resorted to in propagating delicate trees, and for filling up blanks in branches, and other purposes.

The stocks designed to be innarched, and the tree from which the layer or shoot is to be bent or *arched* towards them, and put *in* or united, must be *placed* if in pots, or planted if in the open soil, near together. Hardy trees of free growing kinds should have a circle of stocks planted round them every year in the same circumference, every other one being innarched the one year, and when removed, their place supplied by others, so that there will always be, by this practice, stocks of one year's standing ready to receive the shoot. If the branches of the tree are too high for stocks in the ground, they should be planted in pots, and elevated on posts or stands, or supported from the tree, &c.

To perform the operation, having made one of the most convenient branches or shoots approach the stock, mark on the body of the shoot the part where it will most easily join to the stock; and in that part of each shoot pare away the bark and part of the wood two or three inches in length, and in the same manner pare the stock in the proper place for the junction of the shoot; next make a slit upwards in that part of the branch or shoot, as in layering, so as to form a heel, but more of a tongue shape than in layering, and make a slit downward in the stock to admit it. Let the parts be then joined, slipping the tongue of the shoot into the slit of the stock, making both join in an exact manner, and tie them closely together with bass. Cover the whole afterwards with a due quantity of tempered or grafting clay or moss. In hot-houses, care must be taken not to disturb the pots containing the plants operated on.



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890. Innarching, like layering, is commonly *performed in spring*, and in general cases, the union is effected in four or five months, when the layer or innarched shoot may be separated from the mother plant. This must be done with a very steady hand, so as not to loosen or break out the adhering shoot, sloping it off downwards, close to the stock; and if the head of the stock was not cut down at the time of innarching, it must now be cut off in a sloping direction close to the union; and all the old clay and bandage cleared away and replaced with new, to remain a few weeks longer till the adhesion is complete, when it may be finally removed.

In some cases, however, the innarched shoot requires to remain two years, during the whole of which period, it should be carefully covered to exclude the air from the wounds; nor must the binding be removed more than once during that period for fear of disturbing the cicatrising parts.

891. *Innarching a Branch or Shoot on the same Tree* (*b*, *fig.* 267.) is frequently a very convenient mode of filling up vacancies in trees; in which case it is generally performed without heading down. T. A. Knight adopted this practice on a peach-tree, for a very ingenious purpose, that of procuring returning or concocted sap to swell and ripen the fruit. "In the last season (1812), a *Peach-tree* in my garden, of which I was very anxious to see the fruit, had lost, by the severity of the weather, all its blossoms, except two, which grew upon leafless branches: I was very desirous to preserve these, as well as to ascertain the cause why the *peach* and *nectarine*, under such circumstances, fail to acquire maturity. The most probable cause, according to my hypothesis, appeared to be the want of the returning sap, (which the leaves, if existing, would have afforded,) and the consequent morbid state of the branch; I therefore endeavoured to derive the necessary portion of returning sap from another source. To obtain this object, the points of the branches, which bore fruit, were brought into contact with other branches of the same age that bore leaves; and a part of their bark, extending in length about four times their diameters, was pared off immediately above the fruit. Similar wounds were then made upon the other branches, with which these were brought into contact; and the wounded surfaces were closely fitted; and tightly bound together. An union soon took place; and the fruit, apparently in consequence of it, acquired the highest state of maturity and perfection." Innarching, like grafting, may be applied to various curious and useful purposes (*c d*). Harte mentions that the hornbeam hedges, in some parts of the Netherlands, were worked in the lozenge form (*d*), and that by removing the bark at each intersection, the whole had become united as if one tree. Some curious examples of innarching and grafting combined are to be seen in the *Jardins des Plantes*. See *Grafting*.

Subsect. 4. *Propagation by Grafting.*

892. This is a mode of propagation applicable to most sorts of trees and shrubs; but not easily to very small under-shrubs, as heath or herbaceous vegetables. It is chiefly used for continuing varieties of fruit-trees. A grafted tree consists of two parts, the scion and the stock; their union constitutes the graft, and the performance of the operation is called grafting. The scion is a part of the living vegetable, which, united or inserted in a stock or other vegetable of the same nature, identifies itself with it, and grows there as on its natural stem and roots.

The *end of grafting* is, 1st. To conserve and multiply varieties and subvarieties of fruit-trees, endowed accidentally or otherwise with particular qualities, which cannot be with certainty transferred to their offspring by seeds, and which would be multiplied too slowly, or ineffectually, by any other mode of propagation. 2. To accelerate the fructification of trees, barren as well as fruit-bearing; for example, suppose two acorns of a new species of oak, received from a distant country; sow both, and after they have grown one or two years, cut one of them over, and graft the part cut off on a common oak of five or six years growth; the consequence will be that the whole nourishment of this young tree of five years' growth being directed towards nourishing the scion of one or two years, it will grow much faster, and consequently arrive at perfection much sooner than its fellow, or its own root left in the ground. A French author found the advantage of this practice in the case of a new species of ash, to be as 5 to 1 in point of height. (See *Cours Complet d'Agricultur, &c.* art. *Greffe.*) The third use of grafting is to improve the quality of fruits; and the fourth to perpetuate varieties of ornamental trees or shrubs.

893. The *theory of grafting* may be reduced to the following particulars: —

1. To graft or unite only varieties of the same species; species of the same genus, and by extension, genera of the same natural family. "Whenever the stock, and scion, or bud, are not perfectly well suited to each other, an enlargement," T. A. Knight observes, "is well known always to take place at the point of their junction, and generally to some extent, both above and below it. This is particularly observable in peach-trees, which have been grafted, at any considerable height from the ground, upon plum stocks; and it appears to arise from the obstruction, which the descending sap of the peach-tree meets with in the bark of the plum stock; for the effects produced, both upon the growth and produce of the tree, are similar to those which occur when the descent of the sap is impeded by a ligature, or by the destruction of a circle of bark, in the manner recommended by Williams (*Hort. Trans.* vol. i. p. 108.) The disposition in young trees to produce and nourish blossom-buds and fruit, is increased by this apparent obstruction of the descending sap; and the fruit of such young trees ripens, I think, somewhat earlier than upon other young trees of the same age, which grow upon stocks of their own species; but the growth and vigor of the tree, and its power to nourish a succession of heavy crops are diminished apparently by the stagnation in the branches and stock of a portion of that sap, which, in a tree growing upon its own stem, or upon a stock of its own species, would descend to nourish and promote the extension of the roots. The practice, therefore, of grafting the pear-tree on the quince stock, and the peach and apricot on the plum, where extensive growth and durability are wanted, is wrong; but it is eligible wherever it is wished to diminish the vigor and growth of the tree, and where its durability is not thought important."

"When great difficulty is found in making a tree, whether fructiferous or ornamental, of any species or variety, produce blossoms, or in making its blossoms set, when produced, success will probably be obtained in almost all cases, by budding or grafting upon a stock which is nearly enough allied to the graft to preserve it alive for a few years, but not permanently. The pear-tree affords a stock of this kind to the apple; and I have obtained a heavy crop of apples from a graft which had been inserted in a tall pear stock, only twenty months previously, in a season when every blossom of the same variety of fruit in the orchard was destroyed by frost. The fruit thus obtained was externally perfect, and possessed all its ordinary qualities; but the cores were black, and without a single seed; and every blossom had certainly fallen abortively, if it had been growing upon its native stock. The experienced gardener will readily anticipate the fate of the scion; it perished in the following winter. The stock, in such cases as the preceding, promotes, in proportion to its length, the early bearing and early death of the graft."

2. To observe the analogies of trees, as to the periods of the movement of their sap; in the permanence or deciduous duration of their leaves and the qualities of the juices of their fruits, in order to estimate the probable advantage of grafting a fruit of any particular flavor on another of similar or different qualities.

3. To unite exactly the inner bark of the scion with the inner bark of the stock in order to facilitate the free course of the sap.

4. To make choice of the proper season, and perform the operation with celerity.

894. The *stock* does not change the character of the species of trees, which may be grafted on it; nor even that of the variety, if the connection between the stock and scion is intimate; but by a particular choice of stocks, the tree is often modified differently in the dimensions of its parts; in its general aspect, in the flavor and size of its fruit, though perhaps in a very slight degree, and in the duration of its existence.

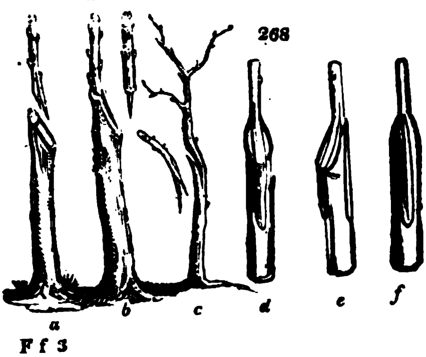
All practical gardeners concur in stating, that the nature of the fruit is to a certain extent affected by the nature of the stock. Miller says decidedly, "that crab stocks cause apples to be firmer, to keep longer, and to have a sharper flavour; and he is equally confident, that if the breaking pears be grafted on quince stocks, the fruit is rendered gritty or stoney, while the melting pears are much improved by such stocks. This, according to Niel, is scarcely to be considered as inconsistent with Lord Bacon's doctrine, "that the scion overruleth the graft quite, the stock being passive only;" which, as a general proposition, remains true; it being evident, that the scion, bud, or inarched shoot is endowed with the power of drawing or forming from the stock that peculiar kind of nourishment which is adapted to its nature, and that the specific characters of the ingrafted plant remain unchanged, although its qualities may be partially affected." *Ed. Encyc.* art. *Hort.*

Professor Thouin observes, that the historians and poets of antiquity have written, and the moderns repeated on the faith of others, that every scion will take on any sort of tree, provided there be a resemblance in their barks. Thus Pliny, Varro, Columella, &c. speak of apples and vines on elms and poplars; and Evelyn mentions, that he saw a rose grafted on an orange-tree in Holland. The ancients acknowledged, however, that such grafts were but of very short duration. "The result of numerous experiments which we have made," observes the professor, "proves that if any one of these grafts seems at first to succeed, they all perish more or less promptly."

"Certain species of trees, and certain varieties of fruits, take more easily on some stocks than on others. Sometimes the cause is known, and at other times, we are ignorant of it. Thus the platanus-leaved maple will not receive the scions of any species of its genus; the reason of which may be deduced from its milky sap, which indicates an organization different from its congeners. In like manner, the common walnut takes with difficulty on the late walnut; because the times of the motion of their sap do not coincide. But why certain varieties of pear succeed better on the quince than on the seedling, and others better on the seedling than on the quince, cannot so easily be accounted for. Such anomalies are frequent, and make part of the practical science of gardeners; of so much the more importance, because less subjected to general laws." *Cours Complet, &c.* art. *Greffe.*

The chief modern writers on grafting are, Quintiney, Duhamel, Rosier, and Thouin, among the French; Mayer, Diederich, Christ, and Sickler, among the Germans; Clarici and P. Re among the Italians; and Miller, Curtis, and Knight, among the English. Thouin has refined so much on the subject, as to have produced or enumerated above forty modes, besides a great many kinds of budding and inarching, named chiefly after eminent, ancient, and modern botanists and gardeners, as Pliny, Virgil, Quintiney, Miller, Adanson, &c. Most of these varieties, however, are separated by such slender shades of difference, or so remotely connected with utility, (as the Greffe Banks,) that they do not appear of sufficient importance for admission here; and we shall, therefore, chiefly describe such varieties as have been long known and practised; which form the basis of all the others; and which every individual may vary according to his taste. The reader who would enquire further into the subject, may consult *Curtis's Lectures on Botany,* (vol. iii.) and *Nouveau Cours Complet d'Agricultur, &c.* (tom. xvieme. art. *Greffe.*)

895. *Whip-Grafting,* (*a, fig.* 268.) or, as it is sometimes called, tongue-grafting, is the most generally adopted in nurseries for propagating fruit-trees. To effect this mode in the best style, it is desirable, that the top of the stock, and the extremity of the scions should be nearly of equal diameter. Hence this variety admits of being performed on smaller stocks than on any other. It is called whip-grafting, from the method of cutting the stock and scions, sloping on one side so as to fit each other, and thus tied together in the manner of a whip-thong to the shaft or handle.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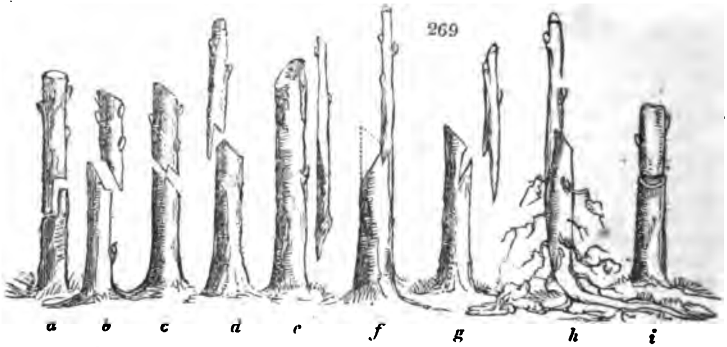
The scion and stock being cut off obliquely at corresponding angles, as near as the operator can guess, then cut off the tip of the stock obliquely or nearly horizontally; make now a slit nearly in the centre of the sloped face of the stock downwards, and a similar one in the scion upwards. The tongue or wedge-like process, forming the upper part of the sloping face of the scion, is then inserted downwards in the cleft of the stock; the inner barks of both being brought closely to unite on one side so as not to be displaced in tying, which ought to be done immediately with a ribband of bass, brought, in a neat manner, several times round the stock, and which is generally done from right to left, or in the course of the sun. The next operation is to clay the whole over an inch thick on every side, from about half an inch or more below the bottom of the graft; to an inch over the top of the stock, finishing the whole coat of clay in a kind of oval globular form, rather longways up and down, closing it effectually about the scion and every part, so as no light, wet, nor wind may penetrate; to prevent which is the whole intention of claying. It may be added, that the whip-grafting of Lawson, and other old horticultural writers, was then practised without a tongue, which addition gave rise to the latter term.

The French mode of whip-grafting differs from the English in their never paring more off the stock, however large, than the width of the scion, (*e*, *f*, *g*, *fig.* 269.) In both modes, the stock is sometimes not shortened down to the graft, but a few inches left to serve as a prop to tie the shoots proceeding from the scion; or even to admit of fastening the ligatures used in the operation more securely. In either case, this appendage is cut off at the end of the season.



896. *Cleft-Grafting*, (*b*, *fig.* 268.), is resorted to in the case of strong stocks, or in heading down and regrafting old trees. "The head of the stock or branch (which we may suppose to be two or three inches in diameter) is first cut off obliquely, and then the sloped part is cut over horizontally near the middle of the slope; a cleft nearly two inches long is made with a stout knife or chisel in the crown downwards, at right angles to the sloped part, taking care not to divide the pith. This cleft is kept open by the knife. The scion has its extremity for about an inch and half, cut into the form of a wedge, it is left about the eighth of an inch thicker on the outer or backside, and brought to a fine edge on the inside. It is then inserted into the opening prepared for it; and the knife being withdrawn, the stock closes firmly upon it." If it be intended to graft any pretty large stocks or branches by this method, two or more scions may be inserted in each. The stock being prepared by cutting over as above, cleave it across in two places parallel and at a small distance apart, and insert a scion in each cleft: or by cutting or sawing the head off horizontally, and smoothing the section, a radiated series of clefts may be made, and scions inserted in each.

897. *Crown-Grafting* is another mode adopted for thick stocks, shortened branches, or headed down trees. It is sometimes called grafting in the bark or rind, from the scion being inserted between the bark and wood. This mode of grafting is performed with best effect, somewhat later than the others, as the motion of the sap renders the bark and wood of the stock much more easily separated for the admission of the scions.

In performing the operation, first cut or saw off the head of the stock or branch, horizontally or level, and pare the top smooth; then having the scions cut one side of each flat, and somewhat sloping, an inch and half long, forming a sort of shoulder at top of the slope, to rest upon the crown of the stock; and then raise the rind of the stock with the ivory wedge, forming the handle of the budding-knife (*fig.* 33.); so as so admit the scion between that and the wood two inches down;

which done, place the scion with the cut side next the wood, thrusting it down far enough for the shoulder to rest upon the top of the stock; and in this manner may be put three, four, five, or more scions, in one large stock or branch. It is alleged as a disadvantage attending this method in exposed situations, that the ingrafted shoots for two or three years are liable to be blown out of the stock by violent winds; the only remedy for which is tying long rods to the body of the stock or branch, and tying up each scion and its shoots to one of the rods.

898. *Side-Grafting*, (*c*, *fig.* 268.), resembles whip or tounge grafting, but differs in being performed on the side of the stock without bending down. It is practised on wall-trees to fill up vacancies, and sometimes in order to have a variety of fruits upon the same tree. Having fixed upon those parts of the branches where wood is wanting to furnish the head or any part of the tree, there slope off the bark and a little of the wood, and cut the lower end of the scions to fit the part as near as possible, then join them to the branch, and tie them with bass, and clay them over.

899. *Saddle-Grafting* is performed by first cutting the top of the stock into a wedge-like form, and then splitting up the end of the scion and thinning off each half to a tounge shape; it is then placed on the wedge, embracing it on each side, and the inner barks are made to join on one side of the stock, as in cleft grafting. This is a very strong and handsome mode for standard trees when grafted at the standard height. It is also desirable for orange trees and rose standards, as it makes a handsome finish, covering a part of the stock, which, by the other methods, long remains a black scar, and sometimes never becomes covered with bark. The stocks for this purpose should not be much thicker than the scions, or two scions may be inserted.

The following variety of saddle-grafting, (*d*, *e*, *f*, *fig.* 267.), is described by T. A. Knight, as practised upon small stocks almost exclusively in Herefordshire. "It is never attempted till the usual season of grafting is passed, and till the bark is readily detached from the alburnum. The head of the stock is then taken off by a single stroke of the knife obliquely, so that the incision commences about a diameter below the point where the medulla appears in the section of the stock, and ends as much above it, upon the opposite side. The scion, which should not exceed in diameter half that of the stock, is then to be divided longitudinally, about two inches upwards from its lower end, into two unequal divisions, by passing the knife upwards just in contact with one side of the medulla. The stronger division of the scion is then to be pared thin at its lower extremity, and introduced, as in crown-grafting, between the bark and wood of the stock; and the more slender division is fitted to the stock upon the opposite side. The scion consequently stands astride the stock, to which it attaches itself firmly upon each side, and which it covers completely in a single season. Grafts of the apple and pear rarely ever fail in this method of grafting, which may be practised with equal success with young wood in July, as soon as that has become moderately firm and mature."

900. *Shoulder, or Chink-Grafting*, is performed with a shoulder, and sometimes also with a stay at the bottom of the slope. It is chiefly used for ornamental trees, where the scion and stock are of the same size, (*a*, *b*, *c*, *d*, *fig.* 269.)

901. *Root-Grafting*, (*h*, *fig.* 269.), is sometimes performed in nurseries on parts of the roots of removed trees, when the proper stocks are scarce; and in which case, the root of the white thorn has been resorted to as a stock both for the apple and pear. In general, however, a piece of the root of the tree of the same genus is selected, well furnished with fibres, and a scion placed on it in any of the ordinary ways for small stocks. Thus united, they are planted so deep as to cover the ball of clay, and leave only a few eyes of the scion above ground. Some gardeners have thought, that in this way the plant must preserve a near resemblance to the parent tree; but Abercrombie remarks, that though, it is an expeditious way of obtaining a new plant, such a graft cannot be materially different from a cutting or layer.

The following variety of root-grafting is practised by T. A. Knight. "Transplanting, many years ago, some pear-stocks from a seed-bed, of which the soil was soft and deep, I found that the first emitted roots of many of them descended a foot or more perpendicularly into the earth, before they divided into any lateral ramifications: and as I did not like to replant the young trees, with such an inconvenient length of perpendicular root, I cut off about six inches from each. The amputated parts were then accurately fitted and bound, as in splice or whip-grafting, to scions of pear-trees, which were selected as nearly as possible of the same size; and the roots, with their attached branches, were deposited in the ground as cuttings, so deep, that the whole of the root, and about an inch of the scion, were covered. The soil was then drawn up with the hoe on each side of the plants, which were placed in rows, so that one bud only of each graft, was above the soil, and another just within it. These grafts succeeded perfectly well; and I have subsequently repeated the same experiment with equal success upon the apple, the plum, and the peach. In the greater part of these experiments, the roots were perfectly cleansed from mould by washing, before they were fitted to the graft, and were then placed in wet moss, till a sufficient number were ready to be carried to the nursery; a common dibber only was employed in planting them; but the mould was washed into the holes with water, to close it well round the roots, and to supply the place of the clay used in other methods of grafting." (*Hort. Trans.* vol. i. p. 239.) A variation of this mode, consists in leaving that part of the tap-root not wanted in the removed tree undisturbed in the soil, and grafting on it there.

902. *Terebration*, or *Peg-Grafting*, (*i*, *fig.* 269.) is an old method, in which the stock being cut off horizontally, a hole was bored in the centre of it; and the scion being selected to fit the stock, within an inch and a half of its lower end, a circular incision was made, and the part between that and the end reduced, so as to fit the hole in the stock. This peg filling the hole, was supposed to secure the graft from the effect of winds.

903. In a month after grafting, it may be ascertained whether the scion has *united* with the stock, by observing the progress of its buds; but, in general, it is not safe to remove the clay for three months or more, till the graft be completely cicatrized. The clay may generally be taken off in July or August, and at the same time the ligatures loosened where the scion seems to require more room to expand; a few weeks afterwards, when the parts have been thus partially innured to the air, and when there is no danger of the scion being blown off by winds, the whole of the ligatures may be removed. If the stock was not shortened down close to the graft or junction of the scion with the stock at the time of performing the operation, it may be done now, or as soon as the ligatures can be entirely dispensed with. In particular cases, a ligature round the graft, or a stake, or other prop, for the shoots of the scion, may be necessary for a year to come, to protect against winds; or a bandage of moss kept over the graft, to preserve moisture, and encourage the expansion of the parts, and complete filling up of the wound.

904. *The Stocks* on which the operation of grafting is performed, are most commonly the stems of young trees, raised from the seed, or from suckers, layers, or cuttings, reared for that purpose. For what are called dwarf-trees, the stock at the time of grafting must always be headed down within a few inches of the ground for the insertion of the scion; and for standards, the heading of the stock for the insertion of the scion may either be near the ground, the scion inserted accordingly, and one of the first shoots from it trained up to form a stem, or the scion inserted at the proper height. But if, as is the case with standard cherries, the stock is intended to form the stem, then it must be suffered to grow six or seven feet high, and be afterwards headed down at five or six feet for the reception of the scion.

The French and Americans graft and bud their stocks much higher than is practised in Britain, which some consider to contribute to the durability of the tree. J. Wilmot is of opinion, that, by the opposite practice, the whole of the wild or proper stock, in garden-grounds where the soil is continually raised by manure, becomes buried in the soil, and reduced to a mere root, and then, he says, the tree begins to decline in vigor, and soon decays and dies. *Hort. Trans.* vol. i. p. 215.

905. Stocks for fruit-trees are divided into what are called *free-growing* and *dwarfing* stocks. The free-growing are such as naturally attain the full height of the species to be grafted on them, as the seedlings of the common apple, common pear, plum, and cherry. The dwarfing-stocks are such as naturally form much smaller trees than the sorts to be grafted on them, and therefore have a tendency to diminish the magnitude of the adopted sorts; as the paradise quince, bullace, and wild red cherry.

Grafting is also performed occasionally on old trees, or such as already bear fruit, particularly when it is designed to change the sorts, or have more than one sort on the same tree, or to renew the whole branches, or any particular part of a tree. In either of these cases, the scions must be inserted into the branches; sometimes heading them down for their reception; and sometimes inserting the grafts into their sides without heading down.

906. *Scions*, as already observed (892.), are those shoots which, united with the stock, form the graft. They are generally the young shoots of last summer's growth, and should be chosen from the outside lateral branches of healthy trees. The outside lateral branches are preferred, because in them the shoots are not so robust and apt to run to wood as in the centre and top of the tree, nor so weak as those which are at its base, and under the shade and drip of the rest. Such shoots are uniformly found to be the best bearers, and to produce the truest specimen of the fruit of the tree on which they grow. An exception to this rule is to be found in the case of debilitated trees, where, of course, the scions should be taken from the strongest shoots in the centre of the tree. The middle part of each shoot makes always the best scion, for the same reasons as those given for choosing the shoots from the middle part of the tree; but long shoots, and especially where the scion is of a rare variety, may be cut into several scions of four or six

inches in length, reserving not fewer than two, nor more than five eyes, to form the future head of the tree.

Scions should be gathered several weeks before the season for grafting arrives; the reason is, that experience has shown that grafting may most successfully be performed, by allowing the stock to have some advantage over the graft in forwardness of vegetation. It is desirable that the sap of the stock should be in brisk motion at the time of grafting; but by this time the buds of the scion, if left on the parent tree, would be equally advanced; whereas the scions, being gathered early, the buds are kept back, and ready only to swell out when placed on the stock. Scions of pears, plums, and cherries, are collected in the end of January, or beginning of February. They are kept at full length, sunk in dry earth, and out of the reach of frost till wanted, which is sometimes from the middle of February to the middle of March. Scions of apples are collected any time in February, and put on from the middle to the end of March. In *July-grafting* (899.), the scions are used as gathered.

907. *The Materials used in Grafting* are, a strong pruning-knife for cutting off the heads of the stocks previous to their preparation by the grafting-knife for the scion; a small saw for large stocks; and a penknife for very small scions; a chissel and mallet for cleft-grafting; bass ribbands as ligatures; and grafting-clay..

908. *Grafting-Clay* is prepared either from stiff yellow or blue clay, or from clayey loam or brick earth; in either case, adding thereto about a fourth part of fresh horse-dung, free from litter, and a portion of cut hay, mixing the whole well together, and adding a little water; then let the whole be well beaten with a stick upon a floor, or other hard substance; and as it becomes too dry apply more water, at every beating turning it over; and continuing beating it well at top till it becomes flat and soft. This process must be repeated, more or less, according as the nature of the clay may require to render it ductile, and yet not so tough as to be apt to crack in dry weather; for instance, it should be several times beaten the first day; and next morning repeat the beating, still moistening it with water, and by thus repeating the beating several times every day for two or three days, or every other day at least, fos a week, it will be in proper order for use; observing, that it should be prepared a week at least before it is used; but if a month the better, keeping it moist.

Some recommend salt to be mixed with the clay, and others ashes or lime-rubbish, or drift-sand; the object in these cases being to prevent its cracking with the sun, which, however, the horse-droppings, if well incorporated, will in general fully prevent.

The grafting-clay of the French and Dutch is composed of half cow-dung, free from litter, and half fresh loam, intimately incorporated. They prefer this to all others for excluding the external air from wounds of every description, and ridicule the idea of certain complex compositions. Bosc (art. *Englumen*, *N. C. d'Ag.* &c. tom. v.) observes, of a noted English composition for healing wounds, that it is so "complicated and ridiculous in the eyes of those who have any knowledge of chemistry or natural philosophy, that it is a matter of astonishment how it could be proposed in our age."

Abercrombie, and various authors, mention resinous substitutes for clay, the details of which are given in the first edition of Miller's Dict. These substitutes are recommended for small and delicate trees, as camelias, daphnes, &c. and are composed of wax and pitch, pitch and tallow, tallow and oil, or a compound of turpentine, bees'-wax, and rosin, at first melted together, and afterwards heated as wanted; care being taken not to apply it too hot. A coating laid on with a brush, to the depth of a quarter of an inch, is said to be less liable to crack than clay; and it is added, that when the full heat of summer arrives, the composition melts away of its own accord. This, we must confess, appears a sufficient argument against its use, since its removal must depend on the weather, and not on the state of the graft. We have seen its use in Italy attended by such consequences.

The use of compositions for covering wounds is threefold; 1st. To prevent the extravasation of the sap. 2d. The too sudden drying of the wood; and 3d. The introduction of rain-water in the wound or cleft. It is evident, therefore, that whatever sort of clay or coating is adopted, much will depend on its immediate application, and instantaneous repair in future, wherever it cracks or falls off untimely. In addition to claying, some nurserymen cover the clay with a coating of moss, to preserve a moderate degree of moisture and tenacity; and others, in the case of dwarf trees grafted close to the ground, earth up the grafts for the same purpose. These practices suit particular cases, but are not generally necessary.

Subsect. 5. *Propagation by Budding.*

909. Budding, or as it is sometimes called, grafting by gems, consists in taking an eye or bud attached to a portion of the bark of ligneous vegetables, of different sizes and forms, and generally called a shield, and transporting it to a place in another, or a different

ligneous vegetable. The object in view is precisely that of grafting, and depends on the same principle; all the difference between a bud and a scion being, that a bud is a shoot, or scion, in embrio.

Budded trees are generally two years later in producing their fruit than grafted ones; but the advantage of budding is, that where a tree is rare, a new plant can be got from every eye, whereas by grafting it can only be got from every three or four eyes. There are also trees which propagate much more readily by budding than grafting; and others, as most of the stone fruits, are apt to throw out gum when grafted.

The operation of budding is performed any time from the beginning of July to the middle of August; the criterion being the formation of the buds in the axillæ of the leaf of the present year. The buds are known to be ready by the shield or portion of bark, to which they are attached, easily parting with the wood. The buds preferred are generally those on the middle of a young shoot, as being neither so apt to run to wood as those at the extremity, nor so apt to lie dormant as those as the lower end. In some cases, however, the buds from the middle and extremity of the shoots are to be rejected, and those taken which are at the base of the annual shoots, as T. A. Knight, (*Hort. Trans.* vol. iii. 135.) found in the case of the walnut-tree.

910. For *gathering the Shoots containing the Buds*, a cloudy day, or an early or late hour, are chosen, on this principle, that the leaves being at these periods in a less active state of perspiration, suffer least from being separated from their parent plant. They are preserved fresh, and may be sent a great distance by inserting their ends in water or moist moss; though, in general, they should be used as soon after gathering as possible; indeed, as in grafting and innarching, the whole operation ought to be performed with the greatest celerity.

A new, ingenious, and seemingly useful application of the art of budding, has been made by T. A. Knight. It is that of transferring "a part of the abundant blossom buds from one tree to the barren branches of others." He tried this first on roses, and afterwards on the pear and peach, with much success. It is necessary to wait till the end of August, or beginning of September, in order to make sure that the buds to be inserted contain blossoms. In this way also he considers that fruit might be produced on yearling trees, not as matter of utility, (as in supplying barren trees with blossom buds,) but as a curious experiment.

Professor Thouin enumerates twenty-three varieties of budding; but we shall here describe only four, of which but one variety is in general use in Britain.

911. *Shield-Budding*, or T budding, (*fig.* 270.) is thus performed. Fix on a smooth part on the side of the stock, rather from than towards the sun, and of a height depending, as in grafting, on whether dwarf, half, or whole standard trees are desired; then, with the budding-knife, make a horizontal cut across the rind, quite through to the firm wood; from the middle of this transverse cut, make a slit downward, perpendicularly an inch or more long, going also quite through to the wood. This done, proceed with all expedition to take off a bud; holding the cutting, or scion, in one hand, with the thickest end outward, and with the knife in the other hand, enter it about half an inch or more below a bud, cutting near half way into the wood of the shoot, continuing it with one clean slanting cut, about half an inch or more above the bud, so deep as to take off part of the wood along with it, the whole about an inch and a half long (*a*, *fig.* 270.); then directly with the thumb and finger, or point of the knife, slip off the woody part remaining to the bud; which done, observe whether the eye or gem of the bud remains perfect; if not, and a little hole appears in that part, it is improper, or, as gardeners express it, the bud has lost its root, and another must be prepared. This done, placing the back part of the bud or shield between your lips, expeditiously with the flat haft of the knife separate the bark of the stock on each side of the perpendicular cut, clear to the wood (*c*), for the admission of the bud, which directly slip down, close between the wood and bark, to the bottom of the slit (*d*). The next operation is to cut off the top part of the shield (*b*), even with the horizontal first made cut, in order to let it completely into its place, and to join exactly the upper edge of the shield with the transverse cut, that the descending sap may immediately enter the bark of the shield, and protrude granulated matter between it and the wood, so as to effect a living union.

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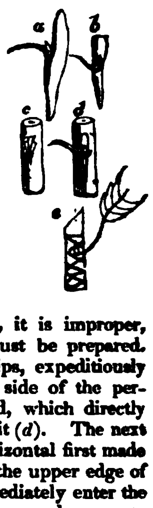

The parts are now to be immediately bound round with a ligament of fresh bass (*e*), previously soaked in water, to render it pliable and tough, beginning a little below the bottom of the perpendicular slit, proceeding upward closely round every part, except just over the eye of the bud, and continue it a little above the horizontal cut, not too tight, but just sufficient to keep the whole close, and exclude the air, sun, and wet.

912. *Shield-Budding reversed*, or reversed ⊥ budding, differs from the former in having

the transverse cut made at the bottom of the perpendicular slit, instead of at its top, and of course the shield is reversed in its position. This mode is represented as preferable to the other by such as contend that the sap rises in the bark equally with the wood; but as this opinion is now generally considered as exploded, the first, or T mode, may justly be considered as the most scientific mode of budding. Thouin describes this variety under the name of *Schnerwoogth.* The advantages attending it, he says, are, that it is not easily drowned with sap or gum; and the disadvantages, that it often fails when there is a scarcity of sap. It is practised occasionally in the orange-nurseries near Genoa, as may be seen in the plants imported to this country.

913. *Scalope Budding* consists in paring a thin tongue-shaped section of bark from the side of the stock; and in taking a similar section from the shoot of buds, in neither case removing the wood. The section or shield containing the bud is then laid on the wound or scollop in the stock; its upper edge exactly fitted, as in shield-budding, and at least one of its edges, as in whip-grafting. After this, it is tied in the usual way. The advantages of this mode are, that it can be performed when the wood and bark do not separate freely, and also on trees having very stiff, thick, suberose barks. Its disadvantages are, that it requires longer time to perform the operation, and is less certain of success.

914. *Budding with double Ligatures* is a mode invented by T. A. Knight, and described by him (*Hort. Trans.* vol. i. 194.) as "a new and expeditious mode of budding." The operations are performed in the manner first above described; but instead of one ligature, two are applied, one above the bud inserted upon the transverse section through the bark; the other, which had no farther office than that of securing the bud, was applied below in the usual way. As soon as the buds had attached themselves, the lower ligatures were taken off; but the others were suffered to remain. "The passage of the sap upwards was in consequence much obstructed, and the inserted buds began to vegetate strongly in July (being inserted in June); and when these had afforded shoots about four inches long, the remaining ligatures were taken off, to permit the excess of sap to pass on; and the young shoots were nailed to the wall. Being there properly exposed to light, their wood ripened well, and afforded blossoms in the succeeding spring; and these would, he adds, no doubt, have afforded fruit; but that, leaving my residence, I removed my trees, &c."

915. In a fortnight at farthest after budding, such as have *adhered* may be known by their fresh appearance at the eye; and in three weeks all those which have succeeded will be firmly united with the stock, and the parts being somewhat swelled in most species, the bandage must be loosened, and a week or two afterwards finally removed. The shield and bud now swell in common with the other parts of the stock; and nothing more requires to be done till spring, when, just before the rising of the sap, they are to be headed down close to the bud, by an oblique cut, terminating about an eighth or a quarter of an inch above the shield.

916. *Stocks for Budding* may, in general, be much smaller than for grafting, as the operation may be performed on the same year's shoot. But it may also be performed on shoots or stems of several years' growth, and in such, by inserting a number of buds, a complete tree may be formed at once.

917. The *instruments and materials* for budding are merely the budding-knife, (*fig.* 33.) and bass ligatures.

Subsect. 6. *Propagation by Cuttings.*

This mode of propagation is abundantly simple when applied to such free growing hardy shrubs, as the willow (*a*, *fig.* 271.) or the gooseberry (*b*,); but considered as the chief mode of propagating most of the ericeæ, myrteæ, proteaceæ, &c. it becomes one of the most delicate and difficult modes of continuing the species. It may be considered, as to the choice of cuttings, their preparation, their insertion in the soil, and their future management.

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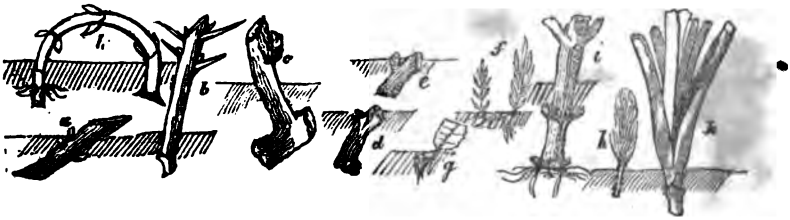

918. In respect to the *choice* of cuttings, those branches of trees and shrubs which are thrown out nearest the ground, and especially such as recline, or nearly so, on the earth's surface, have always the most tendency to produce roots. Even the branches of resinous trees, which are extremely difficult to propagate by cuttings, when reclining on the ground, if accidentally, or otherwise covered with earth in any part, will there throw out roots, and the extremity of the lateral shoot will assume the character of a main stem, as may be sometimes seen in the larch, spruce, and silver fir.

The choice of cuttings then is to be made from the side shoots of plants, rather than from their summits or main stems; and the strength and health of side shoots being equal, those nearest the ground should be preferred. The proper *time* for taking cuttings from the mother plant is, when the sap is in full motion, in order that, in returning by the bark, it may form a callus or protruding ring of granular substance, between the bark and wood whence the roots proceed. As this callus, or ring of spongy matter, is generally best formed in ripened wood, the cutting, when taken from the mother plant, should contain a part of the former year, or in plants which grow twice a year, of the wood of the former growth; or in the case of plants which are continually growing, as most evergreen exotics, such wood as has begun to ripen, or assume a brownish color. This is the true principle of the choice of cuttings as to time; but there are many sorts of trees, as willow, elder, &c. the cuttings of which will grow almost at any season, and especially if removed from the mother plant in winter, when the sap is at rest. In these and other trees, the principle of life seems so strong, and so universally diffused over the vegetable, that very little care is requisite for their propagation. Cuttings from herbaceous plants are chiefly chosen from the low growths, which do not indicate a tendency to blossom; but they will also succeed in many cases, when taken from the flower stems, and some rare sorts of florists' and border flowers, as the dahlia, rocket, cardinal-flower, scarlet-lychnis, wall-flower, &c. are so propagated.

919. The *Preparation of the Cutting* depends on, or is guided by this principle, that the power of protruding buds or roots resides chiefly, if not entirely, at what are called joints, or at those parts where leaves or buds already exist. Hence it is that cuttings ought always to be cut across, with the smoothest and soundest section possible, at an eye or joint. And as buds are in a more advanced state in wood somewhat ripened or fully formed, than in forming wood, this section ought to be made in the wood of the growth of the preceding season; or as it were in the point between the two growths. It is true, that there are many sorts of cuttings, which not only throw out roots from the ring of granulated matter, but also from the sides of every part of the stem inserted in the soil, whether old and large (*c*,) or young and small (*d* & *e*,) as willows, currants, vines, &c.; but all plants which are difficult to strike, as heaths, (*f*,) camelias, orange-trees, &c. will be found in the first instance, and for several years after propagation, to throw out roots only, from the ring of herbaceous matter abovementioned, and to facilitate the formation of this ring, by properly preparing the cuttings of even willows and currants, must be an obvious advantage. It is a common practice to cut off the whole or a part of the leaves of cuttings, which is always attended with bad effects in evergreens, in which the leaves may be said to supply nourishment to the cutting till it can sustain itself. This is very obvious in the case of striking from buds (*g*,) which, without a leaf attached, speedily rot and die. Leaves alone, as in bryophyllum calycinum, will even strike root, and form plants in some instances; and the same, as professor Thouin observes, may be stated of certain flowers and fruits.

920. The *Insertion of the Cuttings* may seem an easy matter, and none but a practical cultivator would imagine that there could be any difference in the growth, between cuttings inserted in the middle of a pot, and those inserted at its sides. Yet such is actually the case, and some sorts of trees, as the orange, ceratonia, &c. if inserted in a mere mass of earth, will hardly, if at all, throw out roots, while, if they are inserted at the sides of the pots, so as to touch the pot in their whole length, they seldom fail of becoming rooted plants. T. A. Knight found the mulberry strike very well by cuttings, when they were so inserted, and when their lower ends touched a stratum of gravel or broken pots; and J. Hawkins, (*Hort. Trans.* vol. ii. p. 12.) who had often tried to strike orange-trees, without success, at last heard of a method (long known to nurserymen), but which was re-discovered by J. L. Luscombe, by which, at the first trial, eleven cuttings out of thirteen grew. "The art is, to place them to touch the bottom of the pot; they are then to be plunged in a bark or hot-bed, and kept moist."

921. The *Management of Cuttings* after they are planted, depends on the general principle, that where life is weak, all excesses of exterior agency must have a tendency to render it extinct. No cutting requires to be planted deep, though such as are large (*i*,) ought to be inserted deeper than such as are small (*f* & *h*,). In the case of evergreens, the leaves should be kept from touching the soil (*h*,) otherwise they will damp

or rot off; and in the case of tubular stalked plants, which are in general not very easily struck, owing to the water lodging in the tube, and rotting the cutting, both ends (*l*,) may be advantageously inserted in the soil, and besides a greater certainty of success, two plants will be produced. Too much light, air, water, heat, or cold, are alike injurious. To guard against these extremes in tender sorts, the means hitherto devised, is that of inclosing an atmosphere over the cuttings, by means of a hand or bell-glass, according to their delicacy. This preserves a uniform stillness and moisture of atmosphere. Immersing the pot in earth (if the cuttings are in pots) has a tendency to preserve a steady uniform degree of moisture at the roots; and shading, or planting the cuttings, if in the open air in a shady situation, prevents the bad effects of excess of light. The only method of regulating the heat is by double or single coverings of glass or mats, or both. A hand-glass placed over a bell-glass, will preserve, in a shady situation, a very constant degree of heat. What the degree of heat ought to be, is decided by the degree of heat requisite for the mother plant. Whatever degree of heat is natural to the mother plant when in a growing state, will, in general, be most favorable to the growth of the cuttings. There are, however, some variations, amounting nearly, but not quite, to exceptions. Most species of the erica, dahlia, and geranium, strike better when supplied with rather more heat than is requisite for the growth of these plants in green-houses. The myrtle tribe, and camelias, require rather less; and in general it may be observed, that to give a lesser portion of heat, and of every thing else proper for plants in their rooted and growing state, is the safest conduct in respect to cuttings. Cuttings of deciduous hardy trees taken off in autumn, should not, of course, be put into heat till spring, but should be kept dormant, like the mother tree.

922. *Piping* is a mode of propagation by cuttings, and is adopted with plants having jointed tubular stems, as the dianthus tribe; and several of the grasses, and tree arundos, it is believed, might be propagated in this manner. When the shoot has nearly done growing, which generally happens after the blossom has expanded, its extremity is to be separated at a part of the stem where it is nearly, or at least somewhat indurated or ripened. This separation is effected by holding the root end between the finger and thumb of one hand, below a pair of leaves, and with the other, pulling the top part above the pair of leaves, so as to separate it from the root part of the stem at the socket, formed by the axillæ of the leaves, leaving the stem to remain with a tubular or pipe-looking termination. These pipings, or separated parts (*k*,) are inserted without any further preparation in finely sifted earth, to the depth of the first joint or pipe, and their future management regulated on the same general principles as cuttings.

Sect. III. *Operations of Rearing and Culture.*

These are various, and some of them of the simplest kind, as stirring the soil, weeding, watering, &c. have been already considered as garden labors on the soil (796.); we here, therefore, confine ourselves to the more complex processes of sowing, transplanting, pruning, thinning, training, and blanching.

Subsect. 1. *Sowing and Planting.*

923. *Sowing* is the first operation of rearing. Where seeds are deposited singly, as in rows of beans or large nuts, they are said to be planted; where dropt in numbers together, to be sown. The operation of sowing is either performed in drills, patches, or broadcast. Drills are small excavations formed with the draw hoe, generally in straight lines parallel to each other, and in depth and distance apart, varying according to the size of the seeds. In these drills, the seeds are strewed from the hand of the operator, who, taking a small quantity in the palm of his hand and fingers, regulates its emission by the thumb. Some seeds are very thinly sown, as the pea and spinage; others thick, as the cress, and small sallading. For sowing by *bedding-in*, see *Bedding-in planting* (968.)

924. *Patches* are small circular excavations made with the trowel; in these, seeds are either sown or planted, thicker or thinner, and covered more or less, according to their natures. This is the mode adopted in sowing in pots, and generally in flower borders.

925. In *broad-cast sowing*, the operator scatters the seed over a considerable breadth of surface previously prepared by digging, or otherwise being minutely pulverized. The seed is taken up in portions in the hand, and dispersed by a horizontal movement of the arm, to the extent of a semicircle, opening the hand at the same time, and scattering the seeds in the air, so as they may fall as equally as possible over the breadth taken in by the sower at once, and which is generally six feet; that being the diameter of the circle in which his hand moves through half the circumference. In sowing broad-cast on beds, and narrow strips or borders, the seeds are dispersed between the thumb and fingers by horizontal movements of the hand in segments of smaller circles.

Dry weather is essentially requisite for sowing, and more especially for the operation of covering in the seed, which in broad-cast sowing, is done by treading or gently rolling the surface, and then raking it; and in drill-sowing, by treading in the larger seeds, as peas, and covering with the rake; smaller seeds, sown in drills, are covered with the same implement without treading.

According to Henderson of Brechin, " It appears to be a fact, that the produce of some small seeds is connected with the time of sowing. Six years ago, I sowed on the flower border in front of our hot-houses, about 140 different kinds of annuals, allowing to each a patch of earth, and tallying them. In the other borders and shrubbery, I sowed the same kinds with equal care, and gave each patch about half a spadeful of compost dung. Of the first sowing, all the kinds grew, except about five or six; of the second, not ten different kinds appeared in all our extensive borders. It happened, that, at the time of the first sowing, there was a field in the park laid down in grass, and at the time of the second, another was laid down with equal care. In the first, the clover was complained of as too abundant; in the second, there was no clover at all, except about the head ridges. Sixteen years ago, I observed the very same result in an early and a later sowing of lucern. The natural course in these instances would be to lay the blame on the seeds, and complain of the merchant; but it turns out, that the seeds in these cases were taken from the same bags. There must, therefore, be some other cause of the failure of the latest sowing, and it will be found in the relation of the time of sowing, to the production of those insects which destroy the seed-leaf of the plant."

926. *Planting*, as applied to seeds, or seed-like roots, as potatoes, bulbs, &c. is most frequently performed in drills, or in separate holes made with the dibber; in these, the seed or bulb is dropt from the hand, and covered with or without treading, according to its nature. Sometimes planting is performed in patches, as in pots or borders, in which case the trowel is the chief implement used.

Quincunx is a mode of planting in rows, by which the plants in the one row are always opposed to the blanks in the other, so that when a plot of ground is planted in this way, the plants appear in rows in four directions.

Planting, as applied to plants already originated, consists generally in inserting them in the soil of the same depth, and in the same position as they were before removal, but with various exceptions. The principal object is to preserve the fibrous roots entire, to distribute them equally around the stem among the mould or finer soil, and to preserve the plant upright. The plant should not be planted deeper than it stood in the soil before removal, and commonly the same side should be kept towards the sun. Planting should, as much as possible, be accompanied by abundant watering, in order to consolidate the soil about the roots; and where the soil is dry, or not a stiff clay, it may be performed in the beginning of wet weather in gardens; and in forest planting, on dry soils, in all open weather during autumn, winter, and spring.

927. *Watering* becomes requisite in gardens for various purposes, as aliment to plants in a growing state, as support to newly transplanted plants, for keeping under insects, and keeping clean the leaves of vegetables. One general rule must be ever kept in mind during the employment of water in a garden; that is, never to water the top or leaves of a plant when the sun shines. A moment's reflection will convince any one that this rule is agreeable to the laws of nature, for during rain the sun's rays are intercepted by a panoply of fog or clouds. All watering, therefore, should be carried on in the evening or early in the morning, unless it be confined to watering the roots, in which case, transplanted plants, and others in a growing state, may be watered at any time; and if they are shaded from the sun, they may also be watered over their tops. Watering over the tops is performed with the *rose*, or dispenser attached to the spout of the watering-pot, or by the syringe or engine. Watering the roots is best done with the rose; but in the case of watering pots in haste, and where the earth is hardened, it is done with the naked spout. The quarters of gardens are sometimes watered by a leather tube and muzzle attached at pleasure to different pipes of supply; but this depends on local circumstances, and, in general, it may be observed that the great increase of labor occasioned by watering quarters renders the practice very limited. In new laid turf, or lawns of a loose porous soil, and too mossy surface, the water barrel (*fig.* 116.) may be advantageously used.

Subsect. 2. *Transplanting.*

Transplanting is the next operation of rearing, and consists in removing propagated plants, whether from seeds, cuttings, or grafts, according to their kinds and other circumstances, to a situation prepared to receive them. Transplanting, therefore, involves three things: first, the preparation of the soil to which the plant is to be removed; secondly, the removal of the plant; and, thirdly, the insertion in the prepared soil.

928. The *Preparation* of the soil implies, in all cases, stirring, loosening, mixing, and comminution; and, in many cases, the addition of manure or compost, according to the

nature of the soil and plant to be inserted, and according as the same may be in the open ground, or in pots or hot-houses.

929. The *Removal* of the plant is generally effected by loosening the earth around it, and then drawing it out of the soil with the hand; in all cases avoiding as much as possible to break, or bruise, or otherwise injure the roots. In the case of small seedling plants, merely inserting the spade, and raising the portion of earth in which they grow will suffice; but in removing larger plants, it is necessary to dig a trench round, or on one side of the plant. In some cases, the plant may be lifted with a ball or mass of earth, containing all or great part of its roots, by means of the trowel or *transplanter* (*fig.* 17.); and in others, as in the case of large shrubs or trees, it may be necessary to cut the roots at a certain distance from the plant, one year before removal, in order to furnish them with young fibres, to enable them to support the change. In pots, less care is necessary, as the roots and ball of earth containing them are, or may be, preserved entire.

930. *Inserting* the removed plant in the prepared soil, is performed by making an excavation suitable to the size of the plant, with the dibber, trowel, or spade.

931. Of *Spade Planting*, there are a variety of different sorts, known by the names of hole planting, trench planting, trenching-in planting, slit or crevice planting, holing-in planting, drill planting, bedding-in planting, furrow planting, &c. All these modes are almost peculiar to nursery gardening.

932. *Hole Planting* is the principal method practised in the final planting of all sorts of trees and shrubs in the open ground; and is performed by opening round holes for the reception of each plant somewhat larger than its roots, then inserting the plant according to the general principles of planting (926).

933. *Trench Planting* is practised in nurseries, in planting out seedlings of trees, and plants in rows, also for box edgings, small hedge plants, asparagus, &c. It is performed by opening a long narrow trench with a spade, making one side upright, placing the plants against the upright side, and turning in the earth upon their roots.

934. *Trenching-in Planting* is practised in light pliable-working ground, for planting young trees in nurseries, thorn hedges, &c. It is performed by digging a trench one spit wide, by a line, and planting from one end of the trench towards the other, as the trench is being dug. Thus, the line being set, and the plants ready, with your spade, begin at one end, and standing side-ways to the line, throw out a spit or two of earth, which forming a small aperture, another person being ready with the plants, let him directly insert one in the opening, whilst the digger proceeds with the digging, and covers the roots of the plants with the earth of the next spit. Another aperture being thereby also formed, place therein another plant, and so on.

Another method of trenching-in planting sometimes used for planting certain roots, such as horse-radish-sets, potatoes, &c. is performed by common trenching, placing a row of sets in each trench or furrow. The horse-radish should be planted in the bottom of the open trench, if not above twelve inches deep, turning the earth of the next over them; and the potatoe-sets placed about four or six inches deep, and cover them also with the earth of the next trench.

935. *Slit Planting.* This method is performed by making slits or crevices with a spade in the ground, at particular distances, for the reception of small trees and shrub plants. It is practised sometimes in the nursery, in putting out rows of small plants, suckers, &c. from about a foot or eighteen inches or two feet high, and that have but small roots: it is also sometimes practised where very large tracts of forest-trees are to be planted by the most expeditious and cheapest method of planting; the following is the method:

A line is set, or a mark made accordingly; then having a quantity of plants ready, for they must be planted as you proceed in making the slits, let a man, having a good clean spade strike it into the ground with its back close to the line or mark, taking it out again directly, so as to leave the slit open: he then gives another stroke at right angles with the first; then the person with the plants inserts one immediately into the second-made crevice, bringing it up to the line or mark, and directly pressing the earth close to the plant with his foot; proceed in the same manner to insert another plant, and so on. A man and a boy, by this method, will plant ten or fifteen hundred, or more, in a day.

936. *Holing-in Planting.* This is sometimes used in the nursery-way in light loose ground; and sometimes in planting potatoes, &c. in pliable soils. The ground being previously digged or trenched, and a line placed, proceed thus: let one man, with his spade, take out a small spit of earth, and in the hole so formed let another person directly deposit a plant; then let the digger take another spit at a little distance, and turn the earth thereof into the first hole over the roots; then placing directly another plant in this second opening, let the digger cover it with the earth of a third, and so on.

937. *Drill Planting.* This is by drawing drills with a hoe, from two to four or five inches deep, for the reception of seeds and roots, and is a commodious method of planting many sorts of large seeds, such as walnuts, cheenuts, &c.; sometimes also broad beans, but always for kidney-beans and peas: likewise for planting many sorts of bulbous roots, when to be deposited in beds by themselves. The drills for all of these purposes should be drawn with a common hoe, two or three inches deep; though, for large kinds of bulbous roots, four or five inches deep will be requisite, and the seeds and roots should always be covered the depth of the drills. See *Sowing* (923.)

938. *Bedding-in Planting.* This is frequently practised for planting the choicer kinds of flowering bulbs, such as hyacinths, &c.; also for larger seeds of trees; as acorns, large nuts, and other kinds of seeds, stones, and kernels, and is performed by drawing the earth from off the tops of the beds, some inches in depth, then planting or sowing the seeds or roots, and covering them over with the earth, drawn off for that purpose. The following is the mode of performance.

The ground must be previously digged or trenched, raked, and formed into beds three or four feet wide, with alleys between bed and bed; then with a rake or spade, trim the earth evenly from off the top of the bed into the alleys, from two or three, to four inches deep for bulbous roots, and for seeds, one or two inches, according to what they are, and their size; then, if for bulbous roots, draw lines along the surface of the bed, nine inches distance, place the roots bottom downward, along the lines, six or eight inches apart, thrusting the bottom into the earth. Having thus planted one bed, then with the spade, let the earth that was drawn off into the alley, be spread evenly upon the bed again, over the roots or seeds, being careful that they are covered all equally of the above depth, and rake the surface smooth. This method is also practised in nurseries, for sowing such seeds as require great accuracy in covering, as the larch, pine, and fir tribe; and, indeed, for most other tree seeds.

939. *Furrow Planting.* This is by drawing furrows with a plough, and depositing sets or plants in the furrow, covering them in also with the plough. It is sometimes practised for planting potatoe-sets in fields, and has been practised in planting young trees, for large tracts of forest-tree plantations, where the cheapest and most expeditious method was required; but it can only be practised advantageously in light pliable ground. It is thus performed: a furrow being drawn, one or two persons are employed in placing the sets or plants in the furrow, whilst the plough following immediately with another furrow, turns the earth thereof in upon the roots of the plants.

940. *Dibble Planting.* This is the most commodious method for planting most sorts of fibrous-rooted seedling plants, slips, off-sets, and cuttings both of herbaceous and shrubby kinds; and likewise for some kinds of seeds and roots, such as broad-beans, potatoe-sets, Jerusalem artichokes, and horse-radish-sets, bulbous roots, &c. It is expeditiously performed with a dibble or setting-stick; therewith making a narrow hole in the earth for each plant or root, inserting one in each hole as you go on, &c.

941. *Trowel Planting.* This is performed with a garden-trowel, which being made hollow like a scoop, is useful in transplanting many sorts of young fibrous-rooted plants with balls of earth about their roots, so as they may not be checked by their removal.

942. *Planting with Balls.* By removing a plant with its roots firmly attached to a surrounding ball of earth, it continues in a growing state, without receiving any, or but very little check from its removal. This mode is often practised more particularly to the more delicate and choicer kinds of exotics, both trees, shrubs, and herbaceous plants; and occasionally to many of the fibrous-rooted, flowery plants, both annuals and perennials, even in their advanced growth and flowering state, when particularly wanted to supply any deficient compartments, or when intended to remove any sort of tree or plant out of the proper planting season, as very late in spring, or in summer.

The most difficult tribe of plants to transplant, when in a growing state, are bulbous roots; which succeed with difficulty, even when removed with balls attached.

943. Planting by *mudding-in* (*einschlamen*) is a German practice in planting fruit-trees, particularly suitable to the dry sandy soils of that country, and sometimes adopted in similar situations in this country. The pit being dug out, the mould in its bottom is watered and stirred so as to form a mass of mud about half the depth of the pit; the tree is then inserted, and its roots worked up and down in the mud so as to spread them as much as possible equally through it. More mud, previously prepared, is poured in till the pit is full, which is then covered with dry earth, raised round the stem, but hollowed in the middle, so as to form a basin round its stem, and finally covered with litter (*mulched*), and, if a standard, fastened to a stake to protect it from winds. Diel, a scientific German author already mentioned (75), assures his readers, that trees planted in this way in spring thrive better in cold situations than those planted in the ordinary way in the preceding autumn; and, that though it occasions considerable trouble, it should never be neglected either in spring or autumn. He found it also particularly useful in the case of planting fruit trees in pots. *Obst. Orangerie*, &c. vol. ii.

944. *Panning* is an almost obsolete phrase, applied by Switzer, and writers of his day, to the operation of forming the above-mentioned hollow or basin round trees, for the purpose of retaining water when given them by art. *Mulching* consists in laying a circle of litter round the roots of new-planted trees, to retain the natural humidity of the soil, or to prevent the evaporation of artificial waterings. *Staking* is the operation of supporting standard-trees, by tying them with straw, or other soft ties, to poles or stakes inserted firmly in the ground close to the tree.

945. *Edgings* are rows of low-growing plants, as box, daisy, &c. planted in lines along the margins of walks and alleys, to separate them from the earth and gravel. They should always be planted before either the gravel or sub-stratum are deposited. To perform the operation, the first thing is to form the surfaces for the edgings in planes, corresponding with the established slopes or levels of the borders or other parts of the garden, observing, that a line crossing the walk at right angles, and touching both of the prepared surfaces, must always be a horizontal line, whether the walk be on a level, or slope. Suppose a walk 150 feet long on a gentle declivity, and that the level or height of both ends are fixed on; then by the operation of the borning-pieces, any number of intermediate points is readily formed to the same slope, and the spaces between these points are regulated by the eye or the application of the straight edge. The earth, so formed into a regular slope, need not exceed about a foot in breadth, on which the line being stretched, half is to be cut down, with a face sloping towards the walk, and against this sloping, or nearly perpendicular face, the box is to be laid as thin and regular as practicable, and every where to the same height, say one inch above the soil. The box is to be previously prepared by separation, and shortening the roots and tops. This is one of those operations, on the performance of which, with accuracy, depends much of the beauty of kitchen-gardens.

946. *Verges* are edgings of turf, generally two feet broad or upwards. The turves being cut in regular lamina, with the edges or sides of each turf perpendicular, and the two ends oblique in the same slope, they are to be placed so as the one may fit exactly to the other. They are next to be beat with the beetle, afterwards watered, and again beat or rolled, and finally a line applied to their edges, and the *racer* (*fig.* 26.) used to cut them off neatly and perpendicularly. If the turf is from loamy soil, this is readily effected; but if no turf can be got but from sandy soils, then it must be cut very thin, and placed on good earth or loam, according to circumstances. Verges are sometimes, though rarely, formed of camomile, strawberries, dwarf-thyme, &c. in which situations the wood strawberry and camomile produce abundant crops.

947. *Turfing* is the operation of laying down turf on surfaces intended for lawn in parterres or pleasure-grounds. The turf is cut from a smooth firm part of an old sheep pasture, in performing which the ground is first crossed by parallel lines, about a foot asunder, and afterwards intersected by others three feet asunder, both made with a line and the turf-racer. Afterwards, the turf-spade or turfing-iron is employed to separate the individual turves, which are rolled up, and conveyed to the spot where they are to be used. It is to be observed, that, in this case, all the sides of each turf are bevelled; by which means, when they are laid down exactly as they were before being taken up, their edges will fit, and in some degree lap over each other, and thereby, after rolling, a more compact surface will be formed.

The surface on which the turves are to be laid, ought previously to be either dug or trenched, so as to be brought to one degree of consistency, and then rolled, so as it may not afterwards sink; the turves being laid so as to fit, are to be first beaten individually, and then watered and rolled till the whole is smooth and even.

In the choice of ground from which to cut turves, care must be taken that the grasses are neither of the annual sorts, as *poa annua*, nor of the coarse sorts, as *dactylus*, *triticum*, *avena*, &c.

948. *In transplanting in pots*, the general practice is to begin with the smallest sized pot, and gradually to transplant into others larger, as the plant advances, and as the object may be to produce a large or a small plant. In the case of balsams and tender annuals, this may require to be performed three or four times a month, till the plant has attained its full size; in the case of heaths, not more than once in a year or seldomer.

The operation of potting is thus performed. Having the pots and mould ready for the reception of the intended plants, observe, previous to planting them, to place some pieces of tile, potsherds or oyster-shells, or gravel over the hole at the bottom of the pot, both to prevent the hole from being clogged and stopped with the earth, and the earth from being washed out with occasional watering; and also to prevent the roots of the plants from getting out. Having secured the holes, place some earth in the bottom of each pot, from two or three to five or six inches or more in depth, according to the size of the pot, and the roots of the plant. This done, insert the plant in the middle of the pot, upon the earth, in an upright position; if without a ball of earth, spread its roots equally every way, and directly add a quantity of fine mould about all the roots and fibres, shaking the pot to cause the earth to settle close about them; at the same time, if the roots stand too low, shake it gently up, as you shall see occasion; and having filled the pot with earth, press it gently all round with the hand to settle it moderately firm in every part, and to steady the upright posture of the plant, raising the earth, however, within about half an inch, or less, of the top of the pot. It will soon settle lower, and thereby leave a void space at top, which is necessary to receive occasional waterings. As soon as the plant is thus potted, give directly a moderate watering to settle the earth more effectually close about all the roots, and promote their shooting into the new earth; repeating the waterings as occasion requires.

949. Transplanting potted plants from one pot to another, is called *shifting;* and is performed with the whole ball of earth contained in the pot entire, so as to preserve the plant in its growing state.

The method of removing them out of the pots with balls, is generally easily effected. Sometimes in small plants it is performed by turning the pot upside down, and striking the edge against the side of a bench, or edge of the boards of a wheelbarrow, or the like, when the ball comes out entire. Or sometimes a plant that is very well rooted, and whose numerous fibres surround the outside of the ball, will readily quit the pot by drawing it by the stem. But if, by either of the above methods, the ball will not readily quit the pot, thrust a narrow thin slip of wood down all round the pot, when the ball will come out by the process of striking the edge of the pot with the greatest facility. Sometimes, however, the bellied form of the pot and the luxuriance of the roots, which circulate between the pot and earth, prevent the possibility of removing the ball entire; in which case, either that circumstance must be dispensed with, or the pot be broken.

The process of removal being effected, the next operation is the replanting in larger pots; and the first step regards the management of the numerous fibres which surround the outside ball. When these are not numerous, the general practice is to leave them untouched; but when they are so abundant as to form a sort of matted coat, like the inside of a bird's nest all around, then the practice is to trim the greater part of them off close to the ball, both on the sides and bottom, together with some of the outward old earth of the ball; then having the pots of proper sizes, larger than the former ones, and having secured the holes at bottom, and put in some fresh compost, deposit the plant with its entire ball in the pot, taking care that it stands in the centre erect, and of the same depth as before. Then fill up all the interstices round the ball with fresh mould, pressing it down, and ramming it round the sides with a broad stick, adding more mould gradually, and raising it so as to cover the old ball, and finish with a moderate watering, to settle the new earth close in every part.

J. Hayward has suggested the idea of a moveable bottom for more readily shifting potted plants with matted roots; and we have already (620.) described the orange-boxes used at Versailles, and by J. Mean at Wormsleybury, by which fresh earth can be put to the sides of the largest plants with little trouble.

Transplanting with balls is to be avoided in the case of diseased plants, unless it be evident that the disease has no connection with the ball of earth and the roots. Very frequently, however, the diseases of plants in pots arise from the want of a proper vent for the water; and from their having had too much given them; hence in transplanting such plants, it is eligible to shake the whole entirely out of the earth, in order to examine its roots, and trim off all decayed and other bad parts; then having a fresh pot, and some entire new compost, replant as already directed.

In potting plants from the full ground, or beds of earth on dung or otherwise, if they have been previously pricked out at certain distances, and have stood long enough to fix their roots firmly, they may be moved into pots with balls, by the proper use of the trowel, transplanter, or hollow spade. Seedlings, however, cannot often be raised with balls, and are therefore planted in the smallest sized pots first, and gradually removed into larger ones with their balls entire.

Plants in pots are never shifted directly from small into large pots, but always into a size only one gradation larger than that in which they are. Experience proves that this is the best mode, and also that plants, in general, thrive best in small pots. The reason seems to be that, in large pots, the roots are apt to be chilled and rotted by the retention of more water than is requisite for their well being.

Subsect. 3. *Pruning.*

950. The amputation of part of a plant with the knife, or other instrument, is practised for various purposes, but chiefly on trees, and more especially on those of the fruit-bearing kinds.

Of two adjoining and equal sized branches of the same tree, if the one be cut off, that remaining will profit by the sap which would have nourished the other, and both the leaves and the fruits which it may produce will exceed their natural size.

If part of a branch be cut off which would have carried a number of fruits, those which remain will set, or fix better, and become larger.

On the observation of these facts is founded the whole theory of pruning; which, though like many other practices of culture, cannot be said to exist very obviously in nature, is yet the most essential of all operations for the culture of fruit produced on trees.

The grape, the first of all fruits, even in the soils and climates which are most natural to it, (as in Albania and Syria,) is worth nothing, if the vine has not been pruned.

The objects of pruning may be reduced to the following: promoting growth and bulk; lessening bulk; modifying form; promoting the formation of blossom-buds; enlarging fruit; adjusting the stem and branches to the roots; renewal of decayed plants or trees; and removal or cure of diseases.

951. *Pruning for promoting the Growth and Bulk of a Tree* is the simplest object of pruning, and is that chiefly which is employed by nursery-men with young trees of every description. The art is to cut off all the weak lateral shoots, that the portion of sap destined for their nourishment may be thrown into the strong ones. In some cases, besides cutting off the weak shoots, the strong ones are shortened, in order to produce three or four shoots instead of one. In general, mere bulk being the object, upright shoots are encouraged rather than lateral ones; excepting in the case of trained trees, where shoots are encouraged at all angles, from the horizontal to the perpendicular, but more especially at the medium of 45 degrees. In old trees, this object is greatly promoted by the removal, with the proper instruments, of the dead outer bark.

952. *Pruning for lessening the Bulk of the Tree* is also chiefly confined to nursery practice, as necessary to keep unsold trees portable. It consists in little more than what is technically called *heading down*, that is cutting off the leading shoots within an inch or two of the main stem, leaving, in some cases, some of the lower lateral shoots. Care is taken to cut to a leaf-bud (814.), and to choose such from among the side, upper, or under buds of the shoot, according as the succeeding year's shoots may be wanted, in radiated lines from the stem, or in oblique lines in some places to fill up vacancies. It is evident that this unnatural operation persisted in for a few years must render the tree knotty and unsightly, and in stone-fruits, at least, it is apt to generate canker and gum.

953. *Pruning for modifying the Form of the Tree embraces* the management of the plant from the time of its propagation. Almost every tree has a different natural form, and in botanic and landscape gardening it is seldom desirable to attempt altering these by pruning, or by any other operation. But in rearing trees planted for timber, it is desirable to throw the timber produced, as much as possible, into long compact masses; and hence pruning is employed to remove the side branches, and encourage the growth of the bole or stem. Where this operation is begun when the trees are young, it is easily performed every two or three years, and the progress of the trees under it is most satisfactory; when, however, it is delayed till they have attained a timber size, it is, in all cases, much less conducive to the desired end, and sometimes may prove injurious. It is safer in such cases to shorten or lessen the size of lateral branches, rather than to cut them off close by the stem, as the large wounds produced by the latter practice either do not cicatrize at all, or not till the central part is rotten, and has contaminated the timber of the trunk. In all cases, a moderate number of small branches, to be taken off as they grow large, are to be left on the trunk, to facilitate the circulation of the sap and juices.

Where timber-trees are planted for shelter or shade, unless intermixed with shrubs or copse, it is evident pruning must be directed to clothing them from the summit to the ground, with side branches. In avenues and hedge-row trees, it is generally desirable that the lowest branches should be a considerable distance from the ground; in trees intended to conceal objects, as many branches should be left as possible; and in others, which conceal distant objects desired to be seen, or injure or conceal near objects, the form must be modified accordingly. In all these cases, the superfluous parts are to be cut off with a clean section, near a bud or shoot if a branch is shortened, or close to the trunk if it is entirely removed; the object being to facilitate cicatrization.

But the grand art of pruning, not only as to the modification of form, but in all its other varieties, relates to fruit-trees, of which the leading characters are standards and wall-trees; the former including dwarfs and half-standards, and the latter, dwarfs and riders.

954. *Pruning to form Dwarf Standards*. The plants being received from the nursery, furnished with shoots of one year's growth, are to be cut down to three or four buds, which buds will throw out other shoots the following year, to form the bush or dwarf. If these buds throw out, during the second year, more than can grow the third year without crossing or intermixing with each other, then the superfluous shoots must be cut off;

but if too few to form a head regularly balanced, or projecting equally beyond the stem on all sides, then one or more of the shoots in the deficient part must be cut down to three or four eyes, as before, to fill up by shoots of the third year the vacancies in the bush. In this way must the tree be treated year after year, cutting away all cross placed branches and crowded shoots, till at last it shall have formed a head or bush globular, oblong, or of any other shape, according to its nature, and with this property common to every form, that all the shoots be so far distant from each other as not to exclude the sun's rays, air, or rain, from the blossoms and fruit. Such is the most approved modern mode of training fruit-trees, bushes or dwarf-standards; but, about a century ago, when dwarfs were in the greatest vogue, they were trained without the least regard to the natural shape or tendency of the branches of the tree into regular geometrical shapes. In the works of Quintiney and Arnaud d'Andilly are described —

1. *Concave Dwarfs*, being trained concave or hollow in the middle, having all the branches ranged circularly around the stem, in an ascending direction, so as to form the heart of the tree hollow or concave.

2. *Convex or conical Dwarfs*, being trained, bellied out, or somewhat spindle-shaped in the middle, so as to form a sort of conical head.

3. *Horizontal Dwarfs*, in which all the branches were trained in a flat position, parallel to the surface of the earth.

4. *Spiral Dwarfs*, (*fig.* 272.) in which the branches were trained spirally round stakes, which stakes were afterwards removed.

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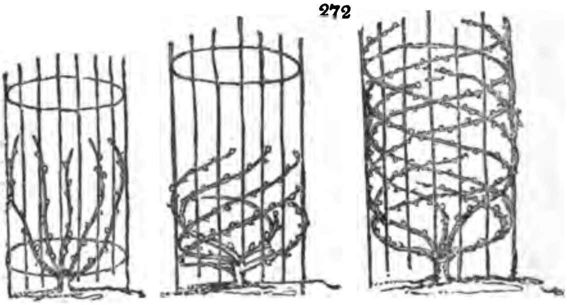

5. *Fan Dwarfs*, (palmettes,) in which the branches were spread out like the hand, or like a spread fan.

6. *Distaffs*, in which the branches bellied out in the middle, and gradually tapered to each extremity of the bush, but especially to the top; and

7. *Natural Dwarfs*, in which the branches were permitted to advance in their natural mode of growth, being only thinned, or shortened, or deprived of supernumerary side-shoots, as already described.

Some authors observe that all these forms may be introduced for the sake of variety; but of all forms which require constraint, as being contrary to the natural shape of the bush and tendency of the branches, it may, with certainty, be observed that they can only be maintained by continual exertion in counteracting nature; and that the trees so constrained and cut, generally throw out, at particular parts, such a superfluity of useless wood, as greatly to lessen their tendency to produce blossom-buds. Each variety of the apple-tree, observes T. A. Knight, "has its own peculiar form of growth, and this it will ultimately assume, in a considerable degree, in defiance of the art of the pruner." The same remark, it is obvious, applies to every sort of tree.

955. *Pruning half and entire Standards* is conducted exactly on the same general principles as pruning dwarfs; the only difference between them being that, in the one case, the bush or head is close to the ground, and in the other, it is elevated from it three or four feet, as in what are called half standards, and six or eight feet, in what are called entire standards. Of the common hardy fruit-trees, it may be observed, that the appple, plum, quince, medlar, and mulberry, form a forked irregular head, (*a*, *fig.* 273.), and the pear and cherry a

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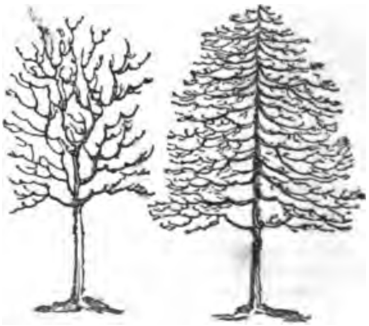

more regular cone, with lateral branches proceeding from an upright stem, (*b*, 273.) The French are particularly expert in pruning their pear-trees into this form, assisted sometimes by a rod to train the central shoot.

"In pruning the apple-tree, and all other standard trees, the points of the external branches should be every where rendered thin and pervious to the light; so that the internal parts of the tree may not be wholly shaded by the external parts: the light should penetrate deeply into the tree on every side; but not any where through it. When the pruner has judiciously executed his work, every part of the tree, internal as well as external, will be productive of fruit; and the internal part, in unfavorable seasons, will rather receive protection than injury from the external. A tree thus pruned, will not only produce much more fruit, but will also be able to support a much heavier load of it, without danger of being broken; for any given weight will depress the branch, not simply in proportion to its quantity, but in the compound proportion of its quantity, and of its horizontal distance from the point of suspension, by a mode of action similar to that of the weight on the beam of the steel-yard; and hence a hundred and fifty pounds, suspended at one foot distance from the trunk, will depress the branch which supports it no more than ten pounds at fifteen feet distance would do. Every tree will, therefore, support a larger weight of fruit without danger of being broken, in proportion as the parts of such weight are made to approach nearer to its centre."

J. Hayward, a late writer on horticulture, has brought together (*Science of Horticulture, &c.* 1818.) a variety of opinions and practices as to fruit-trees, and given some opinions of his own which merit attention. He observes, that the system in general practice of raising and training standard-trees is "imperfect and deficient, particularly in shaping and forming their heads." Hitt, he says, "has recommended the best shape adapted to every desirable purpose;" Hitt "recommends that the shape or figure of standards should be conical, like the natural growth of the fir-tree; and to a certain height, almost all fruit-trees are naturally inclined to grow in this manner." Hayward considers that Hitt rather depresses too much the horizontal branches for the attainment of this figure in perfection; to facilitate this object, he says, the graft from which the tree is raised should "be inserted with its point or extreme bud perfect;" and in respect to pruning "almost every kind of fruit-tree," "it is improper to prune or head-back a tree at any period, or for any purpose but to repair injuries."

"When trees have been headed back, and have from three to five branches of nearly the same strength, it is difficult to give one the ascendancy, and at the same time to preserve a regular figure; but if trees are raised from the point bud, and they proceed uninjured or unchecked, by accident or otherwise, in the manner I have before explained, the horizontals will naturally form and range themselves with regularity, immediately round the extremity of the annual shoot, and will thus prove to be at the distance, and in the position, best adapted to the nature of the tree, and the soil and situation it grows in.

"A tree planted in a rich soil, and well sheltered, will attain a great height and size, and as it will require, so it will make shoots of great length, and the horizontals will form at great distances, so as to acquire a surface proportioned to its supply, and be in a fructiferous state in its usual time; and if planted in a poorer soil, its shoots will be alike proportioned to produce the needful surface, so that there will be no necessity for cutting or stopping, which operation always proves injurious to every tree, and more particularly so to a standard, as it retards its bearing.

"A side-bud should never be forced to form a perpendicular stem but in case of necessity, from any injury or loss of the original. The buds which are naturally arranged round the extreme or point bud, will always grow the strongest, and regularly take the lead of all below of the same age, and form the horizontals in regular tiers; it will therefore seldom be necessary to take off any of the side-branches, for at least a year or two after they are formed; if they are suffered to remain, they will incline the stem to grow stouter and more conical, which will give it more strength, and also keep it more within its natural growth; after a year or two, if they are found too many and too close, they may be thinned and regulated.

"By training, or rather permitting a tree to grow in this manner, it will be found that all the effects desired and intended to be obtained, by the old methods of training and pruning, either young or old trees, will be gained, and with very little difficulty, at its commencement, during its progress, or towards its end.

"Every particle of food consumed will be profitably applied, by the whole of the sap taking its free course, the tree will become fructiferous in the shortest possible time, and the fruit will be so placed and sustained as to attain the most perfect quality, and the greatest quantity.

"Both the stem and the branches, by their conical shape, will be capable of resisting greater pressure from the weight of fruit, snow, wind, &c. and as large amputations will not be required, or accidental fracture so frequent, the health and progress of growth will be more regular and lasting. And that which Mr. Knight justly states to be absolutely necessary to put a tree in a state of perfection, 'an equal division and distribution of the sap to every part,' will be, by this mode, obtained.

"If, by any means, the leading or centre branch be destroyed or injured, so as to prevent its maintaining its position, it must be shortened to some bud, which will admit of being trained up in its place, or if this cannot be done, one of the strongest and uppermost horizontals may be raised up and fastened in a perpendicular position, and whilst young, this is easily done, by tying one end of a straight stick of sufficient strength to the stem of the tree, a foot or more below the branch it is intended to support, and then fastening the branch above to it; being fixed in this position, it will soon gain the ascendancy, and perform its office; but if the stem should be destroyed so low down, that the next horizontals will be too large to be brought up, a graft may be inserted in the stem, which will soon recover its place.

956. *Pruning, for the Modification of Fruit-trees trained on Walls, or Espaliers,* depends on the principle of training which may be adopted. The selection being made of such shoots as are requisite for carrying on the form of the training tree; the others are to be cut off, first on the general principles recommended for all cutting (814.); and secondly, according to the particular nature of the tree.

All trees which are much cut or constrained, have a tendency to throw out over-luxuriant shoots at particular parts of the branches where the sap is suddenly checked; such shoots seem to employ the great body of the sap, and thus divert it from performing its functions in the other parts of the branch or tree. The largest of these shoots, the French term *gourmands,* or gluttons; and the lesser ones, which have their leaves very distant and the wood slender, with hardly any appearance of buds in the axillæ of the leaves, they term *water-shoots.* As soon, in the growing season, as the character of both these sorts of shoots, especially of the latter, is known, they ought to be pinched off, with the exception of some cases, at the discretion of an intelligent pruner, where the gourmand may fill up a vacancy, supply a decaying branch, or otherwise be so situated as to assist in forming the tree. This chiefly happens when they are thrown out on the sides of wall-trees, so as to admit of being checked by a horizontal or oblique position in training. What are called fore-right and back shoots, or such as are thrown out nearly at right angles to the training surface, ought to be rubbed or pinched off, as ill adapted for training, or being applied to the training surface; but with the same exceptions as for gourmands. Where the grand object is fruit, however, it is well remarked by Marshall, (*Introd. to Gard.*) "that in this matter, the end in view is not to be sacrificed to fanciful precision."

957. *Pruning to promote the Formation of Blossom-buds* depends on the nature of the tree. The peach and nectarine, for example, produce their blossoms on the preceding year's wood; consequently the great art of pruning a peach-tree is to have a regular distribution of young wood over every part of it. This the tree has a natural tendency to effect itself, and all that is required from the pruner is, when these shoots are too abundant, to rub them off in the summer pruning, and where they are too few, to cut or shorten some of the least valuable branches or shoots in the winter pruning. In apples and pears, on the contrary, the blossoms are chiefly produced on short leafy protuberances, called spurs, which form themselves naturally along the sides of the shoots, chiefly of apples and pears, but also of plums, cherries, quinces, medlars, and, to a certain degree, the apricot, which produces blossoms on last year's wood, and on spurs and small twigs from the shoots of the second year preceding.

The production of bearing or blossom-buds is sometimes promoted by cutting out weak wood, by which what remains is strengthened; and shortening or stopping the shoots of the vine in summer is believed by many to have the same effect. The rose, syringo, lilac, and many shrubs, produce their blossoms in the wood of the present year, and it is not clear that the blossoms are formed previous to the developement of the buds. It is desirable, when blossoms are wanted in these shrubs, to cut down both old and new wood.

958. *Pruning for the Enlargement of the Fruit* is effected either by diminishing the number of blossom-bearing branches, or shortening them; both which operations depend on the nature of the tree: the mode of shortening is particularly applicable to the vine, the raspberry, and to old kernel fruit-trees.

959. *Pruning for adjusting the Stem and Branches to the Roots* is almost solely applicable to transplanted trees, in which it is an essential operation; and should be performed in general in the interval between removal and replanting, when the plant is entirely out of the ground. Supposing only the extremities of the fibres broken off, as is the case in very small plants and seedlings, then no part of the top will require to be removed; but if the roots have been broken or bruised in any of their main branches or ramifications, then the pruner, estimating the quantity of root of which the plant

is deprived by the sections of fracture and other circumstances, peculiar and general, will be able to form a notion of what was the bulk of the whole roots before the tree was undisturbed. Then he may state the question of lessening the top to adjust it to the roots thus. As the whole quantity of roots which the tree had before removal, is to the whole quantity of branches which it now has, so is the quantity of roots which it now has to the quantity of top which it ought to have. In selecting the shoots to be removed, regard must be had to the ultimate character the tree is to assume, whether a standard, or trained fruit-tree, or ornamental bush. In general, bearing-wood and weak shoots should be removed, and the stronger lateral and upright shoots, with leaf or shoot-eyes, left.

960. *Pruning for Renewal of the Head* is performed by cutting over the stem a little way, say its own thickness above the collar, or the surface of the ground. This practice applies to old osier-beds, coppice-woods, and to young forest-trees. Sometimes also it is performed on old, or ill-thriving fruit-trees, which are headed down to the top of their stems. This operation is performed with the saw, and better after scarification, as in cutting off the broken limb of an animal. The live section should be smoothed with the chisel or knife, covered with the bark, and coated over with grafting clay, or any convenient composition, which will resist drought and rain for a year. Those who are advocates for pruning when the sap is dormant, will not of course be able to perform the operation of scarification, and covering the section with bark.

961. *Pruning for curing Diseases* has acquired much celebrity since the time of Forsyth, whose amputations and scarifications for the canker, together with the plaster or composition which he employed to protect the wounds from air, are treated of at large in his *Treatise on Fruit-Trees*. Almost all vegetable diseases either have their origin in the weakness of the individual, or induce a degree of weakness, hence to amputate a part of a diseased tree is to strengthen the remaining part, because the roots remaining of the same force, the same quantity of sap will be thrown upwards as when the head and branches were entire. If the disease is constitutional, or in the system, this practice may probably, in some cases, communicate to the tree so much strength as to enable it to throw it off; if it be local, the amputation of the part will at once remove the disease, and strengthen the tree.

For the removal of diseases, whole branches, the entire head, single shoots, or merely the diseased spot in the bark or wood, may require to be cut off. In the removal of merely diseased spots, care must be taken to remove the whole extent of the part affected with a part of the sound wood and bark; and, in like manner, in amputating a diseased shoot or branch, a few inches or feet of healthy wood should be taken away at the same time, to make sure of removing every contamination.

Insects may be removed, or at least prevented from spreading on trained trees, especially such as are in houses, and on dwarf trees, where the whole plant comes readily under the eye, either by cutting off, in the summer season, the young shoots or the individual leaves on which the insects, as the coccus, aphis, acarus, &c. are found. This is frequently practised on gooseberry-plants, and Sir Brook Boothby (*Hort. Trans.* vol. i.) asserts that he keeps his peach-trees free from the red spider by cutting off every leaf the moment he sees an insect on it.

962. *Pruning the Roots of Trees.* What effect it would have on the roots of trees, if they could be exposed to view, and subjected to pruning and training, as well as the branches, it is not easy, in many cases, to determine; but where they are diseased, or growing on soil with an injurious substratum, could the pruning-knife be applied to their descending and diseased roots annually, the advantages would be considerable. The practice of laying bare the roots of trees to expose them to the frost, and render the tree fruitful, is mentioned by Evelyn and other writers of his time; but in doing so, it does not appear that pruning was any part of their object.

The pruning of roots can therefore only take place according to the present state of things, in the interval between taking up and replanting; as such roots are generally small, and some of them broken or injured, all that the pruner has to do, is to facilitate the healing of the ends of broken roots by a more perfect amputation; and in fruit-trees he may shorten such roots as have a tendency to strike too perpendicularly into the soil. The form of the cut in either case is a matter of less consequence than in the shoot; but like it, it ought in general to be made from the under side of the shoot, that only one section may be fractured, and that the removed section may be the fractured one; and also that water or sap may rather descend from than adhere to the wound. The chief reason for this practice, however, is the facility of performing it, for a section directly across, as if made with a saw, will, in roots, heal as soon, if not sooner than one made obliquely; but to make such a section in even small roots would require several distinct cuts, whereas the oblique section is completed by a single operation. The Genoese gardeners, in pruning the roots of the orange-trees, always make a section directly across, which, in one year, is in great part covered by the protruding granulated matter.

The roots of trees might be completely pruned, if done by degrees; say that the roots extended in every direction in the form of a circle; then take a portion, say one-eighth, of that circle every year till it is completed; and remove the earth entirely from above and under the roots; then cut off the diseased parts, or those roots which penetrate into bad soil; and laying below them such a strata as shall be impenetrable by them in future, intermix and cover them with suitable soil.

Under *potting*, in the preceding subsection, are directions for *pruning the roots of plants* in pots, in so far as that operation has any thing peculiar.

963. *Pruning herbaceous Plants*, or what is called *trimming*, consists generally in thinning the stems to increase the size and flower of those which remain; but it may also be performed for all the purposes before mentioned; and for some other purposes, such as the prolongation of the lives of annuals by pinching off their blossoms, strengthening bulbous roots by the same means, increasing the lower leaves of the tobacco-plant by cutting over the stem a few inches above ground, &c. In trimming the roots of herbaceous plants, the same general principles are adopted as in pruning the roots of trees. In transplanting seedlings, the tap root merely requires to be shortened; and in most other cases merely bruised, diseased, or broken roots cut off, and fractured sections smoothed.

964. *The Seasons of pruning Trees* are generally winter and midsummer; but some authors prefer spring, following the order of the vegetation of the different species and varieties. According to this principle, the first pruning of fruit-trees begins in February with the apricot, then the peach, afterwards the pears and plums, then the cherries, and lastly the apples, the sap of which is not properly in motion till April. Some have recommended the autumn and mid-winter; but though this may be allowable in forest-trees, it is certainly injurious to tender trees of every sort, by drying and hardening a portion of wood close to the part cut, and hence the granulous matter does not so easily protrude between the bark and wood, as in the trees where those parts are furnished with sap. For all the operations of pruning, therefore, which are performed on the branches or shoots of trees, it would appear the period immediately before, or commensurate with, the rising of the sap, is the best.

965. *Summer Pruning* commences with the rubbing off of the buds, or *disbudding*, soon after they have begun to develope their leaves in April and May, and is continued during summer in pinching off or shortening such as are farther advanced. It is obviously, to a certain extent, guided by the same general rules as winter or general pruning; but the great use of leaves in preparing the sap being considered, summer-pruning wisely conducted will not extend farther than may be necessary to maintain as much as possible an equilibrium of sap among the branches; to prevent gourmands and water-shoots from depriving the fruit of their proper nourishment, and to admit sufficient air and light to the fruit. Most authors are of opinion, that the other objects of pruning will be better effected by the winter operations.

Summer pruning is chiefly applicable to fruit-trees, and among these to the peach; but it is also practised on forest and ornamental trees when young, and is of great importance in giving a proper direction to the sap in newly grafted trees in the nursery.

T. A. Knight recommends a particular description of summer pruning for the peach-tree in cold and late situations; "instead of taking off so large a portion of the young shoots, and training in a few only, to a considerable length as is usually done, he preserves a large number of the young shoots, which are emitted in a proper direction in early spring by the yearling wood, shortening each where necessary, by pinching off the minute succulent points, generally to the length, of one or two inches. Spurs which lie close to the wall are thus made, upon which numerous blossom-buds form very early in the ensuing summer," &c. Upon such spurs in an elevated situation, and after a cold wet season, "as strong and vigorous blossoms are produced" as are usually observed in the best seasons and situations.

The same horticulturist remarks (*Hort. Trans.* vol. i. p. 81.), "that the necessity of winter pruning should generally be avoided as much as possible; for by laying in a much larger quantity of wood in the summer and autumn, than can be wanted in the succeeding year, the gardener gains no other advantage than that of having a "great choice of fine bearing wood to fill his walls," and he does not see any advantage in his having much more than he wants; on the contrary, the health of the tree always suffers by too much use of the knife through successive seasons.

966. *Thinning* may be considered, as to the branches of individual trees, as included in pruning. In herbaceous vegetables, or young trees growing together in quantities, it consists in removing all such as impede the others from attaining the desired bulk, form, or other properties for which they are specially cultivated. It is generally performed in connection with weeding or hoeing.

Subsect. 4. *Training.*

By this operation is to be understood the conducting of the shoots of trees or plants over the surface of walls, espalier rails, trellises, or on any other flat surface. It is performed in a variety of ways, according to the kind of tree, the object in view, and the particular opinions of gardeners.

967. The *object of training* is, either to induce a disposition to form flower-buds in rare and tender trees or plants; to mature and improve the quality of fruits, which would not otherwise ripen in the open air; or to increase the quantity and precocity of the fruit of trees which mature their fruit in the open air. Such are the principal objects of training, which are effected by the shelter and exposure to the sun of the surface to which they are trained, by which more heat is produced, and injuries from severe weather better guarded against; by the regular spreading of the tree on this surface, by which the leaves are more fully exposed to the sun than they can be on any standard; and by the form of training, which, by retarding the motion of the descent of the sap, causes it to spend itself in the formation of flower-buds.

968. The *leading modes of training woody-stemmed trees* are, the fan, horizontal, and vertical, (*a*, *f*, and *h*, *fig.* 274.) To which may be added the wavy or curvilinear. Their varieties are, the herring-bone (*a*), the irregular fan (*b*), the stellate fan (*c*), the drooping fan (*d*), the wavy fan (*e*); the horizontal with screw stem (*g*), and with double stem (*k*); the vertical, with screw or wavy shoots (*h*), and with upright shoots (*i*).

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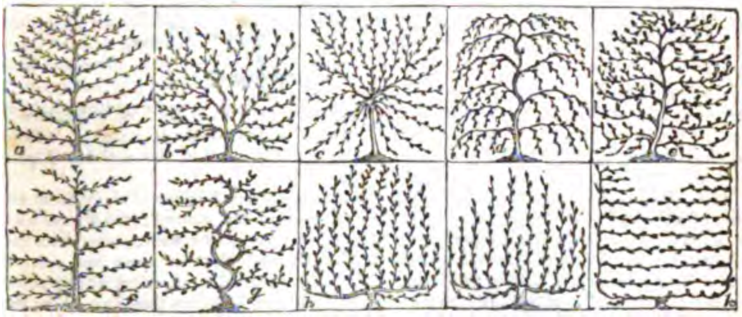

J. Hayward proposes a sort of wavy training (*fig.* 275.), little different from that of the wavy fan, but which is certainly superior to some of the other of the above modes in principle, as it has no tendency to constrain the shoots, and produce an irregular distribution or exhibition of the sap in gourmands, &c.

969. *Trees with flexible Stems*, such as the vine and other climbers, admit of three other varieties of training (*fig.* 276.), which, as vines bear the sweetest fruit at the greatest distance from the root, is particularly suitable for them.

970. *Fan Training*, as the name imports, directs the spreading out of all the branches like the spokes of the fan, and is reckoned most suitable for peaches and other stone-fruits.

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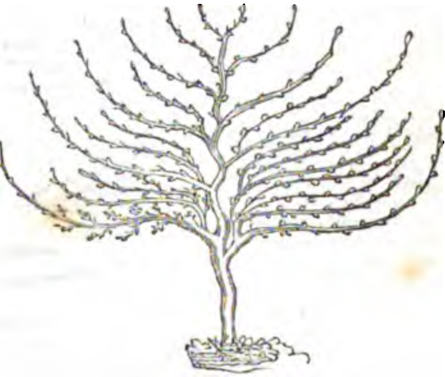

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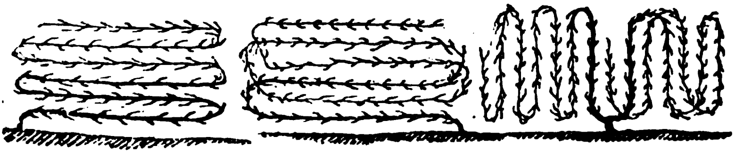

971. *Horizontal Training* is that in which, from a main stem, lateral branches are led out horizontally on each side, and is more especially adapted for pear-trees.

972. *Horizontal Training with the Screw-Stem* is chiefly applicable to pears and apples, and the use of the screw is to cause buds to push at proper places for the horizontal shoots. Where this is not adopted, the annual heading-down of the vertical shoot is resorted to, by which the same effect is produced; but the tree requires in this case a longer period to fill the wall. It may be effected either with one or two main stems; but, in general, the latter mode is preferable (*fig.* 277.), as distributing the sap or vigor of the tree more equally.

973. *Oblique Training* resembles the two last, with this difference, that the lateral shoots are trained obliquely to the main stem. It is particularly adapted for cherries. Thouin remarks, that the shoots should not be raised above an angle of forty-five degrees, unless in the case of a very weak shoot, which, for one season, may be led perpendicularly; nor lowered below the horizontal line, unless in the case of an excessively strong gourmand or water-shoot. The angle of forty-five degrees indeed is recommended by the French writers, as the best for all shoots of fruit-trees to assume, whether by the training against walls or the pruning of standards. See the articles *Espalier* and *Treille* in *Cours complet d'Agriculture*, &c.

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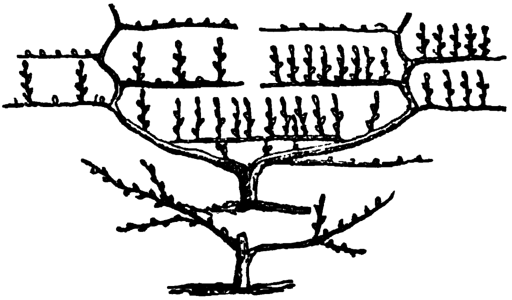

974. *Perpendicular Training* is performed by leading one horizontal shoot from each side of the stem, and within a foot or eighteen inches of the ground; the shoots which proceed from these are led up perpendicularly to the top of the wall; sometimes such shoots are trained in the screw or serpentine manner, particularly in vines and currants, which bear remarkably well in this form. This is the original mode of training practised by the Dutch, and is still more common in Holland and Flanders than any where else.

975. *Stellate Training* refers chiefly to standards trained on walls, or what by some are called riders. The summit of the stem being elevated six or eight feet from the ground by its length, the branches are laid in like radii from a centre.

976. *The open fan* (*fig.* 278.) is a mode of training described by Professor Thouin, and exemplified in the *Jardin des Plantes*. It does not appear to differ much from a mode described by T. A. Knight, which he applied to the peach, and considers, with a little variation, applicable, even with superior advantages, to the cherry, plum, and pear-tree. This form, he adds, "might with much advantage be given to trees whilst in the nursery; and perhaps it is the only form which can be given without subsequent injury to the tree." There is nothing very peculiar in this form the first and second year of training (*a* and *b*), after being headed down; but in the third year (*c*), the reversing of the lateral shoots (*d*), becomes a characteristic.

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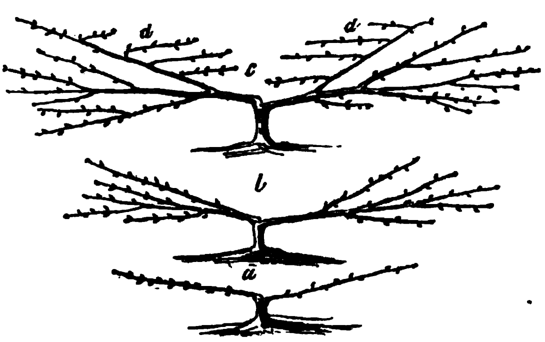

977. *Wavy, or Curvilinear Training*, J. Hayward considers as combining "all the grand requisites stated to be produced" by the modes recommended by other writers on fruit-trees.

"The stems (*a*, *fig.* 279.) being two principal branches through which the sap will flow in equal portions from the root, to the length of three feet, before it is permitted to form collaterals, the same effect will be produced as if the whole sap was to pass up a single stem of a standard of six feet, which is justly observed by

Bradley, 'to make fruit-branches in such plenty, that hardly any barren shoots are to be found upon them.' It also is conformable to the idea of Hales, that 'light, by freely entering the extended surfaces of leaves and flowers, contributes much to the ennobling the principles of vegetables.' By avoiding the precise horizontal position in which Hitt directs the branches to be fixed, the sap is more regularly and uniformly disposed of, and there will be no necessity for waste-pipes, nor for cutting branches short to form studs for producing bearers, nor to adopt the method recommended by Forsyth for furnishing bearers, that of repeatedly pinching off the tops, and shortening the leading shoots. The whole of the sap will, by this mode, be expended in profitable and increasing production, and all the desirable effects which these authors describe to be attainable, will be produced in less time and with less difficulty. By this mode, also, it is possible to train a tree to its utmost extent, without ever using the knife for any other purpose than for removing worn-out branches, or old bearers, nor need a branch ever be shortened. It will be found likewise to support T. A. Knight's ideas, 'and expose a greater surface of leaf to the light,' in the shortest possible time. It will also 'promote an equal distribution of the circulating fluids;' and without cutting off the strongest and weakest branches, 'each annual shoot, as produced, will possess nearly an equal degree of vigor.' And, as the horizontals will be formed of the most luxuriant shoots, they will find sufficient space to be trained in, and thus by 'proper treatment,' will, in due season, be found to 'have uniformly produced the finest possible bearing wood for the succeeding year,' and this without pinching off shoots. Thus, also, the same square of walling will be furnished with more bearing wood, in the third and fourth years, than can possibly be done by any other mode, and than can be effected by the common mode of practice, in less than eight or ten years."

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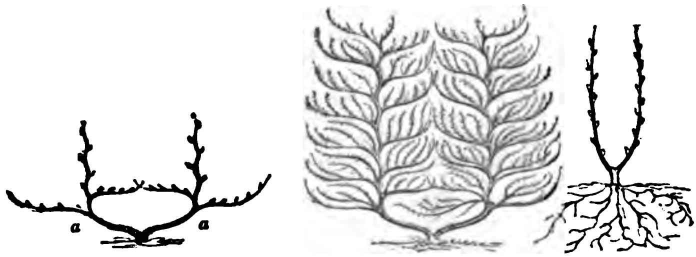

The above mode is chiefly intended for the peach and nectarine; but "apricots, plums, cherries, &c. may be trained in the same manner." However, "as these do not produce their young shoots with so much regularity as peaches and nectarines, and are more liable to injury from cutting and shortening, &c. the young wood must be allowed a greater space.

For this and most other modes of training wall-trees, nearly the same routine is gone through when the trees are young. The grafted tree newly received from the nursery (*a*, *fig.* 280.) is not shortened; at the end of the first season the side branches are left at an elevated angle (*b*), to encourage them to throw out laterals; afterwards they are brought down (*c* and *d*) to an oblique or nearly horizontal position, and each shoot waved as it increases in size.

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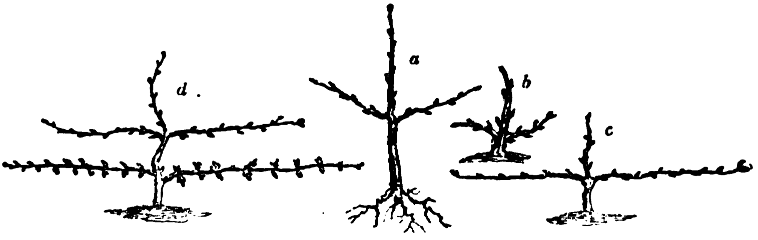

978. The *operation* of training on walls is performed chiefly by means of nails and shreds, on trellisses by *bass* ties, and on espalier rails osier-twigs are most commonly used. The bass, after being applied, is gently twisted round with the finger and

thumb, in order that it may run into a firm knot without tearing and weakening the ligament. The osier tie is made fast by twisting the two ends, somewhat in the manner done by reapers in tying up sheaves of corn, and well known in the nurseries. But the nicety of the operation of training consists in the proper use of nails and shreds on a wall; in which business, as Marshall has observed, "ingenuity will evidence itself in neatness and symmetry." Of both nails and shreds there should be two sizes used, the larger for strong, and the smaller for weak shoots. Trees trained to boards can hardly have nails too small; and those trained to stone or old brick-walls generally require a larger size than commonly pass under the name of garden-nails.

979. "*Shreds* should be adapted to the strength of the branches, and the distance of the buds from each other; so that with strong shoots, having their buds wide, such broad shreds may be used, that would make weak shoots unsightly, and spoil them by covering the buds; many a well-cut tree has been made disgusting, merely by irregular and dangling shreds. An uniformity of *color* can hardly be accomplished, but a regularity of size may; scarlet, if all alike, looks best, and white the worst. The general *width* of shreds should be from half an inch to three quarters, and the *length* two inches to three, having some wider, longer, and stronger, for large branches. In the *disposition* of shreds, some must have their ends turned downwards, and some upwards, as best suits, for bringing the shoots to their proper place, and straight direction. Though some pruners observe a sort of alternate order, yet the ends hanging chiefly down will look best. Use no more shreds and nails than necessary to make good work, as the effect is rude and injurious.

"As nails are apt to break out pieces of the wall in drawing, it is a good way to give the nail a tap to drive it a little, which loosening it from its rust, makes it come out easier, and so saves a wall from large holes, which is a material thing." *Introd. to Gard.*

980. *Herbaceous Training* is performed by means of poles, rods, branches, and pegs. Plants that twine and grow high are furnished with high poles, on which to train themselves, as the tamis, convolvulus, &c. Plants with tendrils, as the pea, the bryonia, &c. are furnished with branches or spray, through which the plant springing up attaches itself by its tendrils; and is thus better exposed to the sun and air, and not so liable to rot as when it lies on the ground. Props or poles are used for supporting and leading upright, tall, slender, growing plants, as the dahlia, tree lupin, and the like. Creeping and trailing plants, as the melon, gourd, &c. are trained in the stellate manner on the ground by means of pegs.

Subsect. 5. *Blanching.*

981. This operation of culture is performed by earthing the stems of plants; by tying up their leaves, or by covering them with utensils from the light.

Blanching by Earthing is performed on the celery, chardoon, asparagus, &c. and the mode for each will be noticed under its particular culture.

Blanching by tying together the leaves is sometimes performed on lettuce, cabbage, endive, &c.

Blanching by overlaying is merely the laying down of tyles, slates, pieces of boards, &c. on endive and other salading, when nearly full grown, and which, being thus excluded from the sun, the future growth is colorless. Covering by the following mode is preferable.

Blanching by covering with Utensils is a recent invention applied to sea-kale, rhubarb, &c. and consists in placing over them the utensils already described as appropriated to this purpose, (*fig.* 90.)

Sect. IV. *Operations for inducing a State of Fruitfulness in barren and unblossoming Trees and Plants.*

There is no more common source of disappointment, in every branch of gardening, than that of trees, whether in the open ground, or in pots, growing vigorously without producing blossoms. Various means have been tried to overcome this evil, with different degrees of success. Almost every description of fruit-tree, as Hayward remarks, if planted in a thin stratum of rich loam on a dry and impervious subsoil, will come into bearing in a regular course, according to its nature; but it too frequently happens that the stratum of soil is too deep, or the roots penetrate into the subsoil, or by some means, not always obvious, acquire the power of throwing much superfluous sap into the tree, which spends itself in leaves and branches, instead of blossoms. Similar circumstances produce similar effects in ornamental trees and shrubs, whether in the open air or in artificial climates. Attempts are known to have been made for upwards of a century and a half, to cause such trees to produce blossoms, attended with different degrees of success; but the practice was carried on empirically, without any knowledge of the reason or principle which operated in producing the desired end, till the true rationale of the practice was given by Du Hamel. *Physique des Arbres*, 1758.

982. *Laying bare the Roots of Trees* is mentioned by Evelyn as conducive to fertility. *Transplanting the Tree frequently*, by Van Osten. *Boring a Hole, and driving in an Oaken Plug*, is mentioned by the same author as the "old way." Every one must have observed that trees partially blown out of the ground, or with the earth washed or otherwise removed from their roots in banks or river sides, or with their trunks or roots mutilated in any way, are always more fruitful than others; and this, we conceive, has suggested the various modes of artificial mutilation. Mutilation, both in plants and animals, is attended by a sort of maturity; and maturity in all living things is the period of re-production.

983. *Cutting the Roots of Trees* is an old practice, generally performed in winter or spring, but recently by W. Beattie, gardener, at Scone, in Midsummer. "In furtherance of this plan, in the beginning of July 1811, I had a border on the south wall, of 400 feet long, trenched to the depth of from two and a half to three feet; in doing this, I had the opportunity of cutting the roots of all the trees, as the work went on, which I did so completely, that they in a manner hung by the nails and shreds, with a ball of earth of about two feet from the stem of the tree. As cutting the roots of fruit-trees has a tendency to make them fruitful, that may possibly proceed from the small quantity of fibrous roots produced by the operation. Beattie says, he acted on the principle of depriving the tree of the means of conveying such a great quantity of sap, thereby preventing it from growing so much to wood, and of course inclining it to become fruitful." *Caled. Mem.* vol. i. 272. Nicol suggests the same expedient in his *Forcing and Fruit Gardener*, 4th edit. p. 240.

984. *Cutting Notches* in the stem or branches, has been tried on many occasions on the same principle as that acted on by Beattie, viz. "depriving the tree of the means of conveying such a great quantity of sap, &c."

985. *Partial decortication* is the removal of the bark already scaling off, covered with mosses and lichens, or carbonized by the action of the atmosphere. It is only applicable to old trees, or trees of a certain age, and the effect is to increase the vigor of the tree, and thus promote the production of young wood and blossom-buds. It was recommended by Arnaud d'Andilly, in 1650, and has been practised for several years, by Forsyth, Lyon, and various others, on standard-trees, and by King, a commercial gardener, at Teddington, on the Vine.

986. *Stripping off Pieces of the Bark* from the stem and branches is said by Marshall to check the luxuriance, and promote the fruitfulness of pear-trees. *Introd. to Gard.* &c. 4th edit. p. 156.

987. *Ringing the Stem and Branches*, circumcision, or excision, &c. was known to the Romans, and is mentioned by Virgil, Columella, &c. Among the moderns, it seems to have been revived by Du Hamel in the beginning of the 18th century, more especially in 1733, when he perfectly succeeded in rendering trees fruitful, and has given an account of his experiments in the *Mémoires de l'Academie des Sciences*, A. D. 1788. The subject has since been taken up by Suriray Delarue, and by Lancry; the former of whom has given an excellent history and rationale of the practice in the *Journal Physico-Œconomique* for 1803. It is also ably treated in the *Cours Complet d'Agriculture*, &c. art. *Bourrelet*. The effect of ringing has been perfectly well known, and acted on in Holland and Germany since Du Hamel's time, as any one may be assured by the perusal of the works of Christ, Diederich, and Diel; and it is remarkable, that so late as 1815, A. Hempel, a clergyman of Saxony, should have published an account of his practice in ringing, as believing it to be new. The use of ringing would be, in all probability, introduced into England soon after Du Hamel's experiments were published; but though it has been known and occasionally practised by some gardeners for upwards of half a century, it seems not to have been generally known, either in 1817, when, judging from a paper of Dr. Nöhden, the subject was considered new in the Horticultural Society; or, in the end of last century, when Dr. Darwin, in his *Notes to Phytologia*, vol. i. p. 393, describes the practice, and accounts for its effects.

988. J. Williams, of Pitmaston, found *ringing to increase the size and accelerate the ripening of fruits*. In a paper read before the Horticultural Society in 1808, he describes a mode of making annular excisions in the bark of vines. These were made rather less than a quarter of an inch in width, that the exposed wood might be covered again with bark by the end of autumn. "Two vines of the white Frontiniac, in similar states of growth, being trained near to each other on a south wall, were selected for trial; one of these was experimented on (if I may use the term), the other was left in its natural state, to form a standard of comparison. When the circle of bark had been removed about a fortnight, the berries on the experimented tree began evidently to swell faster than those on the other, and by the beginning of September showed indications of approaching ripeness, while the fruit of the unexperimented tree continued green and small. In the beginning of October, the fruit on the tree that had the bark removed from it was quite ripe, the other only just began to show a disposition to ripen,

for the bunches were shortly afterwards destroyed by the autumnal frosts. In every case in which circles of bark were removed, I invariably found that the fruit not only ripened earlier, but the berries were considerably larger than usual, and more highly flavored. The effects thus produced, I can account for only by adopting Knight's theory of the downward circulation of the sap through the bark. It is not of much consequence in what part of the tree the incision is made; but in case the trunk is very large, I should then recommend, that the circles be made in the smaller branches."

989. Hempel states a very important consequence, as resulting from his operation of ringing, namely, that you may *force young trees to show fruit*, before they otherwise would do. That ringing may have some effect in this way, we think highly probable; but by no means so much as is ascribed to it by Hempel. Trees must arrive at their age of puberty, like animals, before they can propagate their species. Abundance of food and heat will, no doubt, induce a degree of precocity in the subjects of both kingdoms; and as ringing gives in effect abundance of food to the particular part above the excision, it must have some effect, but it has not been proved to have much.

990. The *operation* of ringing is performed by cutting clean out, with a knife or the ringing-shears (*fig.* 46.), a ring of outer and inner bark, not larger than the tree can fill up in stone-fruit in one, and in kernel fruit in two, or at most three years. If larger, the tree becomes too much excited to fruitfulness, and the part of it separated from the root by the ring dies, while the stem and parts adjoining the root become too luxuriant. When the rings are made so wide as that the barks cannot unite for two or three years, the result, says the author of the article, *Bourrelet*, in *N. C. d'Agriculture*, &c. will be to " accelerate the production of blossoms, and the setting of fruit, and to augment their size during the first year; and then, during the following years, to make them languish, and at last die."

" There is a pear-tree," says J. Sabine, " against one of the walls in the kitchen-garden, belonging to his Majesty, at Kew, which underwent the operation of ringing about fifteen years ago. The part operated on was near the root; and, as it was a principal arm, about one-half of the whole tree became influenced by the operation. This half has uniformly borne fruit, the other half has been nearly barren. The portion of stem which was laid bare is about six inches wide, and it has not been again covered by bark. That part just above the ring is considerably larger than the part below it. The ends of the branches appear in much decay, and there are but very few young shoots thrown out from the sides; whilst, on the other part of the tree, the shoots, as usual, proceed from the extremities, as well as from the sides of the main branches. I apprehend, from the present appearance of the whole, that the portion of the tree which, by the separation of the bark, has been deprived of supply from the root, cannot survive many years."

Ringing will produce blossoms in all plants, herbaceous or shrubby, propagated by extension; that is, originated otherwise than from seed, *at any age;* but its effects on young trees raised from seed, or in causing blossoms on any description of tree to set, are much less certain; though in all cases where they do set, the size of the fruit will be greatly enlarged for the first year or two.

991. *Renewal of the Soil* about fruit-trees has been found by J. Hay, of Newliston, near Edinburgh, in the case of peaches; and G. Maher, of Arundel, in the case of figs, and by various others, to renew the fruitfulness of trees. There may be two reasons given for this, both of which may be concerned in the effect: the first is the exhaustion of the soil generally; and the second is its exhaustion of the particular sort of food preferred by the kind of tree. Though we are not so certain that every species of tree requires, to a certain extent, a particular sort of food, as we are that herbaceous vegetables, as wheat, oats, &c. do (see 576-7.); yet analogy renders the fact highly probable. At any rate, it is clear that a renewal of soil must always be conducted with reference to the state of the plants; a poor, limy, sandy soil, may be substituted for one where the luxuriancy of the plants shows that it is too rich; and a rich loamy one for one of an opposite description, where the plants are unthriving, &c.

992. *Bending down the Branches* has been already mentioned as conducive to fruitfulness; and accounted for on the same principle as ringing. It has been well exemplified by J. Mayer (*Hort. Trans.* i.), in fixing clay-balls to the extremities of the shoots of young apple-trees after Midsummer, which, depressing them, stagnated the sap, and induced the production of abundance of flower-buds.

993. To *induce the production of blossoms in herbaceous plants*, any or all of the above modes may be adopted with most species, but on a large scale the first object is to place the plants in a soil neither too poor nor too rich. A dry soil, not deep, and resting on a dry firm bottom, is most favorable to fruitfulness, especially when joined to abundance of air and light. In perennials, the effect can only be produced the second year, as in trees; but in annuals it will be immediate: in the former class, however, where the defect is want of nourishment, the effect may take place even the first year. T. A.

Knight induced the production of blossoms on an early variety of potatoe, by depriving the plant of the tubers as soon as they made their appearance; by which means, the nourishment which would have been devoted to their enlargement, was employed by the plant in the production of blossoms, as the remaining mode which it had of propagating its species. The reverse of the practice is found proportionally to increase the bulk of the tubers, and has become an important point of practice in potatoe culture. The Dutch, as Darwin informs us, were the first to adopt this mode in the culture of bulbous-rooted flowers. In general, it may be stated, that the art of producing blossoms in perennial herbaceous plants consists in permitting them to have abundance of leaves, fully exposed to the light and air the preceding year, and in not cutting them over when in a state of growth, as is too frequently done, but in letting them first begin to decay. By this means, healthy vigorous buds and roots are prepared for exertion the following year.

All these practices may be resorted to occasionally, but the only permanent mode is by the judicious preparation and culture of the soil.

Sect. V. *Operations for retarding or accelerating Vegetation.*

After civilized man has had every thing which he can desire in season, his next wish is to heighten the enjoyment by consummation at extraordinary seasons. The merit here consists in conquering nature; and it belongs to the last or most artificial and improved stage of every art. That part of gardening to which this state chiefly applies, is the retarding and accelerating of vegetation by *cold-houses* and *hot-houses;* and by excluding or increasing the effects of the sun in the open air. The origin of these practices is obviously derived from the fact that heat is the grand stimulus to vegetation, and its absence, to a certain extent, the occasion of torpor and inactivity.

Subsect. 1. *Operations for retarding Vegetation.*

994. *Retarding by the form of surface* is effected by forming beds of earth in an east and west direction, sloping to the north at any angle at which the earth will stand; here salading may be sown in summer, and spinach, turnips, and such crops as shoot rapidly into flower stems during hot weather. (See 574 & 997.)

995. *Retarding by Shade.* The simplest mode of retarding vegetation is, by keeping plants constantly in comparative shade in the spring season. This is either to be done by having them planted in the north side of a wall or house, or sloping bank, hill or other elevation; or by moving them there in pots; or by placing a shade or shed over, or on the south side of the vegetables to be retarded. Where the object of retarding vegetation is to have the productions in perfection later in the season, the first method is generally resorted to; but where vegetation is only retarded in order that it may burst forth with greater vigor when the shades are removed, then either of the others is preferable. Trees on an east and west espalier rail, shaded from the sun from February to the middle of May, will be later of coming into blossom, and therefore less likely to have their blossoms injured by frost.

996. *Retarding by the Cold-house, or Ice-cold Room,* is more particularly applicable to plants in pots, especially fruit-trees, and might be made a practice of importance. Vegetation may in this way be retarded from March to September, and the plant removed at that season, by proper gradations, to a hot-house, will ripen its fruit at mid-winter. It is even alleged by some gardeners, who have had experience in Russia, that the vegetation of peach-trees may be so retarded an entire year; and that afterwards, when the plant is removed into spring or summer heat, in the January of the second year, its vegetation is most rapid, and a crop of fruit may be ripened in March or April, with very little exertion on the part of the gardener. The earliest potatoes are obtained from tubers which have been kept two seasons; that is, those are to be planted which have been produced the season before the last; or, the produce of spring 1821, in December 1822.

Subsect. 2. *Operations for accelerating Vegetation and Forcing.*

997. *Accelerating by the form of surface* consists in forming beds or banks in an east and west direction, and sloping to the south, forming an angle with the horizon, the maximum of which, in garden soils, cannot exceed 45 degrees. On such beds early sown crops, as radishes, peas, turnips, &c. will come much earlier, and winter standing crops, as lettuce, brocoli, &c. suffer less from severe weather than those on a level surface. The north side of such beds or ridges may be used for retarding vegetation, as leeks, borecoles, &c. (For the rationale of this practice see 574.)

998. *Acceleration by Shelter,* and exposure to the sun, is the simplest, and probably only primitive mode of accelerating the vegetation of plants; and hence one of the objects for which walls and hedges are introduced in gardens. A May-duke cherry,

trained against a south wall, and another tree, of the same species, in the open quarter of a sheltered garden, were found, by the late J. Kyle, of Moredun, near Edinburgh, on an average of years, to differ a fortnight in the ripening of their fruit. In cold, damp, cloudy seasons, they were nearly on a par; but in dry, warm seasons, those on the wall were sometimes fit to be gathered three weeks before the others. It may be here remarked, that though, in cloudy seasons, those on the wall did not ripen before the others; yet their flavor was, in such seasons, better than that of the others, probably from the comparative dryness of their situation. Corn and potatoes on the south and north sides of a hill, all other circumstances being equal, ripen at about the same relative distances of time.

999. *Accelerating by Soils* is effected by manures of all sorts, but especially by what are called hot and stimulating manures and composts; as pigeons' dung for cucumbers; blood for vines; and, in general, as to soils, lime-rubbish, sand, and gravel, seem to have the power of maturing vegetation to a much greater degree than rich clayey or loamy soils, or bog or peat earth.

1000. *Accelerating by previous Preparation of the Plant* is a method of considerable importance, whether taken alone, or in connection with other modes of acceleration. It has long been observed by cultivators, that early ripened crops of onions and potatoes, spring, or give signs of vegetation, more early than usual next season. The same of bulbs of flowers which have been forced, which re-grow much earlier next season, than those which have been grown in the open air. It was reserved to T. A. Knight, however, to turn this to account in the forcing of fruit-trees, as related in a paper, accompanied as usual by what renders all the papers of that eminent horticulturist so truly valuable, — a rationale of the practice.

" The period which any species or variety of fruit will require to attain maturity, under any given degrees of temperature, and exposure to the influence of light in the forcing house, will be regulated to a much greater extent than is generally imagined, by the previous management and consequent state of the tree, when that is first subjected to the operation of artificial heat. Every gardener knows, that when the previous season has been cold, and cloudy, and wet, the wood of his fruit-trees remains immature, and weak abortive blossoms only are produced. The advantages of having the wood well ripened are perfectly well understood; but those which may be obtained, whenever a very early crop of fruit is required, by ripening the wood very early in the preceding summer, and putting the tree into a state of repose, as soon as possible after its wood has become perfectly mature, do not, as far as my observation has extended, appear to be at all known to gardeners; though every one who has had in any degree the management of vines in a hot-house, must have observed the different effects of the same degrees of temperature upon the same plant, in October and February. In the autumn, the plants have just sunk into their winter sleep: in February they are refreshed, and ready to awake again; and whenever it is intended prematurely to excite their powers of life into action, the expediency of putting those powers into a state of rest, early in the preceding autumn, appears obvious." *Hort. Trans.* vol. ii. 368.

T. A. Knight placed some vines in pots, in a forcing-house, in the end of January, which ripened their fruit in the middle of July; soon after which the pots were put under the shade of a north wall in the open air. Being pruned and removed in September to a south wall, they soon vegetated with much vigor, till the frost destroyed their shoots. Others, which were not removed from the north wall till the following spring, when they were pruned and placed against a south wall, " ripened their fruit well in the following season in a climate not nearly warm enough to have ripened it at all, if the plants had previously grown in the open air." Peach-trees, somewhat similarly treated, unfolded their blossoms nine days earlier, " and their fruit ripened three weeks earlier" than in other trees of the same varieties. *Hort. Trans.* vol. ii. 372.

1001. *By thus inducing a state of rest* in plants in pots, say vines or peaches, in August, and placing them immediately in the ice-cold room till the beginning of January, which is allowing four months of a winter to them, they would, in all probability, produce very early crops of grapes with less forcing than would be required for such as ripen their wood in October. Such pots might be placed in pine and other stoves, where a certain degree of heat is kept up at any rate, and might be contrived to produce a succession of fruit, in the manner practised by W. Masland, of Stockport, by a vineyard in pots, which pass in regular succession through his pine-stoves, and furnish ripe grapes the whole year. A state of rest is readily induced by withholding water from plants under cover; and in the open air by covering trees, and a portion of the surface or border around or before them, with canvass or oil-cloth, to throw off the autumnal and part of the winter rains.

1002. *Accelerating by Housing*, such as removing plants in pots and boxes, to sheds or rooms in the night, and exposing them in fine weather to the sun, was practised by the gardener of Tiberius, to procure early cucumbers; and by those of Louis XIV. to force peas. Parkinson, and Gerrarde, describe the practice as applied to raising cucumbers and melons in this country.

1003. *Accelerating by artificial Heat* in walls is a very frequent and useful practice. In general it is accompanied by covers of some description (625); but some, and of late, Trotter, gardener at Alva, a very high and exposed situation on the Ochill hills, never covers his walls, but in ripening the wood in autumn, and in saving the blossom and setting the fruit in spring, keeps up such fires as will "repel the frost, and evaporate the wet that might fall on the wall." "No danger," he observes, "is to be apprehended from the severity of the spring months, even when exposed to all sorts of weather; every kind of covering being superseded by the genial heat of the wall." This he has long experienced, even in England, but especially in Scotland, to be "the best preservative of the blossom of young fruits." (*Caled. Mem.* vol. ii. 113.)

1004. *Accelerating by Flued Borders* has been occasionally attempted, but can never succeed by fire heat; by tubes of steam, perhaps, something might be done, but the heat can always be more economically applied by means of pits or frames, placed on raised beds of mould, with arches, or some similar contrivance underneath. See *A Description of a Flued Border* in *Keil* on *The Peach-tree*, 8vo. 1780.

1005. *Accelerating by covering with Glass-Cases*, of different sizes and descriptions, probably succeeded to *housing*. The Romans are supposed to have hastened the ripening of grapes and peaches, by placing them under talk-cases; and a French author, Bénard, informs us, that the origin of forcing the vine arose from one Gordon observing, that a shoot which had entered his room-window through a crevice, ripened its fruit some time before those branches of the same tree which remained in the open air. By a mere covering of glass, without any description of bottom, heat, or any auxiliary mode of acceleration, almost all fruits and flowers which grow in the open air in this country, may be forwarded from one fortnight to one month, according to the season. Fruits may by the more facile means thus afforded of covering and protection, be retained in a ripe and plump state from one to three months; so that in general it may be observed, that cold frames, as they are called, and mere glass-cases, will double the ordinary time of enjoying hardy fruits, and certainly they greatly increase the flavor of such as ripen late, and especially of the vine and peach.

1006. *Accelerating by Glass-Cases and Artificial Heat combined* is effected by hot-beds, pits, and hot-houses.

Accelerating by the Common Hot-Bed is an ancient, general, but still somewhat precarious and unmanageable mode. The heat being produced by a fermenting mass of vegetable matter, over which is placed the earth containing the plants, it becomes difficult to regulate any excess of heat, and the plants are sometimes, in the empirical phrase, *burnt*. When, however, the heat declines, it is readily renewed by linings or a surrounding layer of dung. To remedy the defects of the common hot-bed, and prevent the possibility of burning the plants, by interposing a stratum of air between the dung and the mass of earth which contains them, is the object of M'Phail's pit (*fig.* 140.); to which there is no objection, but the greater original cost. This pit actually saves dung; and by contriving to cover the linings in the manner of the Alderstone hot-bed or pit, (*fig.* 141.), it can be rendered a perfectly sightly object in any garden.

1007. *Accelerating by Means of Walled Pits* is very similar to that of forcing by hot-beds; with the advantages of more room between the surface of the beds and the glass for the tops of shrubs, and of the glass having a better slope; but with the disadvantages of a chance of burning in the first instance, and no power of increasing the bottom heat when it once declines. Bark is generally used to lessen the first evil, as it does not ferment so powerfully as dung, and the second is remedied by a surrounding flue. Such pits are much used in all the branches of garden culture. J. Henderson, of Brechin, proposes to lay on the surface of beds of tan, or on hot-beds, pits, pineries, &c. fine drifted river or sea sand, three inches deep. "This covering," he says, "possesses many advantages. It will extirpate the slater or wood-louse, (*oniscus asellus*,) as the nature of the sand prevents the insect from concealing itself from the rays of the sun. In dung hot-beds, it keeps down the steam. To fruit, it affords a bed as warm and as dry as tiles or slates. This covering also retains the moisture in the earth longer than any other, and is itself sooner dry. It gives the houses a clean, neat appearance, and though it cannot be expected to remove the infection, where already introduced, will be found a powerful preventive of that great evil, mildew."

1008. *Accelerating by Means of Hot-houses* is the master-piece of this branch of culture, and is but of modern invention, being unknown before Miller's time. Improvement in the form as well as management of these buildings has, as in every other case, been progressive; and there are now a great choice both of the forms adopted, the materials used in the construction of these forms, and the mode of producing artificial heat.

1009. There are two *leading modes* of accelerating plants in these buildings; the first is by placing them there permanently, as in the case of the peach, vine, &c. planted in the ground; and the second is by having the plants in pots, and introducing or withdrawing them at pleasure. As far as respects trees, the largest crops, and with far less care, are produced by the first method; but in respect to herbaceous plants and shrubs, whether culinary, as the strawberry and kidney-bean, or ornamental, as the rose and the pink, the latter is by far the most convenient method. Where large pots are used, the peach, cherry, fig, &c. will produce tolerable crops. T. A. Knight has observed, that "vines and other fruit-trees, when abundantly supplied with water and manure in a liquid state, require but a very small quantity of mould;" and he adds, "A pot containing two cubic feet of very rich mould, with proper subsequent attention, is fully adequate to nourish a vine, which, after being pruned in autumn, occupies twenty square feet of the roof of an hot-house; and I have constantly found that vines in such pots, being abundantly supplied with food and water, have produced more vigorous wood, when forced very early, than others of the same varieties, whose roots were permitted to extend beyond the limits of the house." *Hort. Trans.* vol. ii. p. 373.

1010. When trees are planted for a *permanency* within, or, as in some cases, close to the outside of the house, the soil requires to be prepared of depth and quality according to the nature of the tree; and a principal consideration is, to form, if such does not naturally exist, a subsoil, which shall be impenetrable to the roots. The depth of soil on such a substratum need not in general be great, provided it be rich. Formerly a depth of three or four feet was recommended; but Hayward proposes to have his fruit-tree borders only fifteen or eighteen inches deep; which is conformable to an observation of Hitt, that the finest crop of peaches he had ever seen, grew on trees which were nourished from a border not more than one foot deep, with a compact rock below. W. Nicol allows from twenty-four to thirty inches of soil. T. A. Knight is of opinion, that "a large extent and depth of soil seem to be no farther requisite to trees than to afford them a regular supply of water, and a sufficient quantity of organizable matter;" and, he thinks, "the rapid growth of plants of every kind, when their roots are confined in a pot to a small quantity of mould, till that becomes exhausted, proves sufficiently the truth of this position." *Hort. Trans.* vol. ii. p. 127.

As different kinds of trees require different degrees of heat and management, several houses are required for the purposes of forcing, each of which will be afterwards treated of. In the mean time, it may be remarked of forcing in general, "that it is more perfectly performed in proportion, as less forcing or violence is employed in the operation. All the operations of nature are gradual; and a good gardener will always follow these as the safest examples. He will never be anxious to apply artificial heat before buds have naturally swoln; he will then increase the temperature gradually for some weeks; he will in particular, guard against any sudden decrease of warmth, it being most necessary towards success, to continue the course of vegetation uninterruptedly, through foliation, inflorescence, and fructification. In all kinds of forcing, it is of importance that free admission of air be given according to the state of the atmosphere; and it too should be given and withdrawn by degrees, especially in the early and cold time of the year: the sashes, or the ventilators, may, for instance, be partially opened by 8 in the morning, top air being given before front air; full air may be allowed about 10; a reduction should take place before 3 P. M., and the whole be closed between 4 and 5, according to the season and other circumstances." *Niel* and *Abercrombie.*

1011. T. A. Knight considers, that gardeners often, and widely err, "by *too freely admitting the external air during the day,* particularly in bright weather. Plants generally grow best, and fruits swell most rapidly, in a warm and moist atmosphere; and change of air is, to a very limited extent, necessary or beneficial. The mature leaves of plants, and according to Saussure, the green fruits, (grapes at least,) when exposed to the influence of light, take up carbon from the surrounding air, whilst the same substance is given out by every other part of the plant; so that the purity of air, when confined in close vessels, has often been found little changed at the end of two or three days by the growth of plants in it. But even if plants required as pure air, as hot-blooded animals, the buoyancy of the heated air, in every forcing-house, would occasion it to escape and change as rapidly, and indeed much more rapidly, than would be necessary.

"It may be objected, that plants do not thrive, and that the skins of grapes are thick, and other fruits without flavor in crowded forcing-houses; but in these it is probably light, rather than a more rapid change of air that is wanting; for in a forcing-house, which I have long devoted almost exclusively to experiments, I employ very little fire-heat, and never give air till my grapes are nearly ripe, in the hottest and brightest weather, further than is just necessary to prevent the leaves being destroyed by excess of heat. Yet this mode of treatment does not at all lessen the flavor of the fruit, nor render the skins of the grapes thick; on the contrary, their skins are always most remarkably thin, and very similar to those of grapes which have ripened in the open air. It is always my wish to see the temperature of this house, in the middle of every bright day in summer, as high as 90°; and after the leaves of the plants have become dry, I do not object to ten or fifteen degrees higher. In the following night, the temperature sometimes falls as low as 50°; and so far am I from thinking such change of temperature injurious, I am well satisfied that it is generally beneficial.

"Plants, it is true, thrive well, and many species of fruits acquire their greatest state of perfection in some situations within the tropics, where the temperature in the shade does not vary in the day and night more than seven or eight degrees; but in these climates, the plant is exposed during the day to the full blaze of a tropical sun, and early in the night it is regularly drenched with heavy wetting dews; and consequently it is very differently circumstanced in the day and in the night, though the temperature of the air in the shade at both periods may be very nearly the same. If the thermometer, under the above-mentioned circumstances, were to be exposed, as the plant is, to the sun, it would probably indicate, in the middle of the day, a temperature little below that of boiling water. In the forcing-house, so much light and heat are repelled by the glass and opaque-work of the roof, that the degree of heat to which the leaves are subjected does not greatly exceed that indicated by the shaded thermometer: and by excess of ventilation, I have several times found the temperature of forcing-houses in the gardens of some of my friends reduced so nearly to that of the external air, in the middle of a bright, but not very warm day, that the progress towards maturity of the fruit was certainly rather retarded by the shade, than accelerated by the protection of the glass roof. During the night, the loss, as far as related to time, was probably redeemed by the flues; but the fruit thus ripened during the night never equals in flavor that which is chiefly ripened by confined solar heat. This kind of heat can also be made to operate in every moderately bright day, without incurring either expense or increased trouble; for any observant gardener will soon discover precisely to what extent air may be confined in differently constructed forcing-houses in every different state of the atmosphere and weather, and thus guard in his absence, for a short time, against all danger of injury to the foliage of his trees; at the same time that these may be placed securely in nearly the highest temperature that can be beneficial to them.

"A less humid atmosphere is more advantageous to fruits of all kind, when the period of their maturity approaches, than in the earlier stages of their growth; and such an increase of ventilation, at this period, as will give the requisite degree of dryness to the air within the house, is highly beneficial; provided it be not increased to such an extent as to reduce the temperature of the house much below the degree in which the fruit has previously grown, and thus retard its progress to maturity. The good effect of opening a peach house, by taking off the lights of its roof, during the period of the last swelling of the fruit, appears to have led many gardeners to over-rate greatly the beneficial influence of a free current of air upon ripening fruits; for I have never found ventilation to give the proper flavor or color to a peach, unless that fruit was at the same time exposed to the sun without the intervention of glass; and the most excellent peaches I have ever been able to raise, were obtained under circumstances where change of air was as much as possible prevented consistently with the admission of light (without glass) to a single tree."

1012. T. A. Knight further adds, that "a gardener" in forcing "generally treats his plants as he would wish to be treated himself; and consequently, though the aggregate temperature of his house be nearly what it ought to be, its temperature, during the night, relatively to that of the day, is almost always too high." The consequences of this *excess of heat during the night* are, he considers, in all cases, highly injurious to the fruit-trees of temperate climates.

"Some experiments, which I have made upon germinating seeds, have perfectly satisfied me, that these afford plants of greater or less vigor in proportion as external circumstances are favorable in promoting, beneath the soil, the necessary changes in the nutritive matter they contain; and I suspect that a large portion of the blossoms of the cherry and other fruit-trees in the forcing-house often proves abortive, because they are forced by too high and uniform a temperature, to expand before the sap of the tree is properly prepared to nourish them. I have, therefore, been led, during the last three years, to try the effects of keeping up a much higher temperature in the day than in the night.

"As early in the spring as I wished the blossoms of my peach-trees to unfold, my house was made warm during the middle of the day; but towards night it was suffered to cool, and the trees were then sprinkled, by means of a large syringe, with clear water, as nearly at the temperature at which that usually rises from the ground, as I could obtain it; and little or no artificial heat was given during the night, unless there appeared a prospect of frost. Under this mode of treatment, the blossoms advanced with very great vigor, and as rapidly as I wished them, and presented, when expanded, a larger size than I had ever before seen of the same varieties."

T. A. Knight highly disapproves of watering the heated flues at night to produce steam; as "the influence of hot and damp air upon both animals and vegetables, is greatly more powerful than that of dry air of the same temperature. In the experiments of which Sir Charles Blagden has given an account in the Philosophical Transactions of 1775, he, with Sir Joseph Banks and others, sustained without injury a temperature of 260° in dry air; but they found damp air, at half that temperature, to be scarcely supportable: and every gardener knows, how quickly the leaves of his plants are injured by the combined action of heat and moisture."

"The succulent shoots of trees, however, always appear to grow most rapidly, in a damp heat, during the night; but it is rather elongation than growth, which then takes place. The spaces between the bases of the leaves become longer, but no new organs are added; and the tree, under such circumstances, may with much more reason be said to be drawn, than to grow; for the same quantity only of material is extended to a greater length, as in the elongation of a wire.

"Another ill effect of high temperature during the night is, that it exhausts the excitability of the tree much more rapidly than it promotes the growth, or accelerates the maturity of the fruit; which is in consequence ill supplied with nutriment, at the period of its ripening, when most nutriment is probably wanted. The muscat of Alexandria, and other late grapes, are, owing to this cause, often seen to wither upon the branch in a very imperfect state of maturity; and the want of richness and flavor in other forced fruits is, I am very confident, often attributable to the same cause. There are few peach-houses, or indeed forcing-houses of any kind in this country, in which the temperature does not exceed, during the night, in the months of April and May, very greatly that of the warmest valley in Jamaica in the hottest period of the year: and there are probably as few forcing-houses in which the trees are not more strongly stimulated by the close and damp air of the night, than by the temperature of the dry air of the noon of the following day. The practice which occasions this, cannot be right. it is in direct opposition to nature." *Hort. Trans.* vol. ii. p. 130.

1013. We consider the above observations as of the greatest practical importance, and have no doubt of their leading to a very *different practice* from that now generally adopted by gardeners. Abercrombie says, "When, on account of fruit-bearers or other plants being about to set their blossoms, it becomes improper to water them over the herb, have recourse to steaming the flues, morning and evening; letting the flues be at a maximum heat before you pour the water on them." According to T. A. Knight's reasoning, such a practice must be highly injurious in almost every case. We have no doubt it is productive of the greatest injury, not only in the case of forcing of every description, but even in the culture of exotic fruits, as pines and melons. Though it cannot be expected that old practitioners will yield to what they will consider speculative reasoning, yet we look to the young and enquiring cultivator for a reformed practice in this matter, and in all that respects light, heat, and the use of leaves.

Sect. VI. *Operations of Exotic Culture in Hot-houses.*

1014. The distinction between forcing the vegetables of temperate climates into the premature perfection of their flowers or fruit, and the rearing and culture of plants from hot countries not inured to our climate, is sufficiently obvious. The latter was the first object for which hot-houses were erected, and conservatories, green-houses, and plant-stoves, existed in this country before any description of forcing-house; even pineries are of subsequent introduction to botanic and ornamental hot-houses.

The various climates and constitutions of plants require atmospheres of different degrees of temperature and moisture. These may be reduced to 1. The *green-house*, of which the varieties are the Sinarium, or house for Chinese plants; the Conservatory in which the plants are inserted in the soil without pots. The cold frame for bulbs, and heathery for Cape plants, &c. 2. The *dry-stove*, for succulent plants, and 3. The *moist*, or bark-stove, for pines, palms, and the tropical plants which require the highest degree of heat.

In general, hot-house exotics are kept in pots; but in some cases, fruit-bearing plants, as the orange, and plants with large roots, as the Strelitzia, and luxuriant creepers, as the different Passifloras, are planted in the ground. The soils are of course, very various, and can only be treated of with advantage under each species, tribe, or family. There are none of them, however, that will not thrive either in bog-earth, sand, or loam, or a mixture of these. For pines, oranges, and large blossomed plants, rotten leaves, or old cow-dung, are added with advantage; and to some of these, as to the orange and pine, liquid manures are frequently applied. Gardeners in general are averse to the application of any thing rich to the soil of exotic plants which are not cultivated for their fruit, a prejudice evidently contrary to analogy, and originating, in all probability, in the circumstance, that it is in general desirable to keep exotic plants small, both for want of room in ordinary-sized houses, and by that means to induce a flowering state. Now, however, when the facilities of hot-house building by wrought and cast iron admit of covering several acres of ground with a glass roof at fifty, a hundred feet, or at any distance from the surface; and when the mode of heating by steam readily admits of keeping such a space at any required temperature, all exotic plants, where expense is not an object, may be planted in the ground duly prepared, cultivated and manured like a shrubbery, and allowed to attain their natural size. Such a house or scene may be watered after Loddiges' method already described (701.), and its temperature regulated, if desired, by the ingenious machine of Kewley (*fig.* 129.).

That all plants will bear manure of some sort is proved analogically by T. A. Knight. "An opinion," he says, "generally, though, I think, somewhat erroneously, prevails, that many plants, particularly the different species and varieties of heath, require a very poor soil in pots; but these might, I conceive, with propriety, be said to require a peculiar soil; for I have never seen the common species of this genus spring with so much luxuriance, as from a deep bed of vegetable mould, which had been recently very thickly covered with the ashes of a preceding crop of heaths and other plants, that had been burnt upon it. And I believe, if the branches and leaves of the common species of heath were placed to decompose in water, and such water were afterwards given to the tender exotic species, that these, how heavily so ever the water might be loaded with organizable matter, would be found as little capable of being injured by abundant food as the vine or mulberry tree, though the species of food, which would best suit those plants, might prove to every species of heath destructive and poisonous."

1015. In respect to the *general management* of such houses, the *green-house*, or more temperate sort, are freely exposed to the influence of our atmosphere when the open air is not colder than 48° of Fahrenheit, and when winds and rains do not prevent the opening of the roofs or other means of ventilation. "As long as the weather continues fair without frost," says Abercrombie, "open the green-house windows in the day-time an hour after sun-rise, and close at the same time before sun-set. Never admit air by the door or sashes in foggy or damp weather, or when bleak cutting winds prevail. The admission of air in the middle of a clear frosty day will not hurt the plants, if counteracted by fire heat. Admit air freely when the external temperature is at 42° by Fahrenheit, or above; admit it guardedly when between 35 and 42°; but not at all when under 35° before the furnace is employed." Green-house plants are generally placed in the open air during the five mildest months in the year, either by taking off the roofs of the houses when these are moveable, or by removing the pots, and placing them in the open garden.

1016. *Dry-stoves* are opened night and day in the summer season, but only during sunshine in winter and spring, beginning as in the forcing-house, by opening the top sashes or ventilators first, by which the external air descends and cools down the temperature, partly by mixing with the internal air, and partly by forcing it out. Afterwards, when the temperature of the atmosphere is above 50°, the lower or front sashes or ventilators may be opened, by which means a regular circulation or breeze is promoted in every part of the house, if a detached house; and in most parts of it, if forming part of a range of connected houses.

1017. In *pineries* and *stoves*, for tropical plants, the above remarks will apply as to *air* in the winter and spring seasons; but when it is desired that the plants should grow vigorously, as after renewal of the bark, or shifting of the pots, liquid manure, and very little *ventilation*, as recommended by T. A. Knight, for forcing-houses, is certain of effecting the purpose. "The range of *temperature* which plants can endure in the bark stove," observes Niel, "is from 63 to 81° of Fahrenheit, the instrument being in the middle of the house, at a considerable distance from the furnace, and out of reach of the sun's rays." M'Phail, however, found that pines will bear without injury 130°, and he considers that no plant whatever will be injured by 120°.

"It is not uncommon to give air to a hot-house only through the day, and to shut it up close at night, perhaps even increasing the temperature in the evening. Judicious horticulturalists reverse the practice. Knowing, for example, that, in the West Indies, chilly and cold nights usually succeed to the hottest days, they rather imitate nature, by shutting up the house during the day, and throwing it open at night. This practice, however, can only be followed in our climate in the summer and autumn seasons." *Niel.*

This seems to be in unison with T. A. Knight's opinion, who considers excess of heat during the night, as in all cases, highly injurious to the fruit-trees of temperate climates, and not at all beneficial to those of tropical climates; "for the temperature of these is in many instances low during the night. In *Jamaica*, and other mountainous islands of the *West Indies*, the air upon the mountains becomes, soon after sun-set, chilled and condensed, and in consequence of its superior gravity descends and displaces the warm air of the valleys; yet the sugar-canes are so far from being injured by this sudden decrease of temperature, that the sugars of Jamaica take a higher price in the market than those of the less elevated islands, of which the temperature of the day and night is subject to much less variation." *Hort. Trans.* vol. ii. p. 151.

"One of the weak points in artificial culture," Abercrombie remarks, "is the difficulty of ventilating the house in cold weather, without letting the temperature sink to an injurious degree; but it is better to raise the heat and air the house, than to lose the salubrious influence of a duly renewed and perfectly sweet air within, by keeping the house constantly shut up in inclement weather. From November to April, the admission of air must be very guarded; being given by small openings, about noon in fine days, from an interval of five hours together to half an hour before and after twelve; and on any adverse change in the weather, the sashes must be closed in a shorter time. In confirmed summer, draw down some of the top, or slide open some of the front sashes, an hour after sun-rise; and let them remain open till an hour before sun-set. Admit also a little air from evening till morning, when the nights are sultry. In admitting or excluding air at a natural temperature, have always regard to the thermometer.

"In respect to artificial heat, the temperature for the general hot-house," according to the same author, "is 58° *min.* 70° *max.* When meridian summer is felt, the temperature must keep pace with the increase of heat in the atmosphere; and therefore will ascend through all the intermediate degrees, to 75°, 80°, 85°, 90°, 95°, and even to 100°. The maximum heat in the house, in July and August, may in general be kept down to 90°, by free admissions of air, and by evaporation from the water given to the plants; although the force of the season will sometimes prevail to 95° and 100°." T. A. Knight would not object to 120° or 130°, or more, during the day, provided the sashes were left open, and the air by that means allowed to cool down proportionally during the night.

1018. *Watering in Exotic Culture.* "All plants in a course of growth require occasional supplies of water; regulated by their constitution, and the state of the weather, as to heat or cold, dryness or humidity. In winter the artificial heat of the house, and the situation of evergreens in constant growth, deprived of the dews and rains which they would catch exposed in their native climate, renders the application of water necessary; though it requires great circumspection to administer this branch of culture without injuring delicate exotics. In rigorous weather, it is dangerous to water over the herb even of robust shrubs. And water spilt in the house in watering now and then at the roots should be carefully wiped up, lest a damp vapor should be raised calculated to render the earth in the pots, or even the plants, *mouldy*. From November to February, the shrubs nearest the flues, not succulents, may require a little water once in three days; herbaceous plants, once in five days; such as are in cooler parts of the house must have water seldom and in less quantities. The succulents, in particular, must be watered very sparingly in winter, and at intervals, once or twice a fortnight when the earth in the pots is very dry; the more humid-leaved only in the saucers. The time of day for watering in winter is noon, or within an hour of it; and a mild sunny day should be taken, if such offers. In summer, succulents which are shrubby partake of the wants of shrubs, and plants making new branches require water plentifully, and in dry hot weather almost daily, in proportion to the firmness and woody nature of the shoots; the completely succulent kinds require rarely, even in summer, to be watered over the herb. Succulent exotics, exposed to all the changes of our climate, suffer more from humidity than from cold; in or out of the house, they must be guarded carefully from drips; if in the winter season, one of these delicate plants becomes too wet by accident, shake it out of the pot, dry it for half a day, and replant it in dry earth. Herbaceous kinds require water in a middling degree. Water should never be withheld from any plant so long as that the effect of a dry heat, unbalanced by water, may occasion the herb to droop. Use the soft water of a pond, river, or cistern.

"It is rarely proper to put saucers under any other pots than those of plants on shelves, to prevent drips on plants below. Speedily empty the water from the saucers, as it cannot stand long without being pernicious." *Abercrombie.*

Most gardeners have a powerful prejudice against condensed water falling from the glass roof on plants; but M'Phail alleges, and, in the opinion of many cultivators, justly, that such water of condensation does no harm. The vapors arising out of bark or leaves, or from water poured on these or on any part of the hot-house, he considers must be wholesome to plants when it descends in drops, or condenses on them. "Indeed," he adds, "if plants be kept in a climate which suits their nature, it is only reasonable to suppose, that they are possessed of properties capable of dispersing of water which happens to fall on them by accident or otherwise." The only evil to be apprehended from such water is, where it drops continually from one point, and consequently must chill and destroy the plant, or part of the plant it drops on. But this, according to the Latin proverb, is not the water, but its continued effect.

1019. *Insects in exotic culture.* There are a great variety of modes of destroying these in artificial climates, each of which will be noticed in its proper place; but the known fact of hot, moist air being so hurtful to animal life, affords a general and most philosophical method of destroying every known species of insect; and for this mode, as it appears to us, the practical gardener is indebted to M'Phail. Having "ascertained that a vegetable can endure, without hurting it, 130° of heat, according to the degrees on Fahrenheit's thermometer, I am inclined," he says, "to think that no animal is able to endure such a heat and live. Undoubtedly, insects increase rapidly in hot weather in the open air, especially on the peach-tree, and on other trees, against warm walls, both in the spring and summer months; and they increase most rapidly in dry weather; but the heat in the open air against walls seldom rises to 100°; and in the hottest countries in the world, where vegetables and animals exist, the heat in the shade seldom rises to blood heat, which is about 97°. Having considered these things, and ascertained that a plant can endure a heat of 130°, I determined to try another experiment, that is, to ascertain whether heat and water would destroy insects, and keep plants alive." He then watered the leaves of pines with water "heated to not less than 70 or 80 degrees, and sometimes 100 degrees;" keeping a strong fire and bottom heat, so as to keep them constantly in a hot, moist air, sometimes at two or three o'clock in the afternoon about 120°. The plants, which, in the experiment, were pines, grew vigorously, and in a few weeks the insects with which they were covered, were "totally destroyed, many of them lying dead on the leaves and fruit." "The methods which I used, and which I have described, for the destruction of insects on the pine apple, will destroy them on all other sorts of plants in a hot-house, but it is too powerful to be applied to them in blossom or in fruit. The exact time it takes to destroy them I cannot tell; it may be that they die a lingering death; and it is necessary that their spawn or eggs, which are deposited in hidden places of the plants, be destroyed also, otherwise I apprehend the heat will hatch them. I have set tender and curious sorts of exotic plants into a brick bed, covered with glass, and have given them the degrees of heat I have mentioned, watering them over their leaves every day, and in the course of a fortnight it evidently appeared that the insects were destroyed on them." Where houses are heated by steam, this process may be performed with great ease and efficiency, by simply admitting constantly, for some weeks together, the vapor into the air of the house. And, in fact, where hot-houses are heated by steam, and this mode practised, insects are very seldom to be seen. We, thererefore, consider it as the simplest and most universal mode of destroying them. The next in order we consider to be rubbing or washing them off each leaf and plant separately with a brush or sponge and water; and the third fumigating with tobacco-smoke, sulphur, or volatile alkali. But of these three modes, the most powerful is that of keeping plants clean, by washing them frequently with water and a sponge, and keeping the air of the house moist. The various compositions recommended by gardeners, by inducing an implicit reliance on their effects, often lead to a neglect of regimen and cleanliness, and thus are injurious rather than beneficial.

Sect. VII. *Operations of Protection from Injuries, Insects, and Diseases.*

Many vegetables which flourish in Britain in the open air during the summer season require protection during some or all of the other seasons of the year. Some also, from the state of their health, or other circumstances, require to be protected from the direct rays of the sun, from excessive rains, or winds, &c. What is general on this subject shall be treated of in this section, and what is particular will, as in all other cases, be found under the culture and treatment of individual vegetables.

1020. *Protecting by Fronds and Frond-like Branches* is performed by sticking in the foot-stalks of the fronds of any of the ferns, but especially of the *pteris aquilina*, branches of whin or broom, or of any other evergreens, between the branches of wall-trees and the wall, so as the frond or leafy part of the branch may project, and either retard the blossom by excluding the sun, as is often done in Denmark and Sweden, or protect it from the frost and winds, as is generally the object in Britain. This is a very simple and economical protection for myrtles, camelias, and other tender botanical plants, trained to walls, or even growing in the open ground as stools, and also for fruit-trees. Archd. Gorrie (*Caled. Mem.* vol. i. 276.) formed a frame for the more commodiously containing the branches of spruce and silver firs, and other evergreens; and applied frames so clothed to his fruit-tree walls, on the principle of retarding the blossom. The success was equal, and even beyond his expectations. He covered them on the 20th of February, and removed the frames on the 1st of June. During this period, the frames were opened every fine day, but always shut at night. Adjoining were some trees of the same kinds, which were covered night and day, during the above period, with a woollen net. The shoots of these trees were infected with the *curl* or wrinkled leaf — a disease peculiar to peach-trees in exposed situations; while those protected by the frames of branches were perfectly healthy; and what is remarkable, though retarded nearly four weeks in the period of their blossoming, the fruit ripened one week sooner.

The advantage of Gorrie's practice is, that the screens or protecting frames can be removed in the day time; whereas, attaching them to the trees, they must, in general, remain till they have effected their object. It is easy to conceive that trees so treated must often suffer from want of light, and accordingly W. Nicol, on the whole, rather disapproves of it. "It is," he says, "a common practice to *screen the blossoms of wall-trees* by sticking twigs of larch, or of evergreens, as firs, or laurels, between the branches and the wall, in such a manner as to overhang the blossoms where thickest; and some, instead of these, use the leaves of strong fern. These last are certainly fitter for the purpose than the former mentioned, as being lighter, and less liable to hurt the blossoms, when dashed by the wind against them. But all these are objectionable, on account of their shading the bloom too much, and too constantly, from the sun and light, by which they are rendered weak, and the fruit they produce often drop away, before arriving to any considerable size; so that all this trouble taken goes for nothing, as there would probably have been as good a crop, had the trees been left to take their chance."

1021. *Protecting by Straw-ropes* is effected by throwing the ropes in different directions over the trees, and sometimes depositing their ends in pails of water. It is a Dutch practice, and appears to have been first made known in this country by Dr. Anderson, in his *Recreations, &c.* in 1804. James Laird appears to have tried it successfully on wall-trees, and on potatoes and other herbaceous vegetables. His method is as follows: — "As soon as the buds of the trees become turgid, I place poles against the wall, in front of the trees, at from four to six feet asunder; thrusting their lower ends into the earth, about a foot from the wall, and fastening them at the top with a strong nail, either to the wall or coping. I then procure a quantity of straw or hay ropes, and begin at the top of one of the outer poles, making fast the end, and pass the rope from pole to pole, taking a round turn upon each, until I reach the end; when, after securing the end well, I begin about eighteen inches below, and return in the same manner to the other end, and so on, till I have reached to within eighteen inches or two feet of the ground.

"I have also found straw-ropes to be very useful in protecting other early crops from the effects of frost, as peas, potatoes, or kidney-beans, by fixing them along the rows with pins driven into the ground. Old herring-nets, and branches of evergreens, are not so efficacious as straw-ropes, which, besides being much cheaper, may be obtained in every situation."

1022. *Protecting by Nets* is effected by throwing either straw, hay, bass, hempen, or woollen nets over standard-trees, the extreme shoots of which will support the net; or by throwing it over hooped beds, or hooped single plants of herbaceous vegetables, or fixing it over the fruit-trees trained against a wall (*fig.* 100.), or by placing it over tender flowers and botanic plants, as *auricula and hydrangea, &c.* by means of net-frames or portable cases.

"The ordinary way of applying nets," Nicol observes, "is to hang them over the trees, close to the branches; the flowering buds and spurs often sticking out beyond the net. Instead of being hung on in so unmeaning a manner, they should be placed out, at the distance of fifteen or eighteen inches from the tree; being kept off by hooked sticks, with their butts placed against the wall, and at the distance of about a yard from each other. In order to make these stand firmly, the net should be first stretched tightly on, and be fastened on all sides. By farther stretching it, to the extent of fifteen or eighteen inches, over the hooked ends of the sticks, it will be rendered so firm, that no wind will displace it; and the sticks will also be made quite fast at the same time. If the nets were doubled, or trebled, and put on in this way, they would be the more effectual a screen, as the meshes or openings would, in that case, be rendered very small." Woollen nets are deemed the best, and are now in general use in Scotland. Bass nets are used in Sweden, and straw nets at the Duke of Buccleugh's garden at Dalkeith. "In screening with nets of any kind," Nicol observes, "they are always to be let remain on night and day, till all danger be over; the trouble of putting them properly on being considerable, and there being no necessity for repeating such trouble, as they will in nowise injure the health of the trees, being incapable of shading them *very* much."

1023. *Protecting by Canvass or Buntine Screens* is effected either by placing moveable canvass cases over or around detached trees; portable hand-cases over herbaceous plants; tents or open sheds over the florists' productions; or frames or sheets against trees trained on walls. In all cases they should be placed clear of the tree or plant, either by extended, forked, or hooked sticks, or hooping, or any other obvious resource. "For hot-walls," Nicol observes, "they should be placed "about the distance of a foot at top, and of eighteen inches at bottom." "In using canvass or buntine-screens, in either of the above mentioned forms, the trees are always to be exposed to the free air and light, in good weather, through the day; screening only at night, and on bad days, applying them from the time the buds begin to open, till the fruit is fairly set, or till any fear of further danger from the effects of frost be past."

1024. *Protecting by Mats* is the commonest of all modes for bushes, beds, and single herbaceous plants. Sometimes also screens of mats sewed together, or bound in frames, are applied to fruit-trees, either singly or in frames, or on hooks and pegs. Nicol considers that they are "in no way so good, effectual, or ultimately so cheap screens as those of canvass."

1025. *Protecting by Straw and Litter* is effected in herbaceous plants by laying it round their roots, as in the artichoke, asparagus, &c.; or covering the tops of seedlings, which was formerly done, in cultivating the cucumber and melon, and is still practised by market-gardeners in raising radishes and other tender salading. Straw is also formed into coverings of various sorts for frames; screens for projecting from walls; cones for bushes, and herbaceous plants, and bee-hives.

1026. *Protecting by oiled Paper Frames* is effected on exactly the same plan and principle as that by buntine or canvass screens. "Frames covered with oiled paper have been successfully employed at Grangemuir garden in Fifeshire. The frames are of wood, inch and half square, with cross-bars mortised into the sides. To give support to the paper, strong pack-thread is passed over the interstices of the frames, forming meshes about nine inches square. Common printing (or unsized) paper is then pasted on; and when this is quite dry, a coating of boiled linseed-oil is laid on both sides of the paper with a painter's brush. These frames are placed in front of the trees, and made moveable, by contrivances which must vary according to circumstances. If the slope from the wall be considerable, a few triangular side frames may be made to fit the spaces. At Grangemuir, the frames are not put up till the blossoms be pretty well expanded; till which time they are not very apt to suffer from spring frosts or hail showers. In this way, it may be remarked, there is much less danger of rendering the blossom delicate by the covering, than if it were applied at an earlier period. The paper frames, if carefully preserved when not in use, will endure for a good many years, with very slight repairs."

1027. *Protecting Copings*, and horizontal boards, mentioned by Miller and Laurence, are used chiefly with a view of preventing the perpendicular cold. They are projected generally from the top, but in lofty walls, also from the middle, and remain on night and day during the cold season. When there is only a temporary coping, it is recommended by Miller and others to be hinged, and to have strings hanging down from every board on each side of the wall, so as the board may be projected or thrown back to rest on the top of the wall at pleasure.

1028. *Protecting by transparent Covers* is effected with small plants by placing over them a hand or bell glass; with larger ones, by other portable bell, or curvilinear-shaped portable cases, and with considerable shrubs or fruit-trees by moveable cases or glass tents (*fig.* 134.). For culinary seedlings, herbaceous plants in pots, and young trees of delicate sorts, timber frames with glass covers are used; or the plants are placed in pits dug in the ground, over which sashes are laid. In whichever way transparent protections are used, they must be partially or wholly removed, or otherwise opened, in fine weather, to admit a change of atmosphere, and a free current to dry up and destroy the appearance of what are called damps; and also to harden and prepare such plants for the removal of the covers.

1029. *Transparent Screens* are made by placing sashes not in use on edge, and thus forming as it were glass walls or partitions, which, applied to green-house plants, set out in the open air, have the effect of producing shelter without shade, and at the same time of admitting the fall of rain on the plants. Many plants receive sufficient protection by being placed near to the south side of a wall, hot-house, or other building, or under a tree or bush during the winter months, without any covering or guard whatever.

1030. *Protection from the Enemies of Gardens* is of two kinds, that which relates to birds, insects, quadrupeds, &c. and that which relates to the human species. Plants cannot easily be protected from insects, though these may be destroyed when they appear. Some species, as wasps, flies, &c. are prevented from attacking ripe fruits by gauze or nets, or by inclosing the fruit, as grapes in bags. The blossoms of the *hoya carnosa* are said by Mahir (*Hort. Trans.* vol. i.) to entice wasps from grapes, in hot-houses; and the fruit of the common yew-tree is said by T. A. Knight to have the same effect in the open air.

Birds are prevented from attacking newly-sown seeds by nets thrown over them and supported by rods at some distance from the ground; from fruits and seeds in a similar manner, and also by scares and other devices in universal use.

Protection from quadrupeds, and, in some degree, from the human animal, is afforded by boundary fences; to which, for our own species, is added the fear of being caught by traps, shot by spring-guns, or discovered through alarums, &c.

1031. The only way to *protect from diseases* is by using every means to promote health and vigor, and to anticipate natural decay by removing the plant to the compost heap or fuel stack. Regimen and cleanliness, therefore, in plants as in animals, are the grand protectors from disease.

Sect. VIII. *Operations of Gathering, Preserving, and Keeping.*

Some of the productions of gardening, after being reared and perfected, are to be gathered for immediate consumption; but a part require to be preserved in a state fit for culinary purposes; or for sowing or dispersing, or sending to a distant market, family, or friend.

1032. *Gathering Vegetables* is, in part, performed with a knife, as in cutting off some fruits, as the cucumber, or heads of leaves, as the cabbage; and in part by fracture or torsion with the hand, as in pinching off strawberries between the finger and thumb, gathering peas, with one hand applied to retain the stem firm, and the other to tear asunder the peduncle, &c. In all cases of using the knife, the general principle of cutting is to be attended to, leaving always a sound section on the living plant. Gathering with the hand ought to be done as little as possible, as there are now garden pincers for all such purposes, which do the work quicker, with far less injury to the plant, and more regard to cleanliness. Sometimes the entire plant is gathered, as in celery and onions; and at other times only the root or tuber, as in potatoes and carrots. In taking up these, care must be taken not to injure their epidermis, as on the preservation of this depends their retention of juices, beauty, and keeping.

1033. The *gathering of Fruits* should take place "in the middle part of a dry day; not in the morning before the dew is evaporated, nor in the evening when it begins to be deposited. Plums readily part from the twigs when ripe: they should not be much handled, as the bloom is apt to be rubbed off. Apricots may be accounted ready when the side next the sun feels a little soft upon gentle pressure with the finger. They adhere firmly to the tree, and would over-ripen on it and become mealy. Peaches and nectarines, if moved upwards, and allowed to descend with a slight jerk, will separate, if ready; and they may be received into a tin funnel (*fig.* 66.) lined with velvet, so as to avoid touching with the fingers or bruising. The old rule for judging of the ripeness of figs, was to observe if a drop of water was hanging at the end of the fruit; a more certain one is, to notice when the small end becomes of the same colour as the large end. The most transparent grapes are the most ripe. All the berries on a bunch never ripen equally; and it is therefore proper to cut away unripe or decayed berries before presenting the bunches at table. Autumn and winter pears are gathered, when dry, as they successively ripen. The early varieties of apples begin to be useful for the kitchen in the end of June; particularly the codlins and the jenneting; and in July they are fit for the dessert. From this time till October or November, many kinds ripen in succession. The safest rule is to observe when the fruit begins to fall naturally. Another easy mode of ascertaining, is to raise the fruit level with the footstalk; if ripe, it will part readily from the tree: this mode of trial is also applicable to pears. A third criterion is to cut up an apple of the average ripeness of the crop, and examine if its seeds have become brown or blackish; if they remain uncolored, the fruit is not ready for pulling. Immature fruit never keeps so well as that which nearly approaches maturity; it is more apt to shrivel and lose flavor. Winter apples are left on the trees till there be danger of frost: they are then gathered on a dry day." *Niel.*

In no case should fruit be gathered with the hand when any of the different descriptions of fruit-gatherers (*figs.* 65 to 69.) can be used. With one or other of these, and the use of proper ladders, every kind of fruit, from the gooseberry to the walnut, may be gathered without bruising, soiling, or fingering the fruit, and without injuring the tree.

1034. The *Gathering* of seeds should take place in very dry weather, when the seed-pods, by beginning to open, give indications of perfect ripeness. Being rubbed out with the hand, beat with a stick, or passed through a portable threshing-machine, they are then to be separated by sieves and fanners from their husks, &c. and spread out in a shaded airy loft till they are so dry as to be fit for putting up in linen or paper bags, or putting in drawers in the seed-room till wanted.

1035. *Preserving Heads or Leaves of Vegetables* is effected in cellars or sheds, of any temperature, not lower, nor much above the freezing point. Thus cabbages, endive, chiccory, lettuce, &c. taken out of the ground with their main roots in perfectly dry weather, at the end of the season, and *laid in*, or partially immersed in sand or dry earth, in a close shed, cellar, or ice-cold room, will keep through the winter, and be fit for use till spring, and often till the return of the season of their produce in the garden. The German gardeners are expert at this practice; and more especially in Russia, where the necessities being greater, has called forth greater skill and attention.

1036. *Roots are preserved* in different ways, according to the object in view. Tuberous roots, as those of the *dahlia*, *pæonia*, tuberose, &c. intended to be planted in the succeeding spring, are preserved through the winter in dry earth, in a temperature rather under than above what is natural to them. So may the bulbous roots of commerce, as hyacinths, tulips, onions, &c.; but for convenience, these are kept either loose in cool dry shelves or lofts, or the finer sorts in papers, till the season of planting.

Potatoes, turnips, and all similar roots which it is desired to preserve in a dormant or unvegetating state beyond the season of planting, have only to be sunk in pits to such a depth as that vegetation will not take place. This need seldom exceed four feet; a pit kept quite dry, filled with these roots to within four feet of the surface, and the remainder compactly closed with earth, will keep one or more years in a sound state, and without vegetating (*Farmers' Mag*). For convenience of using, there should be a number of small pits, or rather of large pots of roots, so buried at a little distance from each other, as that no more may be taken up at a time than what can be consumed in a few days. The mould or compost ground will, in general, be found a convenient scene for this operation; and, for a small family, pots contrived with covers, or with their saucers, used as such, may be deeply immersed in a large shaded ridge of earth, to be taken up, one at a time, as wanted. Grain, apples, and potatoes, are kept the whole year in deep pits, in sandy soil, formed in the village greens of some parts of Gallicia and Moravia. J. Oldacre informs us, in his account of his mushroom-house, (*Hort. Tr.* vol. ii.) that he preserved even broccoli in it through the winter; and J. Henderson, of Brechin, makes use of the ice-house for preserving "roots of all kinds till the return of the natural crop.

"By the month of April," he says, "the ice in our ice-house is found to have subsided four or five feet; and in this empty room I deposit the vegetables to be preserved. After stuffing the vacuities with straw, and covering the surface of the ice with the same material, I place on it case-boxes, dry ware casks, baskets, &c.; and fill them with turnips, carrots, beet roots, celery, and, in particular, potatoes. By the cold of the place, vegetation is so much suspended, that all these articles may be thus kept fresh and uninjured, till they give place to another crop in its natural season."

The Rev. A. Dow preserves that part of his potatoes intended for spring and summer use in small pits, holding about 6 cwt. each, which are heaped up, and covered with straw and earth in the usual mode. "In April or May, according to the heat of the season, these potatoes are turned over into other pits, after carefully rubbing off, or picking out the shoots or buds, and laying aside every one that has any blemish or tendency to spoil, the evening before a new pit is dug, or an old one cleaned out, in some dry spot, and, if possible, under the shade of some tree, wall, or stack of hay, &c. This is filled nearly full of water, which, by next morning is all drunk in, and the earth well cooled all round in the pit. The potatoes, carefully picked of all their shoots, are put into the pit thus prepared; and every quantity, of a firlot or half boll, is watered as it is put in, till the potatoes are level with the surface of the ground; they are then covered with live turf, the green side next the potatoes, and a hearty watering given; when the whole is covered to the depth of two feet with earth, watered, and well beaten together with the spade. This process is repeated every time the potatoes are turned over, which is about once in three weeks, less or more, according to the weather. When it is very hot, and the pits or heaps not in the shade, it is proper sometimes to cover the pit or heap with a mat, supported on a few sticks, so as to allow a free current of air between the mat and the heap.

An obviously preferable mode, wherever it is practicable, is to place the roots so deep, or by other means in so low a temperature as not to subject them to vegetation, by which means, turning, picking, and watering every three weeks, will be entirely avoided.

1037. *Green Fruits* are generally preserved by pickling or salting, and the operation is performed by some part of the domestic establishment; but in some countries it is made the province of the gardener, who, in Poland, preserves cucumbers and kholrabbi by salting, and then immersing them in casks at the bottom of a deep well, where the water, preserving nearly the same temperature throughout the year, impedes their decay. It must be confessed, however, that vegetables so preserved are only fit to be eaten with animal food, as preserved cabbage, (*i. e.* sour-crout,) or other salted legumes.

1038. Such *ripe fruit* as may be preserved, is generally laid up in lofts and bins, or shelves, when in large quantities, and of baking qualities; but the better sorts of apples and pears are now preserved in a system of drawers, (*fig.* 189.), sometimes spread out in them, at other times wrapt up in papers; or placed in pots, cylindrical earthen vessels, among sand, moss, paper, chaff, hay, saw-dust, &c. or sealed up in air-tight jars or casks, and placed in the fruit cellar (710.).

1039. Hitt's method of keeping pears may be shortly mentioned. Having prepared number of earthenware jars, and a quantity of dry moss, (different species of hypnum and sphagnum,) he placed a layer of moss and of pears alternately till the jar was filled; a plug was then inserted, and sealed around with melted rosin. These jars were sunk in dry sand to the depth of a foot; preferring a deep cellar for keeping them to any fruit-room.

1040. Miller says, after sweating and wiping pears, in which operations great care must be taken not to bruise the fruit, they are packed in close baskets, having some wheat-straw in the bottom and around the sides to prevent bruising, and a lining of thick soft paper to hinder the musty flavour of the straw from infecting the fruit. Only one kind of fruit is put in each basket, as the process of maturation is more or less rapid in different kinds. A covering of paper and straw is fixed on the top, and the basket is then deposited in a dry room, secure against the access of frost, "and the less air is let into the room, the better the fruit will keep." A label should be attached to each basket, denoting the kind of fruit; for the basket is not to be opened till the fruit be wanted for use.

1041. James Stewart, an experienced gardener at Pinkie, in Scotland, has long preserved his choice apples and pears in glazed earthenware jars, provided with tops or covers. In the bottom of the jars, and between each layer of fruit, he puts some pure pit-sand, which has been thoroughly dried on a flue. The jars are kept in a dry airy situation, as cool as possible, but secure from frost. A label on the jar indicates the kind of fruit; and when this is wanted or ought to be used, it is taken from the jars, and placed for some time on the shelves of the fruit-room. The less ripe fruit is sometimes restored to the jars, but with newly-dried sand. In this way he preserves colmarts and other fine French pears till April; the terling till June; and many kinds of apples till July, the skin remaining smooth and plump. Others who also employ earthenware jars, wrap each fruit in paper, and, in place of sand, use bran. *Niel.*

1042. Ingram at Torry, in Scotland, a very intelligent gardener, has succeeded uncommonly well in the management of the fruit-room. For winter-pears he finds two apartments requisite, a colder and a warmer; but the former, though cold, must be free of damp. From it the fruit is brought into the warmer room, as wanted; and by means of increased temperature, maturation is promoted, and the fruit rendered delicious and mellow. Chaumontels, for example, are placed in close drawers, so near to a stove, that the temperature may constantly be between 60° and 70° Fahr. For most kinds of fruit, however, a temperature equal to 55° is found sufficient. The degree of heat is accurately determined by keeping small thermometers in several of the fruit-drawers, at different distances from the stove. The drawers are about six inches deep, three feet long, and two broad; they are made of hard wood, fir being apt to spoil the flavour of the fruit. They are frequently examined in order to give air, and to observe the state of the fruit, it being wiped when necessary. —. Ingram remarks, that, in Scotland particularly, late pears should have as much of the tree as possible, even although some frost should supervene; such as ripen freely, on the other hand, are plucked rather before they reach maturity.

1043. Winter apples are generally left on the trees till there be danger of frost. They are then gathered, when dry, as formerly noticed; and are laid in heaps, and covered with mats or straw, or short grass well dried. Here they lie for a fortnight or more, to *sweat*, as it is called, or to discharge some of the juice of their skin, which thus contracts in a certain degree. After this they are wiped dry with a woollen cloth, and placed in the fruit-room. Sometimes, when intended for winter dessert fruit, they are made to undergo a farther sweating; and are again wiped and picked: they are then laid singly on the shelves, and covered with paper. Here they are occasionally turned, and such as show any symptoms of decay are immediately removed. Baking fruit is kept in a close but cool place, where the temperature undergoes little variation. It is found to be advantageous to keep each sort separate. Sometimes apples and pears for baking are kept in baskets or hampers. Thick paper is considered a better material for lining and covering such baskets or hampers than straw, and straw is better than hay.

It may be proper to mention, that some entirely disapprove of the sweating of fruit, affirming that it thereby acquires a bad flavour, or, at any rate, that the natural flavor of the fruit is deteriorated, and that it gets dry and mealy. They consider it better to carry the fruit directly from the tree, carefully avoiding all sort of bruising, and to lay it thinly on the shelves of the fruit-room; afterwards wiping each fruit, if necessary. The room, they say, should be dry, and the only use that should be made of a stove, is to take off the damp. *Niel.*

1044. T. A. Knight, in a valuable paper on this subject, gives the following *rationale*, and account of his own practice in preserving fruits.

"The art of preserving fruits for the dessert, in winter and spring, appears to be better understood, or, at least, to be practised with better success by the gardeners of the continent, than by those of the British islands; and it becomes a very interesting subject of enquiry, whether the superior success of the continental gardeners be dependent upon the superior qualities of their fruits, upon the influence of a less humid atmosphere during winter, or upon some peculiarities of management.

"Fruits which have grown upon standard trees, in climates sufficiently warm and favourable to bring them to maturity, are generally more firm in their texture, and more saccharine, and therefore more capable of being long preserved sound, than such as have been produced by wall-trees; and a dry and warm atmosphere also operates very favourably to the preservation of fruits, under certain circumstances, but under other circumstances, very injuriously: for the action of those elective attractions, which occasion the decay and decomposition of fruits, is suspended by the operation of different causes, in different fruits, and even in the same fruit, in different states of maturity. When a grape is growing upon the vine, and till it has attained perfect maturity, it is obviously a living body, and its preservation dependent upon the powers of life; but when the same fruit has some time passed its state of perfect maturity, and has begun to shrivel, the powers of life are probably no longer, or at most very feeble, in action; and the fruit appears to be then preserved by the combined operation of its cellular texture, the anti-septic powers of the saccharine matter it contains, and by the exclusion of air by its external skin; for if that be destroyed, it immediately perishes. If longer retained in a dry and warm temperature, the grape becomes gradually converted into a raisin; and its component parts are then only held in combination by the ordinary laws of chemistry.

"A *nonpareille apple*, or a *catillac*, a *d'auch*, or *bergamotte de bugi pear*, exhibits all the characters of a living vegetable body long after it has been taken from the tree, and appears to possess all the powers of other similar vegetable bodies, except that of growing, or vitally uniting to itself other matter; and the experiments which I shall proceed to state, prove that the pear is operated upon by external causes, nearly in the same manner after it has been detached from the tree, as when it remains vitally united to it.

"Most of the fine French pears, particularly the d'auch, are much subject, when cultivated in a cold and unfavourable climate, to crack before they become full grown upon the trees, and, consequently, to decay before their proper season or state of maturity; and those which present these defects in my garden, are therefore always taken immediately from the trees to a vinery, in which a small fire is constantly kept in winter, and they are there placed at a small distance over its flue. Thus circumstanced, a part of my crop of auch pears ripen, and will perish, if not used, in November, when the remainder continue sound and firm till March or April, or later; and the same warm temperature which preserves the grape in a slightly shrivelled state, till January, rapidly accelerates the maturity, and consequent decay, of the pear. By gathering a part of my swan's egg pears early in the season (selecting such as are most advanced towards maturity,) and subjecting them, in the manner above mentioned, to artificial heat, and by retarding the maturity of the later part of the produce of the same trees, I have often had that fruit upon my table nearly in an equal state of perfection from the end of October to the beginning of February; but the most perfect, in every respect, have been those which have been exposed in the vinery to light and artificial heat, as soon as gathered.

"The most successful method of preserving pears and apples, which I have hitherto tried, has been placing them in glazed earthen vessels, each containing about a gallon (called, provincially, steens,) and surrounding each fruit with paper; but it is probable that the chaff of oats, if free from moisture or any offensive smell, might be used with advantage, instead of paper, and with much less expence or trouble. These vessels being perfect cylinders, about a foot each in height, stand very conveniently upon each other, and thus present the means of preserving a large quantity of fruit in a very small room; and if the spaces between the top of one vessel and the base of another, be filled with a cement composed of two parts of the curd of skimmed milk, and one of lime, by which the air will be excluded, the later kinds of apples and pears will be preserved with little change in their appearance, and without any danger of decay from October till February and March. A dry and cold situation, in which there is little change of temperature, is the best for the vessels; but I have found the merits of the pears to be greatly increased by their being taken from the vessels about ten days before they were wanted for use, and being kept in a warm room; for warmth at this, as at other periods, accelerates the maturity of the pear. The same agent accelerates its decay also; and a warmer climate cannot contribute to the superior success of the French gardeners; which probably arises only from the circumstance of their fruit being the produce of standard or espalier trees."

Some fruits may be preserved through the winter by allowing them to hang on the tree in a moderate climate, somewhat above the freezing point. Vines are sometimes so preserved, and Diel mentions that frequently on the nonpareil pippin, planted in pots, and kept under glass, without any fire-heat, he has had the fruit hanging on the tree till the ripening of the succeeding crop. Arkwright (*Hort. Trans.* vol. iii. 97.) by late forcing, retains plump grapes on his vines till the beginning of May, and even later, till the maturity of his early crops. In this way he gathers grapes every day in the year.

By covering some sorts of cherry, plum, gooseberry, and currant trees, either on walls or as bushes with mats, the fruit of the red and white currant, and of the thicker skinned gooseberry trees may be preserved to Christmas and later. Grapes, in the open air, may be preserved in the same manner; and peaches and nectarines may, in this way, be kept a month hanging on the trees after they are ripe.

But the true way to preserve keeping-fruits, such as the apple and pear, is to put them in air-tight vessels, and place them in the fruit-cellar, (710.) in a temperature between 32 and 40 degrees. In this way, all the keeping sorts of these fruits may be preserved, in perfect order for eating, for one year after gathering. (*Braddick, in Hort. Trans.* vol. iii.) See also *Encyc. Brit. Supp.* art. *Food.*

1045. When *seeds are to be preserved* longer than the usual period, or when they are to be sent to a great distance, various devices have been adopted to preserve their vitality. Sugar, salt, cotton, saw-dust, sand, paper, &c. have been adopted with different degrees of success. A. Livingston, who, from a long residence in China, is well informed on the horticulture of the Chinese, states that, "from April and October, rain is so frequent in China, and the air is generally so moist, that it is nearly impossible to preserve seeds. If excluded from the air, they are quickly covered with mildew, and when exposed, no less certainly destroyed by insects." He proposes to dry Chinese seeds by means of sulphuric acid, in Leslie's manner, which he found dried "small seeds in two days, and the largest seeds in less than a week. Seeds thus dried," he observes, "may be afterwards preserved in a vegetating state for any necessary length of time by keeping them in an airy situation in common brown paper, and occasionally exposing them to the air in a fine day, especially after damp weather. This method will succeed with all the larger mucilaginous seeds. Very small seeds, berries, and oily seeds, may probably require to be kept in sugar, or among currants or raisins." *Hort. Trans.* vol. iii. 184. See the article *Cold*, in *Supp. Encyc. Brit.*

It is probable many seeds might be preserved and sent to a distance with safety, if, after being thoroughly matured and dried, they were enveloped or baked into a large ball of loam. Such a mode, at all events, being suggested by nature, deserves a trial.

Nuts sent from the East Indies compactly packed in a barrel of clay, and the head of the cask firmly put on, have made a partial development of their parts, and still grown after their arrival.

1046. *Roots, Cuttings, Grafts*, and perennial plants in general, are preserved, till wanted, in earth or moss, moderately moist, and shaded from the sun. The same principle is followed in packing them to be sent to a distance. The roots or root-ends of the plants, or cuttings, are enveloped in balls of clay or loam, wrapped round with moist moss, and air is admitted to the tops. In this way orange-trees are sent from Genoa to any part of Europe and North America in perfect preservation; and cuttings of plants sent any distance which can be accomplished in eight months or even longer with some kinds. Scions of the apple, pear, &c. if enveloped in clay, and wrapt up in moss or straw, and then placed in a portable ice-house so as to prevent a greater heat than 32° from penetrating to them, would, there can be little doubt, keep a year, and might thus be sent from England to Australasia or China. T. A. Knight found that the buds of fruit-trees might be preserved in a vegetating state, and sent to a considerable distance, by reducing the leaf-stalks to a short length, and enclosing the shoot in a double fold of cabbage-leaf, bound close together at each end, and then enclosing the package in a letter. "It was found advantageous to place the under surface of the cabbage-leaf inwards, by which the enclosed branch was supplied with humidity, that being the perspirating surface of the leaf, the other surface being nearly or wholly impervious to moisture." *Hort. Trans.* vol. iv. p. 403.

Chap. IV.

Operations relative to the final Products desired of Gardens and Garden Scenery.

Hitherto, we have described particular operations calculated to effect particular purposes; and we now propose to take a summary view of the vegetable products, for which garden operations are performed; of the mode of regulating their performance by the master or manager; and of the points of attention requisite to ensure the beauty and order of garden scenery.

Sect. I. *Of the Vegetable Products desired of Gardens.*

These are the production of fruits, seeds, roots, stems, and stalks, leaves, flowers, barks, woods, and entire plants.

1047. *Fruits.* All plants require to attain the age of puberty, before they will produce fruits or seeds. In annuals, as in the melon, this happens in a few weeks or months; in trees, as the pear, it requires several years. The first object is to induce the production of blossom-buds; the next, to induce the blossoms to set or fecundate; and the third, to swell and ripen the fruit. New fruits are procured from seeds properly produced and selected; continued in trees by grafting or budding; in perennials, by slips or runners; in annuals, by seeds. The quality of fruits is improved by abundant supplies of nourishment, by increased air, light, and heat; by pruning, thinning, and other means; their bulk by moisture, and their flavor by withholding moisture. Fruit is preserved by placing it in a low dry temperature, burying it in the earth, or drying it in the sun. See Part III. book i. Horticulture.

1048. *Seeds* are the essential part of fruits, or constitute the entire fruit, and are produced on the same general principle. Those produced for culinary purposes in gardening are chiefly from annuals, and used green, as the pea, bean, Indian cress, &c.; but seeds of almost all garden vegetables are occasionally produced for the sake of propagating the species. Here attention is requisite to make choice of a proper stock, and to place it so as not to be in danger of impregnation from other allied species, which might hybridize the progeny; to thin out superfluous blossoms, or remove leafy or barren exuberances, or bulbs, tubers, or other productions which might lessen the nourishment devoted to the production of the seed. Seeds of common forest-trees are not generally subjected to so careful management as those of herbaceous vegetables or rarer trees; but, wherever the best progeny are desired, the same practices are applicable. Light air, and a free exposure, with dry, warm weather, are essential to the proper ripening of seeds. They are preserved in dry, cool temperatures, like fruits; and, if perfectly excluded from air and moisture, will never vegetate.

1049. *Roots* to be produced in perfection require a deep, well pulverized, pliable, porous soil, and moderate moisture. The plants should, in all cases, be prevented from bearing seeds, should have their roots thinned where practicable, and their leaves carefully preserved, and fully exposed to the sun, air, and weather. Roots are preserved by burying in the earth; by being placed in low, dry temperatures, like fruits, or by being kept dry; or dried by art when not intended for vegetation.

1050. *Stems and Stalks* are increased in size in the same way as roots, by a rich, deep, well pulverized soil, by preventing the plant from producing blossoms, or even flower-stalks, and by thinning out weak or crowded leaves. Stems and stalks are blanched, to lessen their acrimony, as in the celery, asparagus, and chardoon, or used in a green state, as in the rhubarb and angelica. Stems and stalks are preserved to a certain extent in cool, dry, but well ventilated situations; some sorts, as celery, similarly to roots.

1051. *Leaves.* Abundant nourishment supplied by the usual means; abundant moisture, and room for expansion of growth; free exposure to light and air; thinning, and preventing the appearance of flower-stalks, will in general ensure large succulent leaves, which are sometimes used separately and green, as in the spinnage and white beet; in tufted or compact heads, as in the cabbage and lettuce, or blanched, as in the endive. Leaves of the headed or tufted sorts may be preserved similarly to stems and stalks; others, as those of most sallads, require to be used immediately; while most herbs are dried at the time the plant begins to blossom, and used only in that state.

1052. *Flowers.* These are produced for culinary purposes, medicine, and ornament. The principal of those grown for culinary purposes are the cauliflower and broccoli, and here the first object is to produce a large and vigorous plant, by abundant nourishment and moisture in a temperate, moist, but not over warm climate. Free room for the roots and leaves to extend on every side must be given, and the situation should be open and exposed to the full light of the atmosphere; though, if in very hot weather the direct influence of the sun's rays be impeded by a screen at a moderate distance, there will be less risk of over-rapid growth. When the plant is fully grown, the flower appears, and, in the case of the sorts mentioned, is gathered whilst the fasciculus of blossom is in embryo. Such flowers may be preserved, on the same principle as stems and headed leaves, for a moderate period. Other flowers, used for culinary purposes, as those of the nasturtium, caper, &c. for pickling, require less attention, the object being flavor, rather than magnitude.

Flowers for medical purposes should have no culture whatever; for, in proportion as they are increased in bulk, they are diminished in virtue. For ornament, flowers are enlarged, increased in number, rendered double, and variegated in a thousand ways, by excess of nourishment, peculiar nourishment, and raising from selected and curiously impregnated seed: these are called florists' flowers. Other flowers are grown for ornament, with a moderate degree of culture, which enlarges their parts generally: such are border-flowers. Others are grown, as much as possible, without producing any change in their parts, as in botanical collections, whether hardy or exotic.

1053. *Barks* produced by British gardening, are applied only to one purpose, that of tanning. Little or no culture is ever given expressly to increase or improve the bark; but abundant nourishment, and all the requisites of vegetable growth, will increase that part of the plant in common with others. Moss, or any other cortical parasites, should be removed. Bark is best separated from the wood, when the sap is ascending with the greatest vigour, late in spring.

1054. *Woods.* The production of timber, and coppice-wood or small timber, is an important and extensive branch of gardening. Timber is propagated in various ways, but the principal sorts generally from seed, either sown where it is finally to arrive at maturity, or in nursery gardens, and transplanted into prepared or unprepared ground. The growth of all timber may be greatly increased by culture, and especially by deeply turning over, and pulverizing the soil previously to planting or sowing, and stirring it, and removing weeds afterwards. The timber is also produced in the most useful, or in any desired form, as in trunks or branches, straight or crooked, or in spray or small shoots, by pruning. But as it is chiefly desired in the form of a straight stem or trunk, pruning is particularly useful in this respect, especially when joined to judicious thinning, to allow of the beneficial effects of air, and the motion produced by wind. Though pruning and pulverizing the soil are undoubtedly of great use in hastening the growth of trees when young, and consolidating their timber as they grow old, yet planting trees in a more rich, warm, and moist soil than is natural to them, is to be avoided. The timber of the Scotch pine and the oak, grown in deep, fertile valleys, or in alluvial depositions, is found to be less hard, tough, and durable, than when grown in colder situations and thinner soils. This doctrine applies more especially to the resinous tribe of timber trees, which, as every one knows, thrive best in cold regions, produced by elevation in warm countries, as in the Alps of Italy, or by high latitudes, as in Russia and Sweden. Where timber is grown for fuel, the more rapidly it is made to grow, whether by culture or the choice of species, (as the willow, accacia, &c.) the greater will be the produce and profit within a given period. The preservation of timber from fungi, insects, dry rot, and natural decay, is best effected by immersion in water, or in earth, or complete desiccation in the open air. See *Supp. Encyc. Brit.* art. *Dry Rot.*

1055. The *Entire Plant* is produced in gardening, for ornament, in herbs, shrubs, and trees, but especially in exotics; sometimes for culinary purposes, as in the fungi and fuci; for purposes of general economy, as in hedge-plants; for shelter and shade, in hardy trees; and for picturesque effect in trees and shrubs, in parks and pleasure-grounds. In general, the object of culture for this purpose ought to be to give each individual plant sufficient nourishment and space fully to expand itself, and, as it were, shew and express its nature or character; but though this will apply in hot-houses and artificial gardens, it is in general but partially accomplished, even in picturesque scenery, in the open air, where the object is connection and grouping of different objects, rather than the display of single ones; and it is inconsistent with the formation of hedges, rows, strips, and masses.

SECT. II. *Of the Superintendence and Management of Gardens.*

Whenever the culture and management of a garden requires more than the labor of one man, one of those employed must necessarily be appointed to arrange the labors of the rest, and, in fact, to establish a general system of management. It is only under such a system that the performance of operations can be procured in the proper season, and the objects in view attained at a moderate expenditure.

1056. On being appointed to a situation as *head-gardener*, the first thing to be done, in that capacity, is to survey the extent of the field of operations, and to ascertain any peculiar products or objects desired by the master, so as to determine the number of permanent hands that will be required. Then the number of implements of every kind must be fixed on and procured, and an estimate formed of the occasional hands, men or women, that may be necessary as extraordinary assistants at particular seasons. If only two or three permanent men are required, then one of them should be appointed foreman, to act as master during absence or sickness, and to have constantly the special charge of the hot-houses, or forcing and exotic departments.

If, however, the situation is of such extent as to require a dozen permanent hands or upwards, then it will generally be found best to appoint a foreman to each department; as one to the artificial climates of the kitchen-garden, another to the open garden, one to the flower-garden and shrubbery, pleasure-ground, &c.; (when there are plant-stoves and collections of florists' flowers, these departments should be divided;) and one to the woods and plantations, unless there is a regular forester directly under the control of the master. To each of these foremen a limited number of permanent men should be assigned, and when occasion requires, assistance should be allowed them, either by common laborers or women, or by a temporary transfer of hands from any of the other departments from which they can be spared. The next thing is to *fix on the hours of labor and of rest*, the amount of wages, and arrangements as to board, lodging, &c. The hours of labor ought to be at least one hour per day less than those for common laborers (who require no mind), in order to allow time for studying the science of the art to be practised. The amount of fines should also be fixed on at the same time, as for absence at the hours of going to labor; for defects in the performance of duty of various sorts, as putting by a tool without cleaning it, being found without a knife or apron, or not knowing the name of a plant, &c. &c. A set of general maxims and rules of conduct should be drawn up by the master, (for which the succeeding section will afford some hints,) and printed, and the amount of fine specified at the end of each rule. The fines may either be applied to some general purpose, or distributed quarterly.

1057. The system of *keeping accounts* may next be determined on, and this, in gardening, is very simple. The books necessary are, the *time-book*, the *cash-book*, and the *forest* or *plantation-book*.

The *time-book* is a large folio volume, ruled so as to read across both pages, with columns titled, as in the specimen in the next page. In this the master inserts the name of every hand; and the foreman of each department inserts the time in days, or proportions of a day, which each person under his care has been at work, and the particular work he or she has been engaged in. At the end of each week the master sums up the time from the preceding Saturday or Monday, to the Friday or Saturday inclusive; the sum due or to be advanced to each man is put in one column, and when the man receives it he writes the word *received* in the column before it, and signs his name as a receipt in the succeeding column. The time-book, therefore, will show what every man has been engaged in during every hour in the year for which he has been paid, and it will also contain receipts for every sum, however trifling, which has been paid by the gardener for garden-labor. In short, it would be difficult to contrive a book more satisfactory for both master and servant than the *time-book*, as it prevents, as far as can well be done, the latter from deceiving either himself or his employer, and remains an authentic indisputable record of work done, and of vouchers for money paid during the whole period of the head gardener's services. In laying out grounds in a distant part of the country, where upwards of two hundred men were employed under one foreman, we have had their *time*, *employment*, and *payments* recorded, and *receipts* taken, in this way, and found it an effectual bar to every thing doubtful or disagreeable.

1058. The next book is the *cash-book*, (see next page,) which may be a common quarto or octavo book, with horizontal lines running across both pages; Dr. and Cr. columns for cash on the left hand page; and the right hand page left blank for signatures.

The cash book may be finally balanced once a year, or oftener, and, if requisite, the sums received from the woods and plantations can be taken out and added together, to show the amount of profit by that department. In small gardens, this is the only book that gardeners in general require to keep; but our business here is to show what belongs to first-rate gardens.

1059. The *forest-book*, (see next page,) where that department is not an entirely separate concern, may be simply what, in Italian book-keeping, is called a waste-book. The size may be quarto, with a column for cash to each page, and the intention of the book is to serve as a record for all bargains for the sale of timber, fuel, bark, or the felling of timber, grubbing, planting, &c. When the money is received for any such sale, it is entered in the cash-book; as paid for work done, it is entered in the time-book. In very extensive concerns it may be necessary to open accounts for particular woods or plantations, as well as for individuals who become purchasers of timber, bark, fuel, charcoal, &c.; in such cases it is hardly necessary to observe, that recourse is to be had to the common ledger of merchants.

Time-Book. 1821, June 8th to 15th. Time, Expense, and Occupation of Hands employed at Aubrey Hall, under the Management of the Gardener A. D.

June	Time. 8,	9,	10,	11,	12,	13,	14,	15.	Rate per Day.	Amount of Money.	Advances on Jobs, &c.	Receipts and Signatures.		Occupation.							Remarks.
Names.	Sat.	Sun.	Mon.	Tues.	Wed.	Th.	Frid.	Total		L. s. d.	L. s. d.	L. s. d.		Saturday.	Sunday.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	
H. Twigg	Foreman hired by the year.								0 0	0 0 0	1 5 0	Recd. 1 5 0	H. Twigg.	Shifting succession pines, 3d time.	Attending hot-houses in the day.	Shifting succession and part of fruiting plants.	Washing the leaves of orange-trees.	Preparing cuttings of hard-wooded plants.	Making up a hot-bed for salading.	Removing peach-trees from ice-room to pinery.	There have been only two days of sunshine this week, when the thermometer was at 50 deg. and 52 deg., the rest of the week cloudy and cold, the thermometer not above 48 deg. The Russian ambassador, Count Bublynowski, called on Tuesday, and Baron Schmutzighoff on Friday. Teisel wishes her weeding gloves repointed. Much pleased with the Amazon working dress given her by my Lady Almeria.
J. Green	1	0	½	1	1	1	1	5½	3s. 0d.	0 16 6	0 0 0	Recd. 0 16 6	J. Green.	Digging in the parterre B.		Transplanting China-asters to shrubbery.	Removing the ivy at magnolia wall.	Shifting plants in Lady Almeria's glass closet.	Attending the young Lord in Idles wood.	Went to see the new plants at Froghall.	
C. Fisher	1	0	1	1	1	1	1	6	2s. 6d.	0 15 0	0 0 0	Recd. 0 15 0	C. Fisher	Nailing the creepers in Drystove dome.		Removing apples from cellar to fruit-room.	Pruning with L. Madottie in Torwood.	Potting hydrangias in sinarium.	Arranging sinarium and frames.	Repairing box edgings in east shrubbery.	
R. Fraser	A labourer by the job.								0 0	0 0 0	1 6 6	Recd. 1 6 6	R. Fraser.	Digging a drain in Crooked copse at 2d. per rod.		The same as on Saturday.	The same, &c.	Trenching quarter No. 1. at 1s. 6d. per perch.	The same.	Absent.	
J. Gott	Apprentice.													In the house with H. Twigg.	At church once, and reading to master in the evening.	In the houses with H. Twig.	At B. with some cuttings of struthiola.	With master pruning.	With Henry Twigg, and also with C. Fisher.	Sweeping all the sheds and gathering mushrooms.	
A. Teisel	1	0	1	1	1	1	1	6	1s. 0d.	0 6 0	0 0 0	Recd. 0 6 0	A. Teisel.	Searching for insects and worms.		Searching for snails and slugs, &c.	Weeding turnips.	Gathering green gooseberries for wine.	Same as yesterday.	Weeding the walks.	
									Amount	1 17 6	2 11 6	Total 4 9 0									

Cash-Book.

1821.		Cash.	Dr. £	Dr. s.	Dr. d.	Cr. £	Cr. s.	Cr. d.	Signatures.
June	10	Received of Lord Madottie	40	0	0				
	15	Paid as per time-book, of this date ..				4	9	0	
	—	Paid to J. Muck for three loads of horse-dung				1	7	0	Received by me, John Muck, farmer.
—	22	Paid to Simon Peter for an old net, as per bill and receipt				4	0	0	Recived by me, S. Peter, fisher.
	25	Received for three and a half loads of thorn faggots	5	4	0				Bought by me, Robert Hedgewell, of Allgap Mains, huckster.
July	2	Received A. Sawell's account for three loads of larch timber, and paid it to my Lord	60	0	0	60	0	0	Received, Madottie.
	3	Myself, (A. D.) cash to account........				10	0	0	

Forest-Book.

1821.	Forests, Woods,	£	s.	d.	1821.	and Plantations.	£	s.	d.
June 17	Sold Eben. Woodward 500 poles of poplar and birch from Rook's Nest copse, to be taken away by him, and then paid for at the rate of 25s. per hundred, amount.........	6	5	0	June 30	Agreed with B. Bulhead and A. Swan to stock up White Knight's copse, and to stack the roots, and to be paid for every hundred of poles 2s., for every hundred of faggots 3s., and for every cubic yard of roots neatly put into stacks 2s. 6d. Advances to be made at my option. The work to be completed by the 1st of Feb. under a penalty of 5l. 5s. (Signed) B. BULHEAD. A. SWAN.			
	Sold Widow Layabout for her oven, a lot of rotten spray in Maiden's Dingle copse, to be removed in three months; credit nine months, and then to pay........................	5	5	0					

These three books, and, in common cases, the two first will answer every purpose as to money matters in private gardens: where gardening is practised as a trade, as in nurseries, &c. of course the common routine books of other trades become necessary.

1060. The other books which a gardener may require as official records in his office are a journal of *sowing and reaping*, *trenching-book*, *produce-book*, and *weather-book*; or some of these books may be very well supplied by tables of common folio or quarto size. The *sowing and reaping book* may be an octavo blank book, with a column for the date on each page. On the left hand page the time and place of sowing or planting is recorded, and when the crop is fit to gather, that circumstance is noticed in the opposite page, thus —

1821.	Sowing or Planting.	1821.	Gathering the Crop.
April 4	Planted Mazagan beans in Q. No. 1, A.	July 23	Gathered the first dish of beans.
	Sowed spinach between the rows of beans in ditto.	May 29	Gathered part of the spinach.

Or a *table* may be used for this purpose, (*fig.* 281.) in which there may be two vertical columns for each of the principal crops sown in gardens, and horizontal lines for each month. Then suppose frame peas, sown in November, begin a line on the left hand column, headed *peas*, opposite November, and write the variety *frame* in the right hand column; and when the peas are fit to gather, trace the line diagonally down to the horizontal line representing the month, (*May in the figure*,) in which they ripen. This is a very simple mode, as it presents the sowing and reaping of the whole of the principal kitchen-garden crops at one view. A few large sheets, ruled in this manner, might be bound together; one page would serve for a year, and when a few years were recorded, the whole would present a rich assemblage of facts to suggest ideas as to cropping.

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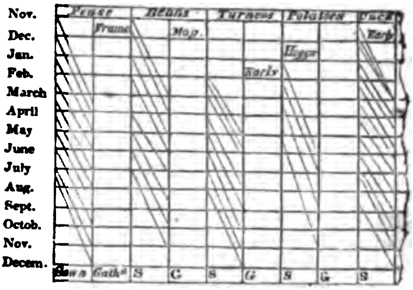

1061. Another very requisite book in extensive gardens is *the trenching-book*, which is simply a thin octavo volume, in which a page is devoted to each quarter of the kitchen-garden or nursery, or to any ground frequently trenched; and in this column the date of the trenching and the depth is recorded. The object is to ensure fresh soil at the surface, by never trenching twice in succession to the same depth.

1817 to 1827.	Quarter, No. 2. A.	1817 to 1827.	Quarter, No. 2. B.
1817 April.	Trenched two spits after asparagus for turnips.	1817. February.	Trenched two spits, and dunged for strawberries.
1818 Septemb.	——— three spits and winter fallow.	1818.	Strawberries.
1819 January.	——— one spit (that is dug) for onions, dunged.	1819.	Strawberries.
1820 October.	——— two spits, and ridged during winter.	1820 August.	Trenched three spits, and well dunged.

Or a table may easily be arranged thus: —

	Quarter, No. 1.				Qur. No. 2.				Qur. No. 3.				Qur. No. 4.				Slip, No. 5.			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
1817.	4	3	2	1	1	3	1	1	4	1	1	2	4	1	2	4	1	3	1	1
1818.	3	2	3	2	4	-	4	2	-	2	4	3	1	2	3	3	4	2	3	1
1819.	2	1	4	3	2	-	2	3	-	3	3	4	2	-	-	2	3	1	4	2
1820.	1	4	1	4	-	-	1	4	1	4	2	-	3	-	-	1	3	-	-	4

For the two last books or tables, as well as for a variety of other purposes, it is necessary that a plan of the kitchen-garden should be made, and the quarters numbered, and their sub-divisions lettered; and this plan, as well as another containing every scene under the gardener's care, should be framed and hung up in the office for constant reference.

1062. The *produce-book* may be either a quarto or octavo volume, ruled with blue lines across both pages, with a column for the date on the left-hand page, and the other blank for signatures. In this book is to be entered daily, on the left-hand page, the disposal of produce gathered or taken from the garden or garden-stores, as the fruit-room, ice-cold-room, &c. On the right-hand page the name of the party in the family of the master receiving it, is to be signed by the receiver as a receipt. Such books are not uncommon in first-rate gardens; and, like the game-book and cellar-book, are of very considerable use.

1821	Garden Produce.	Signatures.
June 20	Sent peas, onions, parsley, cabbage, spinach, and some herbs, to the kitchen, by J. Gott	Received by me, Leah Fry, cook.
	Two bunches sweetwater grapes, two cucumbers, a pottle of strawberries, and a pine, by J. Twig	Received by me, Joseph Ramcat, butler.
	A large nosegay for Lady Almeria, by J. Gott	Received by me, Juliet Flirtwell, for my Lady A.
22	Sent a fine fruit of the blood pine to the Horticultural Society in London; and also a seedling mango plant, and some seeds of the new red lettuce. Booked them per mail at Reading, and directed them to J. Sabine, esq. Horticultural Society, Regent's Street, London.	

1063. A *weather-book* is very useful, and may be either of the folio or quarto size, with columns for the

1821. June	Thermometer. M.	N.	E.	Barometer.	Rain and Hail.	Wind.	Weather.	Trees in Leaf, or defoliated. Fungi appear, &c.	Plants in Flower or Fruit.	Birds and Insects appear or disappear.	Observations as to Fish and other Animals.	Miscellaneous. Bodily Pains, prevailing Diseases, &c.
21	50	71	60	28.90	0.	S.S.W.	Fair.	Marchantia polymorpha in perfection.	Lilium candidum in full blow.	Sphinx elpenor appears.	Spawn of the Carp hatched in breeding pond.	Dull and sleepy.
22	52	59	58	28.8	0.02	S.W.	Showers.					
23	51	65	59	28.8	0.00	S.	Fair.	————	Nuphar advena in flower.	————	————	————
24	58	70	58	28.7	0.01	S.W.	Fair.	————		————	Ditto Bream.	Rheumatic pains.

There is a very good model of this description, called the "Naturalist's Kalendar," by the Honorable Daines Barrington, in quarto, which may be procured and filled up. Indeed, every apprentice ought to be made to keep such a kalendar, for the sake of inducing habits of observation. For the manner of doing so, see the "Naturalist's Calendar," of *White;* and "Naturalist's Pocket-Book," of *Graves.*

It has been judiciously remarked (*Farm. Mag.* 1820.), that in all calendars of nature, particular attention should be paid to the inflorescence of aquatics, as these are much more regular in their times of foliation and flowering than land plants. The comparative denseness of the medium in which they live, prevents their being affected by winds or rains, and probably also by electrical and other atmospherical changes.

1064. For keeping *a register of the temperature of hot-houses* and the open air, a book with columns may be adopted, or a table (*fig.* 282.) may be fixed on, in which the vertical lines representing days of the month, and the horizontal ones degrees, the variations of each house, and the open air, may be shown by wavy lines made by daily increments depressed or raised, according to the rise or fall of the thermometer in each separate house or place. Twelve tables, or twelve pages of an oblong folio book ruled in this way, would keep a register of all the hot-houses, frames, and the open air, of a garden for a year.

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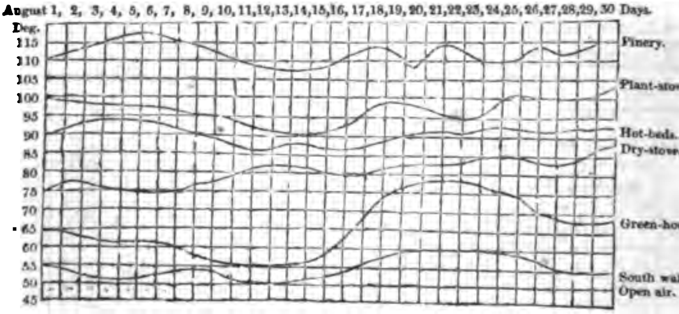

A very beautiful graphic mode (*fig.* 283.) of recording the variations of temperature of the open air, or of any one house during a year, is given by Howard, in his *Climate of London*, a simplification of which may be adopted by the curious gardener.

Here the indicating line waves upon a circular zone, composed of radiating lines, representing time, and concentric circles representing degrees of heat. One line represents the average temperature of the year: all the degrees exceeding the average temperature are projected beyond this line towards the extremity of the zone; and all the degrees under the average are projected from the average line towards the inner circumference of the zone. A series of tables of this sort might prove useful to the gardener, by enabling him at all times, by a simple glance, to compare the present weather with that of several past years. Howard's nomenclature of clouds deserves also the study of the gardener desirous of scientifically registering the weather. See *Encyc. Brit. Sup.* vol. iii. art. *Cloud.*

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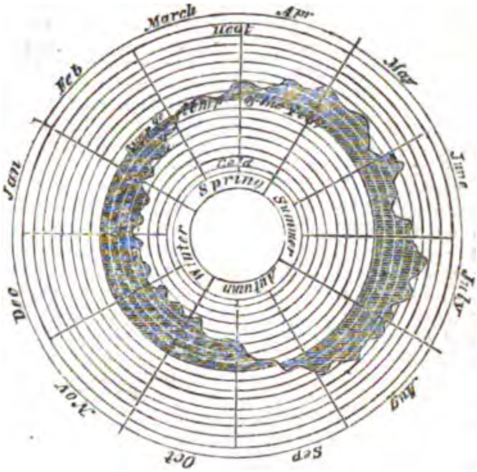

1065. *Records of the growth of plants* are sometimes kept to show the comparative warmth and congeality of seasons to vegetation. When that is to be done, a table (*fig.* 284.) may be composed of horizontal lines, the distance between which shall represent space in feet or inches, and vertical lines, the distance between which shall represent time by months or days. Then supposing a plant (Briony) beginning to push in the middle of March, make a mark on the lowest line in the middle of the column for that month, and trace the line as the plant grows, ascending diagonally through the other months, according to the progress of the shoot in feet. If a kidney bean germinates in the beginning of April, and attains the height of ten feet by the first of September, then the indicatory line will pass through five vertical columns or months, and through ten feet, or spaces, between the horizontal lines (as in the figure).

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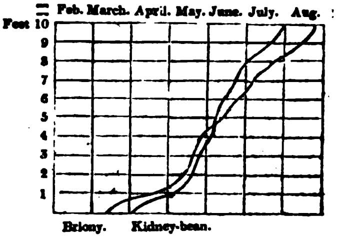

All these books, tables, and records, must be kept in the office as a part of its library; by which means, when the head gardener is changed, the new-comer will the sooner become acquainted with the situation, and climate, his duties, and a variety of other useful circumstances.

Besides the above books and tables, it is almost unnecessary to add, that various small *blank books* for inventories of tools, memorandums of agreements, *out of door entries*, lists of names, &c. will be required both by the head gardener and by his different foremen. Models of all these books may be had at *Harding's Agricultural Library*, St. James's Street, London.

1066. The *reading library of the gardener's office* should at least contain the following works.

One of the best *Encyclopædias*, and whichever one is adopted, add the Suppl. to the Encyc. Brit., the best work of its kind now publishing. The *Agricultural Survey of the County*, and statistical account of the parish. If convenient, the surveys of all the counties in the empire should be procured. The best modern *Systema Naturæ* of the time; Turton's Linnæus, is very imperfect, but the only one to be had at present. The best *Introduction to Botany*, say that of Sir J. E. Smith, for technical or systematic botany; and that of Keith for physiology. The best catalogues of plants, say those of Sweet and Page. The best *Flora Brittanica* for the time, say Galpine's, or the forthcoming Translation, by Sir J. E. Smith, and his *Compend. Flor. Brit.* Sowerby's

British Botany, Mineralogy;—and *Zoology,* when published. Kirby and Spence's *Introduction to Entomology;* and Samouelle's *Entomologist's Useful Companion.* The best *Dictionary of Botany and Culture,* say that of Miller, enlarged by Martyn. *Marshall, Pontey,* and *Sang,* on planting. *Whateley, Girardin, Price,* and *Repton,* on laying out grounds. The *Transactions of the London and Edinburgh Horticultural Societies.* The best *Gardener's Kalendar* for the time, say that of Abercrombie for England, and Abercrombie or Nicol, for Scotland and Ireland. All new works on practical gardening, if possible, as they appear. *English, Latin, French,* and *Geographical Dictionaries,* and as many other works as the master may be pleased to deposit in the gardener's office, or lend from the library of the mansion.

These books ought to be considered as for the use of the journeymen and apprentices, as well as the master; but the latter ought to be responsible for their being kept clean and perfect. Where the head gardener is of a humane and kind turn of mind, he may assemble the men and also the women, and read aloud and expound to, or answer questions put by them; or he may cause them to read aloud to one another, &c. In short, he ought to consider it as a part of his duty to improve their minds, as well as to render them habile in his art, and by all means to ameliorate their condition and manners as much as is in his power. Niel, one of the best modern writers on gardening, and obviously a humane and benevolent man, states of the late Walter Nicol, that "he observed a praiseworthy practice, now too much neglected by head-gardeners,—that of instructing his young men or assistants, not only in botany, but in writing, arithmetic, geometry, and mensuration. He used to remark, that he not only used to improve his scholars, but taught himself, and made his knowledge so familiar, that he could apply it in the daily business of life." The same practice, as already observed (82), is still carried on in Germany.

All these preparations being made, as well as various others, to which it is needless to recur, the whole must be brought into action, by the head gardener acting as the moving power, and so conducting the whole as, if possible, to bring forth in their proper seasons the products desired by his employer without a wasteful expenditure, and to the satisfaction of all parties concerned.

Sect. III. *Of the Beauty and Order of Garden Scenery.*

1067. However varied the products of gardening, and different the departments in which they are produced, one object is common to them all, viz. that the agreeable be united with the useful. The kitchen-garden, the orchard, the nursery, and the forest, are all intended as scenes of recreation and visual enjoyment, as well as of useful culture; and enjoyment is the avowed object of the flower-garden, shrubbery, and pleasure-ground. Utility, however, will stand the test of examination longer and more frequently than any scene merely beautiful, and hence the horticultural and planting departments of gardening are, in fact, more the scenes of enjoyment of a family constantly residing on the spot, than the ornamental or picturesque departments. It has been a very common assertion since the modern style of gardening became prevalent, and absorbed the attention of gardeners and their employers, that beauty and neatness may be dispensed with in a kitchen-garden; but this is to assign too exclusive limits to the terms beauty and neatness; and, in truth, may be considered as originating in the vulgar error of confounding beauty with ornament, which latter quality is unquestionably not essential to scenes of utility. Every department of gardening has objects or final results peculiar to itself; and the main beauty of each of these departments will consist in the perfection with which these results are attained; a secondary beauty will consist in the display of skill in the means taken to attain them; and a third in the conformity of these means to the generally received ideas of order, propriety, and decorum, which exist in cultivated and well regulated minds. It is the business of this section to offer some general observations, with a view to the attainment of the last beauties, or those of order, propriety, and decorum. The entire work is devoted to the former beauties.

1068. *Order,* it has been well observed, is "Heaven's first law." It is, indeed, the end of all law. Without it, nothing worth having is to be attained in life, even by the most fertile in resources; and with it much may be accomplished with very slender means. A mind incapable of an orderly and regular disposition of its ideas or intentions, will display a man confused and disorderly in his actions; he will begin them without a specific object in view; continue them at random, or from habit, without knowing well why, till some accident or discordant result puts an end to his present progress, unmans him for life, or awakens reflection.

But a well-ordered mind reflects, arranges, and systematizes ideas before attempting to realize them, weighs well the end in view, considers the fitness of the means for attaining that end, and the best mode of employing these means. To every man who has the regulation and disposal of a number of servants, this mode of orderly arrangement is essentially necessary in order to reap the full effects of their labors; and to no men is it of more importance than to master-gardeners, whose cares are so various, and the success of whose operations, always connected with, and dependant on, living beings, depends so much on their being performed in the fitting moment.

1069. *Propriety* relates to what is fitting and suitable for particular circumstances; it is the natural result of an orderly mind, and may be said to include that part of order which directs the choice and adaptation of means to ends, and of ideas and objects to cases and situations. It belongs to order for a master to allow workmen proper periods for rest and refreshment; propriety dictates the time and duration of these periods, and prudence suggests the wisdom of departing as little as possible from established practices.

1070. *Decorum* is the refinement of propriety. It is in *order* to procure stable-dung for hot-beds, and to cart it into the framing-ground; it is proper to do this at all times when it is wanted, but it is *decorous* to have the work performed early in the morning, that the putrescent vapours and dropping litter may not prove offensive to the master of the garden, should he, or any of his family or friends, visit that scene at the time.

1071. *Neatness*, as opposed to slovenliness, is well understood; it consists in having every thing where it ought to be; and in attending to the decorum of finishing operations, and to minute things in general.

These abstract hints may be considered as more particularly directed to master operators; the following practical directions apply both to *masters and their journeymen or laborers.*

Perform every operation in the proper season. The natural, and therefore the best indications for the operations of sowing and reaping, transplanting, &c. are given by the plants themselves, or by the progress of the season as indicated by other plants. But there are artificial kalendars or remembrancers, the use of which is to remind the master of the leading crops and operations of culture throughout the year. But, even if such books were made as perfect as their nature admits of, still they are only calculated to aid the memory, not to supply the place of a watchful and vigilant eye, and habits of attention, observation, reflection, and decision. Unless a gardener has these, either naturally, or partly natural and partly cultivated, in a considerable degree, he will be but little better than a common laborer as to general management and culture of garden scenery.

Perform every operation in the best manner. This is to be acquired in part by practice and partly also by reflection. For example, in digging over a piece of ground, it is a common practice with slovens to throw the weeds and stones on the dug ground, or on the adjoining alley or walk, with the intention of gathering them off afterwards. A better way is to have a wheel-barrow, or if that cannot be had, a large basket, in which to put the weeds and extraneous matters, as they are picked out of the ground. Some persons, in planting or weeding, whether in the open air or in hot-houses, throw down all weeds, stones, and extraneous matters on the paths or alleys, with a view to pick them up, or sweep or rake them together afterwards: it is better to carry a basket or other utensil, either common or subdivided (620), in which to hold in one part the plants to be planted, in another the extraneous matters, &c.

Complete every part of an operation as you proceed. This is an essential point in garden operations, and though it cannot always be attended to, partly from the nature of the operation, partly from weather, &c. yet the judicious gardener will keep it in view as much as possible. Suppose a quarter, or breadth of rows of potatoes, containing one-tenth of an acre required to have the ground stirred by the Dutch hoe, the weeds raked off, and then the potatoes earthed-up with the forked hoe; the ordinary practice would be, first to hoe over the whole of the ground, then to rake it wholly over, and, lastly, to commence the operation of earthing-up. If the weather were certain of holding good two days, this, on the principle of the division of labor, would certainly be somewhat the most economical mode. But supposing the weather dry, the part left hoed and not raked will, for a time, (and one hour ought to be an object in a fine garden) appear unfinished; and if rain should happen to fall in the night, the operation will be defeated in most soils. Better, therefore, to hoe, rake, and earth-up a small part at a time: so that leave off where you will, what is done will be complete.

Finish one job before you begin another. This advice is trite, but it is of great importance; and there are few cases where it cannot be attended to.

In leaving off working at any job, leave your work and tools in an orderly manner. Are you hoeing between rows, do not throw down your hoe blade upwards, or across the rows, and run off the nearest way to the walk the moment the breakfast or dinner hour strikes. Lay your implement down parallel to the rows, with its face or blade to the ground; then march regularly between one row to the alley, and along the alley to the path Never drop your tools and leave off work before the hour has well done striking; an above all, never run on an occasion of this kind; it argues a gross brutalized selfishness, highly offensive to well regulated minds.

In leaving off work for the day, make a temporary finish, and carry your tools to the tool-house. In general, do not leave off in the middle of a row; straighten your trenches in digging, because, independently of appearances, should a heavy rain of a week's duration intervene, the ground will have to be re-dug, and that will be more commodiously done with a straight than with a crooked, and consequently unequal trench.

In passing to and from your work, or, on any occasion, through any part of what is considered under the charge of the gardener, keep a vigilant look out for weeds, decayed leaves, or any other deformity, and remove them, or some of them, in passing along. Attend to this particularly on walks, edgings, and in passing through hot-houses, &c. In like manner, take off insects, or leaves infected by them. Much in large as well as in small gardens may be effected by this sort of timely or preventive attention, which induces suitable habits for a young gardener, and occupies very little time.

In gathering a Crop, or any part of a Crop, remove at the same time the Roots, Leaves, Stems, or whatever else belonging to the Plant of which you have cropped the desired Part is of no further use, or may appear slovenly, decaying, or offensive. In cutting cabbage, lettuce, borecoles, &c. pull up the stems, (with exceptions), and roots, and take the mat once with the outside leaves, to the compost heap. Do the same with the haulm of potatoes, leaves of turnips, carrots, celery, &c. Do not suffer the haulm of peas and beans to remain a moment after the last gathering of the crop.

Let no Crop of Fruit, or Herbaceous Vegetables, or any part thereof, go to waste on the spot. Instantly remove it when decay or any symptom of disease appears, to the compost-yard, or to be consumed by pigs or cattle.

Cut down the flower-stalks of all flowering Plants, with the proper exceptions, the moment they are fully done flowering, unless seed is an object. Cut off decayed roses, and all decaying double flowers, with their foot-stalks, the moment they begin to decay; and the same of single plants, where seed is not wanted. From May to October, the flower-garden and shrubbery ought to be looked over by apprentices or women, every day, as soon as the morning dews are evaporated for this purpose, and for gathering decayed leaves, tying up tall-growing stems before they decline or become straggling, &c.

Keep every Part of what is under your care perfect in its kind. Attend in spring and autumn to *walls and buildings,* and get them repaired, pointed, glazed and painted, where wanted. Attend at all times to *machines, implements, and tools,* keeping them clean, sharp, and in perfect repair. With an imperfect tool, no man can make perfect work. See particularly that they are placed in their proper situations in the tool-house. House every implement, utensil, or machine not in use, both in winter and summer. Allow *no blanks* in edgings, rows, single specimens, drills, beds, and even where practicable in broad-cast sown pieces. Keep edgings and hedges cut to the utmost nicety. Keep the shapes of your *wall-trees* filled with wood according to their kind, and let their training be in the first style of perfection. Keep all walks in perfect form, whether raised or flat, free from weeds, dry, and well rolled. Keep all *the lawns* under your care, by all the means in your power, of a close texture, and dark-green velvet appearance. *Keep water clear and free from weeds,* and, if possible, let not ponds, lakes, or artificial rivers, rise to the brim in winter, nor sink very far under it in summer.

Finally, *attend to personal habits and to cleanliness.* "Never perform any operation without gloves on your hands that you can do with gloves on; even weeding is far more effectually and expeditiously performed by gloves, the fore-fingers and thumbs of which terminate in wedge-like thimbles of steel, kept sharp. Most other operations may be performed with common gloves. Thus, no gardener need have hands like bears' paws. Always use an iron *tread* fastened to your shoe when you dig; and generally a broad-brimmed, light, silk hat, to serve at once as a parasol and umbrella. You will thus save the use of your feet, lessen the wear of your shoes, and avoid the rheumatism in the neck. Let your dress be clean, neat, simple, and harmonious, in form and color: in your movements maintain an erect posture, easy and free gait and motion; let your manner be respectful and decorous to your superiors; and conduct fair and agreeable to your equals. Elevate, meliorate, and otherwise improve, any raw, crude, harsh, or inharmonious features in your physiognomy, by looking often at the faces of agreeable people, by occupying your mind with agreeable and useful ideas, and by continually instructing yourself by reading. This also will give you features if you have none. Remember that you are paid and maintained by and for the use and pleasure of your employer, who may no more wish to see a dirty, ragged, uncouth-looking man in his garden, than a starved, haggard, untutored horse in his stable." *Traugott Schwamstapper.*

1072. "*He who undertakes the profession of a gardener,*" says the Rev. W. Marshall, "takes upon himself a work of some importance, and which requires no small degree of knowledge, ingenuity, and interest, to perform well. There are few businesses which may not be learned in much less time than that of a gardener can possibly be. It often happens, however, that a man who has been very little in a garden, and that only as a laborer, who can do little more than dig, or put out cabbage plants, will call himself a gardener; but he only is worthy of the name who having had much practice in the various parts of horticulture, possesses a genius and adroitness, fitting him for making experiments, and for getting through difficulties that the existing circumstances of untoward seasons, &c. may bring him into. He should possess a spirit of enquiry into the nature of plants and vegetation, and how far art (in his way) may be made successfully useful, or at least probably so. The mode of growth, the pruning, the soil, the heat, and the moisture that suits particular plants, are not to be understood without a native taste, and close application of the mind. Whoever will give himself the pains to trace a good gardener through the several stages of his employ, in all the seasons of the year, will find it to be one continued circle of reflexion, labor and toil. Gardening depends more upon the labor of the brain than of the body: there is no such thing as always proceeding with certainty and insuring success. Plants will die, and that sometimes suddenly, under the very best management. There are few things to be done in a garden which do not require a dexterity in operation, and a nicety in hitting the proper season for doing it. A gardener should be a sort of prophet in foreseeing what will happen under certain circumstances, and wisely cautious to provide, by the most probable means, against what may happen. A man cannot be a good gardener, except he be thoughtful, steady, and industrious; possessing a superior degree of sobriety and moral excellence, as well as genius and knowledge adapted to his business. He should be modest in his manners and opinions. It too often happens, with those who have much practical skill, that they slight what is written upon subjects of their profession; which is a fastidious temper, that the man of real merit will hardly entertain.

" The character of a gardener is here set high; but it is the goal of respectability at which he ought to aim who presumes to call himself a professed one. A gardener has reason, indeed, to love his employment, as he meets with health and tranquillity in the exercise of it; but considering what he is, and what he does, in his proper capacity, he may justly claim a superior degree of estimation and reward. A true gentleman is of a liberal spirit, and I would plead for his gardener as a proper person to be generous towards, if his manners be good." *Introd. to Gard. p.* 447.

PART III.

GARDENING AS PRACTISED IN BRITAIN.

1073. In the earlier ages of society, the art of Gardening would be practised without those local subdivisions, or technical distinctions, which its progressive improvement has since rendered necessary; and being then carried on in one inclosure, called a Garden, the term Gardening was then sufficiently explicit for every purpose. But at present the local subdivisions and technical distinctions of this art are various; we have the kitchen, fruit, flower, forcing, and exotic gardens, the pleasure-ground, shrubbery, park, and timber plantation, all within the province of Gardening; and the terms culinary-gardening, fruit-gardening, flower-gardening, planting, &c. as technical distinctions for them. The vague manner in which so many terms have been used by gardeners and authors, has led to some confusion of ideas on the subject, which it is much to be wished could be avoided in future.

Taking the word gardening as a generic term, we have arranged its ramifications or divisions, in what we conceive to be permanent or specific distinctions. The principle of classification which we have adopted, is that of the use or object in view; and applying it, we think all the varieties of gardening may be included under the four following species:

1. *Horticulture,* the object of which is to cultivate products used in domestic economy. It includes culinary and fruit gardening, or orcharding; and forcing or exotic gardening, as far as respects useful products.

2. *Ornamental Gardening,* the object of which is to cultivate plants ornamental in domestic economy. It includes flower, botanic, and shrubbery gardening; and forcing and exotic gardening, as far as respects plants of ornament.

3. *Planting,* the object of which is to cultivate trees and shrubs, useful in general economy. It is practised in forests, woods, groves, copses, stripes, and rows.

4. *Landscape Gardening*, the object of which is to produce landscapes; or, so to arrange and harmonize the external scenes of a country residence, as to render them ornamental, both as domestic scenery, and as a part of the general scenery of the country. This branch is by some called picturesque, rural, ornamental, or territorial improvement; rural ornament, ornamental-gardening, pictorial improvement, new ground work, ornamental planting, &c. It includes the ancient, formal, geometric, or French gardening, and the modern, natural, picturesque, or English gardening.

There are other terms applied to gardens and gardening; as nursery, market, physic, &c. gardens, and nursery-gardening, market-gardening &c.; but these concern gardening as a *trade*, rather than as an *art*, and their discussion is referred to the succeeding part of this work, in which gardening is considered statistically.

BOOK I.

HORTICULTURE.

In treating this branch, some, as Nicol and Abercrombie, have neglected its local unity, and, adopting its technical subdivisions, treated of the culinary fruit and forcing departments, as if they were separate gardens. But as these departments are all generally carried on within the same ring-fence, and as it is impossible to form and arrange a kitchen-garden, without at the same time forming and arranging the walls and borders destined to receive the most valuable part of the fruit-garden, and equally so to lay out the area inclosed, without determining the situation and extent of the forcing department, we deem it preferable to treat of Horticulture as actually carried on, and in the following order: viz. — The formation of the kitchen-garden. The distribution of the fruit-trees. The forming and planting of a subsidiary orchard. The general culture of the kitchen-garden. The general culture of the orchard. The construction of buildings used in the forcing department. The general culture of the forcing department. Catalogue of plants and trees used in horticulture. A monthly table of horticultural productions.

Chap. I.

The Formation of a Kitchen Garden.

This subject embraces a variety of considerations, some relative to local circumstances; as *situation, exposure, soil*, &c.; others depending on the skill of the artist; as *form, laying out the area, water*, &c.; both require the utmost consideration; for next to a badly designed, ill-placed house, a mis-placed, ill arranged, and unproductive kitchen-garden is the greatest evil of a country residence.

Sect. I. *Situation.*

1074. The kitchen-garden, considered relatively to the other parts of a residence, should be situated as near the mansion and the stable offices, as is consistent with beauty, convenience, and other arrangements. Nicol observes, "In a great place, the kitchen-garden, considered merely as such, should be so situated as to be convenient, and, at the same time, be concealed from the house. The kitchen-garden is often combined with the shrubbery or pleasure-garden, and also placed near to the house. There can be no impropriety in this, provided it be kept in good order, and that the walls be screened by shrubbery from the immediate view of the public rooms; indeed, it has been found, that there is both comfort and economy in having the various gardens of a place combined, and placed at no great distance from the house. In stepping from the shrubbery or flower-garden, thence to the orchard, and lastly, to the culinary-garden, there is a gradation both natural and pleasant. With such an arrangement, in cases where the aspect of the ground is answerable, and the surface, perhaps, is considerably varied, few faults will be found."

"Sometimes we find the kitchen-garden placed immediately in front of the house, which I consider the most awkward situation of any, especially if placed near, and so that it cannot be properly screened by some sort of plantation. Generally speaking, it should be placed in the rear or flank of the house, by which means the lawn may not be broken and rendered unshapely where it is required to be most complete. The necessary traffic with this garden, if placed in front, is always offensive. Descending to the consideration of more humble gardens, circumstances are often so arbitrary with respect to their situations, as that they cannot be placed either so as to please, or give satisfaction by their products. There are cases where the kitchen-garden is necessarily thrust into a corner, and perhaps is shaded by buildings, or by tall trees, from the sun and air; where they are placed on steep hangs in a northern aspect, the subsoil is a till or a cankering gravel, and the site cold and bleak. Such situations as these are to be avoided, and should be considered among the worst possible. Next are open, unsheltered plains. But even there, if the soil be tolerably good, and the subsoil be not particularly bad, shelter may be reared, so as that in a few years the garden may produce a return for the expence laid out in its improvements." *Kalendar*, p. 8.

Niel observes, "That it has of late become fashionable to place the fruit and kitchen-garden at perhaps half a mile's distance or more from the house. In many cases this has been found inconvenient, and it can seldom happen that the garden-walls may not be effectually concealed by means of shrubs and low growing trees, so as not to be seen, at least from the windows of the public rooms, and the garden yet be situated much nearer to the house. It is scarcely necessary," he adds, "to observe that an access for carts and wheelbarrows, without touching the principal approach, is indispensable." *Ed. Encyc.* art. *Hort.*

According to Forsyth, "A garden, if possible, should be on a gentle declivity towards the south, a little inclining to the east, to receive the benefit of the morning sun. If it be situated in a bottom, the wind will have the less effect upon it; but then damps and fogs will be very prejudicial to the fruit and other crops; and if situated too high, although it will in a great measure be free from damps and fogs, it will be exposed to the fury of the winds, to the great hurt of the trees, by breaking their branches, and blowing down their blossoms and fruit." *Tr. on Fruit Trees*, p. 286.

Abercrombie observes, "That the situation should not be so elevated as to be exposed to boisterous and cutting winds; nor should a very low situation be chosen, if circumstances afford any choice. It should be situate conveniently for access from the house." *Practical Gardener*, p. 1 & 2.

Switzer cautions his readers to avoid low situations and bottoms of valleys, "because there is often a sourness in the earth that cannot be eradicated, and in this uncertain climate of ours, such heavy fogs and mists that hang so long on the fruit and leaves in low situations, that not only vegetation is retarded, but also the fruit." *Pract. Fruit Gardr.* 2d edit. p. 19.

"The greater warmth of low situations," Dr. Darwin observes, "and their being generally better sheltered from the cold north-east winds, and the boisterous south-west winds, are agreeable circumstances; as the north-east winds in this climate are the freezing winds; and the south-west winds being more violent, are liable much to injure standard fruit-trees in summer by dashing their branches against each other, and thence bruising or beating off the fruit; but in low situations the fogs in vernal evenings, by moistening the young shoots of trees, and their early flowers, render them much more liable to the injuries of the frosty nights, which succeed them, which they escape in higher situations."

Professor Bradley "gives a decisive fact in regard to this subject. A friend of his had two gardens, one not many feet below the other, but so different, that the low garden often appeared flooded with the evening mists, when none appeared in the upper one; and in a letter to Bradley he complains that his lower garden is much injured by the vernal frost, and not his upper one. A similar fact is mentioned by Lawrence, who observes, that he has often seen the leaves and tender shoots of tall ash-trees in blasting mists to be frozen, and as it were singed, in all the lower parts and middle of the tree; while the upper part, which was above the mist, has been uninjured. In confirmation of this idea, I well remember many years ago to have travelled sixty miles, partly in the valley of the Trent, and partly over adjacent hills, on the 6th of May; and to have observed that the new shoots of all the ash-trees in the vallies had their young extremities entirely turned black by the frost of the preceding night; but that on the hills they had escaped, which I at first ascribed to the trees being less forward on the hills, but believe it was more probably owing to the greater succulence of those in the valleys, and to their having been previously exposed to the moisture of the evening mist." *Darwin's Phytologia*, sect. xv. 3. 6.

Sect. II. *Exposure and Aspect.*

1075. Exposure is the next consideration, and in cold and variable climates is of so much consequence for the maturation of fruits, that the site of the garden must be guided by it, more than by locality to the mansion.

Nicol observes, "That the *exposure* should be towards the south, and the aspect at some point between south-east and south-west, the ground sloping to these points in an easy manner. If quite flat, it seldom can be laid sufficiently dry; and if very steep, it is worked under many disadvantages. It may have a fall, however, of a foot in twenty, without being very inconvenient, but a fall of a foot in thirty is most desirable, by which the ground is sufficiently elevated, yet not too much so." *Kalendar*, p. 6.

Switzer recommends an *exposure* declining towards the south, "but not more than six inches in ten feet. Two or three inches he considers better." *Pract. Fruit Gard.* 2d edit. p. 17.

Abercrombie observes, "An open *aspect* to the east is itself a point of capital importance in laying out a garden, or orchard, on account of the early sun. When the sun can reach the garden at its rising, and continue a regular influence, increasing as the day advances, it has a *gradual* and most beneficial effect in dissolving the hoar frost, which the past night may have scattered over young buds, leaves, and blossoms or setting fruit. On the contrary, when the sun is excluded from the garden till about ten in the morning, and then suddenly darts upon it, with all the force derived from considerable elevation, the exposure is bad, particularly for fruit-bearing plants, in the spring months; the powerful rays of heat at once melt the icy particles, and immediately acting on the moisture thus created, scald the tender blossom, which drops as if nipped by a malignant blight; hence it happens, that many a healthy tree, with a promising show of blossoms, fails to produce fruit; the blossoms and thawed frost sometimes falling together in the course of a morning. The covering of the hoar frost, or congealed dew, is otherwise of itself a remarkable preservative of the vegetable creation from frosty winds." *Pract. Gard.* p. 1.

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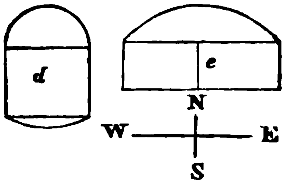

Forsyth requires an *exposure* in which is a free admittance for the sun and air, rejecting a place surrounded by woods as very improper, because a foul stagnant air is very unfavorable to vegetation; and it is also observed that blights are much more frequent in such situations than in those that are more open and exposed. Such an exposure will generally be to the south (*d* and *e*, *fig.* 285.), but much depends on the surrounding scenery. For this reason the northern boundary of a garden, where the hot-beds are generally placed, will admit most sun and air, in proportion to the open space, when of a rounded (as in *d* and *e*, *fig.* 285.) rather than an angular form; especially if the plantation (*a*, *fig.* 286.) which surrounds the garden gradually decline in height as it approaches the hot-bed ground (*b*), on the north, and the surrounding walk (*c*), on the other sides.

If there be any slope in the area of a garden, Marshall considers that "it should be southward, a point to the east or west not much signifying; but not to the north, if it can be avoided, because crops come in late, and plants do not stand the winter so well in such a situation. A garden with a northern *aspect* has, however, its advantages, being cooler for some summer productions, as strawberries, spring-sown cauliflowers, &c.; therefore, to have a little ground under cultivation, so situated, is desirable, especially for late succession-crops." *Introd. to Gard.* 5th edit. p. 8.

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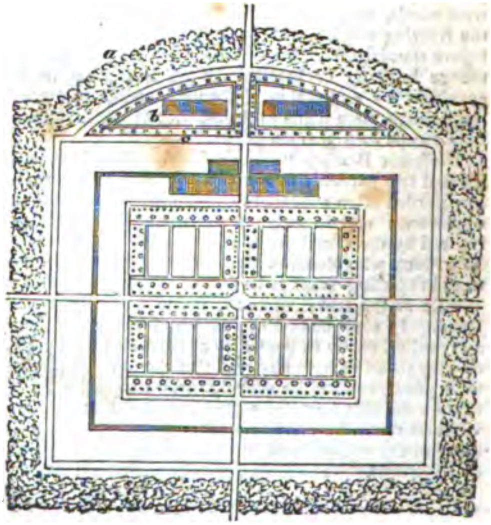

Sect. III. *Extent.*

1076. Little has been offered on this part of the subject by writers on kitchen-gardens. In general, it may be observed, that few country-seats have less than three-fourths of an acre, or more than twelve acres in regular cultivation as kitchen-garden, exclusive of the orchard and flower-garden. From one and a half to five acres may be considered as the common quantities inclosed by walls, and the latter size, under proper management, with abundance of manure, is capable of supplying a respectable establishment. Where a farm is cultivated by the proprietor, it is found a desirable practice to have part of the more common kitchen-crops, as cabbages, turnips, peas, potatoes, carrots, &c. grown in the fields; the flavor of vegetables so grown being greatly superior to that of those raised in a garden by force of manure. Where a farm is not kept in hand, by annually changing the surface of the garden by trenching (1061), this effect of enriched grounds is considerably lessened.

Justice says, "for a small family, two acres of ground will do; but if for a great family, it should be six or eight acres." *Brit. Gard. Direc.* p. 1.

Marshall states, "to assist in resolving on the quantity of ground it may be prudent to cultivate as a garden, a general idea may be given in observing, that an *acre* with wall-trees, hot-beds, pots, &c. will furnish employment for one man, who, at some busy times, will need assistance. The *size* of the garden should, however, be proportioned to the house, and to the number of inhabitants it does, or may contain. This is naturally dictated; but yet it is better to have too much ground allotted than too little, and there is nothing monstrous in a large garden annexed to a small house. Some families use few, others many vegetables; and it makes a great difference whether the owner is curious to have a long season of the same production, or is content to have a supply only at the more common times. But to give some rules for the quantity of ground to be laid out, a family of four persons (exclusive of servants) should have a rood of good-working, open ground, and so in proportion. But, if possible, let the garden be rather extensive, according to the family; for then a useful sprinkling of fruit-trees can be planted in it, which may be expected to do well under the common culture of the ground about them; a good portion of it also may be allotted for that agreeable fruit the strawberry in all its varieties; and the very disagreeable circumstance of being at any time short of vegetables will be avoided. It should be considered also that artichokes, asparagus, and a long succession of peas and beans, require a good deal of ground. *Hot-Beds* will also take up much room, if any thing considerable be done in the way of raising cucumbers, melons, &c." *Introd. to Gard.* p. 25.

As to the size of a garden, Forsyth observes, "it may be from one acre to six or eight within the wall, according to the demand for vegetables in the family."

Sect. IV. *Shelter and Shade.*

1077. To combine adequate shelter, with a free exposure to the rising and setting sun, is essentially necessary, and may be reckoned one of the most difficult points in the formation of a garden.

The kitchen-garden, Nicol states, "should be sheltered by plantations; but should by no means be shaded, or be crowded by them. If walled round, it should be open and free on all sides, or at least to the south-east and west, that the walls may be cloathed with fruit-trees on both sides." *Kal.* p. 6.

According to M'Phail, for bringing the produce of the soil to the greatest perfection, the garden should be sheltered from the east, north, and west winds, by hills, rising grounds, high buildings, or plantations of trees, at such a distance on the east and west sides, as not to prevent the sun from shining upon it." *Gard. Rem.* 2d edit. p. 12.

Abercrombie looks to shade as well as shelter, and observes, "that competent fences are serviceable in sheltering tender seedlings, and in forming warm borders for early crops and winter standing plants; while in another direction some part of the line of fence will afford a shady border in summer, which is required by the peculiar constitutions of many small annual plants. Where a kitchen-garden incloses two, three, or four acres, it will admit cross walls at proper distances, by which the advantages just mentioned may be multiplied." *Prac. Gard.* 2d edit. p. 3.

The garden, observes Marshall, ought to be sheltered as much as can be from the north and east winds. "These points of the compass should be guarded against by high and good fences, by a wall of at least ten feet high, lower walls do not answer so well for fruit-trees, though one of eight may do. A garden should be so situated as to be as much warmer as possible than the general temper of the air is without, or ought to be made warmer by the ring and subdivision-fences. This advantage is essential to the expectation we have from a garden locally considered. As to trees planted without the wall, to break the wind, it is not to be expected to reap much good this way, except from something more than a single row; *i. e.* a plantation. Yet the fall of leaves by autumnal winds is troublesome; and a high wall is therefore adviseable. Spruce firs have been used in close shorn hedges; which, as evergreens, are proper enough to plant for a screen in a single row, though not very near to the wall; but the best evergreens for this purpose are the evergreen oak and the cork-tree. The witch-elm, planted close, grows quick, and has a pretty summer appearance behind a wall; but is of little use then, as a screen, except to the west; when still it may shade too much (if planted near) as it mounts high. In a dry hungry soil, the beech also is very proper, and both bear cutting. The great maple, commonly called the sycamore, is handsome, of quick growth, and being fit to stand the rudest blasts, will protect a garden well in a very exposed situation; the wind to be chiefly guarded against as to strength, in most places, being the westerly." *Introd. to Gard.* p. 27.

In elevated situations, with a considerable slope to the south, a garden (*fig.* 287.) may require to be surrounded on all sides by high woods (*n*), and even to have groups of evergreens, as pines and hollies (*e*), and hedges of trellis or lattice-work (*p p*), within the garden. The hot-houses (*d*), hot-beds (*f*), may be placed, and more delicate culinary crops (*h*) cultivated, in an artificial basin or hollow, which will have the advantage of being sheltered both naturally and artificially, and on a steep exposed to the south, will have a powerful influence in accumulating heat in winter from the sun's rays. The south borders of such gardens (*l* and *m*), and the walls heated by furnaces (*q*), will frequently be found to produce earlier crops than gardens placed on level surfaces and in low, sheltered situations.

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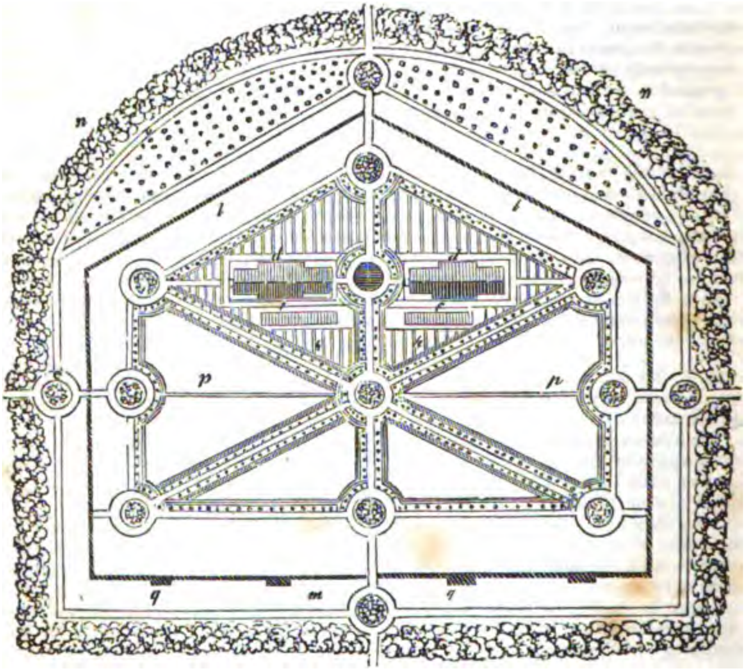

Niel observes, "shelter in our climate is a primary consideration. This may, in part, be derived from the natural shape and situation of the ground. Gentle declivities, at the bases of the south or south-west sides of hills, or the sloping banks of winding rivers, with a similar exposure, are therefore very desirable. If plantations exist in the neighbourhood of the house, or of the scite intended for the house, the planner of a garden naturally looks to them for his principal shelter; taking care, however, to keep at a reasonable distance from them, so as to guard against the evil of being shaded. If the plantations be young, and contain beech, elm, oak, and other tall-growing trees, allowance is of course made for the future progress of the trees in height. It is a rule that there should be no tall trees on the south side of a garden, to a very considerable distance; for, during winter and early spring, they fling their lengthened shadows into the garden, at a time when every sun-beam is valuable. On the east also, they must be sufficiently removed to admit the early morning rays. The advantage of this is conspicuous in the spring months, when hoar-frost often rests on the tender buds and flowers: if this be gradually dissolved, no harm ensues; but if the blossom be all at once exposed to the powerful rays of the advancing sun, when he overtops the trees, the sudden transition from cold to heat often proves destructive. On the west, and particularly on the north, trees may approach nearer, perhaps within less than an hundred feet, and be more crowded, as from these directions the most violent and the coldest winds assail us. If forest-trees do not previously exist on the territory, screen-plantations must be reared as fast as possible. The sycamore (*Acer pseudo-platanus*) is of the most rapid growth, making about six feet in a season; next to it may be ranked the larch, which gains about four feet; and then follow the spruce and balm of Gilead firs, which grow between three and four feet in the year." *Edin. Encyc.* art. *Hort.*

"A garden," Forsyth states, "should be well sheltered from the north and east, to prevent the blighting winds from affecting the trees; and also from the westerly winds, which are very hurtful to the gardens in the spring or summer months. If a garden be not naturally sheltered with gently rising hills, which are the best shelter of any, plantations of forest-trees, made at proper distances, so as not to shade it, will be found the best substitute." *Tr. on Fruit Trees*, p. 286.

What is of "great import," observes Switzer, is, that the garden be "guarded well with wood," *viz.* the north-east, south-west, and north-west; the south and south-east being the only aspects that should be open. There is great danger as to the easterly exposition, inasmuch as all blighting winds come from that quarter; so also the south-west is subject to the violent concussions of those winds that come off from the Atlantic or western ocean. But, it may be observed, the sun acting in an oblique manner, and the winds fluctuating horizontally, the garden may be planted all round with wood, between ten and fifteen yards' distance, provided you keep your trees to about fifteen feet high, for security from winds, without any danger of depriving it of the benefit of the sun. *Pract. Fruit Gard.* 2d edit. p. 18.

Sect. V. *Soil.*

1078. The soil of a garden is obviously of the greatest consequence in its culture. It is, however, a subordinate consideration to situation and exposure, for the soil may be changed or improved by art; but no human efforts can remove the site, or change the exposure of a plot of ground. This subject was much more attended to about a century ago, in the days of London and Wise, Switzer and Hitt, than it seems to be at present. Gardeners, in general, depending too much on manures, and other adventitious aids, for securing large, though sometimes ill-flavored, culinary crops. Jethro Tull has some coarse but just remarks on this subject in his Treatise on the Horse-hoeing Husbandry, 3d edit. p. 30.

"The best soil for a garden," M'Phail observes, "is a sandy loam, not less than two feet deep, and good earth not of a binding nature in summer, nor retentive of rain in winter; but of such a texture, that it can be worked without difficulty, in any season of the year. It should be remembered, that there are few sorts of fruit-trees, or esculent vegetables, which require less depth of earth to grow in than two feet to bring them to perfection; and if the earth of the kitchen-garden be three or more feet deep, so much the better; for when the plants are in a state of maturity, if the roots, even of peas, spinach, kidney-beans, lettuce, &c. be minutely traced, they will be found to penetrate into the earth, in search of food, to the depth of two feet, provided the soil be of a nature that allows them. If it can be done, a garden should be made on land whose bottom is not of a springy wet nature. If this rule can be observed, draining will be unnecessary; for when land is well prepared for the growth of fruit-trees and esculent vegetables, by trenching, manuring, and digging, it is by these means brought into such a porous temperament, that the rains pass through it without being detained longer than necessary. If the land of a garden be of too strong a nature, it should be well mixed with sand, or scrapings of roads, where stones have been ground to pieces by carriages." *Gard. Rem.* p. 12.

Abercrombie states, that "the natural soil may be regarded as good, if it be either a hazel-colored loam, or a blackish vegetable earth; or if it be a fat loam mixed with silvery sand, or a moderately light mellow loam. A bed of very light sand or gravel is to be rejected, unless the alternative would give you a soil still more difficult to improve. The worst of all soils for a kitchen-garden is a strong clay. Nevertheless, as both clay and chalk have an attraction for fluid and volatile solutions of oil, a limited proportion of those earths, contributes to form a rich and generous soil. Chalk may abound in a higher proportion than clay, and sand in a higher proportion than either clay or chalk, without causing barrenness. The soils best adapted for moderating the excesses, and compensating the deficiences of heat and moisture in different seasons, are compositions of sand, pulverized chalk, and finely-divided clay, with a proportion of animal or vegetable matter. If the soil be not naturally good to the depth of thirty inches, and thence to three feet, proper earths and composts should be incorporated with it, to make it so, where the tenure does not render the expense unadvisable. It should be done where it is intended to found a complete kitchen-garden; not, indeed, because many esculent plants require more than eighteen inches depth of good earth, in order to flourish in perfection; nor that even fruit-trees generally will not thrive for a considerable course of time in a suitable soil, full two feet in depth, although three feet on their account is better; but, in order that the gardener may have it in his power to give rest to alternate portions of the soil, without keeping the surface out of crop, by trenching in successive years to different depths, so as to bring any given layer, measuring a spit in thickness, by turns to the bottom, the middle, and the surface, in proportion as the natural soil is unfavorable, it should receive improvement, till it be gradually brought to the desired state. Where something intractable must be taken away, as in the case of a very stony bed, let the ground be trenched, and the larger stones screened or raked out: ameliorate the residue by such earths, manures, and composts, as its defects may require. To give heart to excessively light, sandy, and unstable ground, incorporate with it substantial loam and well-rotted dung. To correct a cold stubborn clay, add drift sand, shell marl, sea-weed, warm light earth, and well-rotted dung. To qualify soot for application in a garden, mix a thirty-sixth part with a heap of compost. If the soil has been rendered cold and wet by the passage and lodgment of water, it is requisite to have the ground effectually drained." *Pract. Gard.* p. 2.

Marshall observes, "The soil that suits general cultivation best is a loam, rather the red than the black; but there are good soils of various colors, and this must be as it happens; the worst soil is a cold heavy clay, and the next a light sand; a moderate clay, however, is better than a very light soil, though not so pleasant to work. If the soil is not good, *i. e.* too poor, too strong, or too light, it is to be carefully improved without delay. Let it first, at least, be thoroughly broke, and cleaned of all rubbish, to a regular level depth at bottom as well as top, so as to give about eighteen inches of working mould, if the good soil will admit of it; none that is bad should be thrown up for use, but rather moved away. This rule of bottom-levelling is particularly necessary when there is clay below, as it will secretly hold up wet, which should not stand in any part of the garden. When a piece of ground is cleared of roots, weeds, stones, &c. it would be of advantage to have the whole thrown into two feet wide trenches, and lie thus as long as conveniently may be. The ground cannot be too well prepared; for when this business is not performed to the bottom at first, it is often neglected, and may not be conveniently done afterwards; so it happens, that barely a spade's depth (or less) is too often thought sufficient to go on with. There is this great advantage of a deep staple, that in the cultivation of it the bottom may be brought to the top every other year, by double-trenching; and being thus renewed, less dung will do, and sweeter vegetables be grown. Tap-rooted things, as carrots and parsnips, require a good depth of soil." *Introd. to Gard.* p. 28.

"In laying out a new garden," Forsyth observes, "a very essential point is to make choice of a good soil. It should be two or three feet deep, but if deeper the better, of a mellow pliable nature, and of a moderate dry quality; and if the ground should have an uneven surface, I would by no means attempt to level it, for by that unevenness, and any little difference there may be in the quality, you will have a greater variety of soil adapted to different crops. The best soil for a garden is, a rich mellow loam; and the worst, a stiff heavy clay. A light sand is also a very unfit soil for a garden. Sea-coal ashes, or the cleaning of streets and ditches, will be found very proper to mix with a strong soil; and if the ground should be cold, a large quantity of coal-ashes, sea-sand, or rotten vegetables, should be laid upon it, in order to meliorate and loosen the soil, and render it easy to work. Lime-rubbish, or light sandy earth from fields and commons, will also be found of great service to stiff clayey ground. If the soil be light and warm, rotten neat's dung is the best dressing that you can give it. If horse-dung be ever used, it must be completely rotted, otherwise it will burn up the crop the first hot weather." *Tr. on Fr. Trees*, p. 290.

Nicol has probably had more experience in the formation of gardens than any of the authors we have quoted, and his remarks "on soils, and how to improve them," merit every attention, and will be duly valued by those who have seen any of the excellent kitchen-gardens he has formed in Fifeshire, Perthshire, and other northern counties.

"It is a happy circumstance," he says, "that in many instances we meet with different soils in the same acre. In the same garden they should never be wanting; and where nature (or natural causes) has been deficient, recourse must be had to art; inasmuch as the variety of fruits and vegetables to be cultivated require different soils to produce them in perfection.

"It would be absurd, however, to imagine, that for every particular vegetable there is to be a particular soil prepared. The varieties of soil in any garden may, with propriety, be confined to the following: — Strong clayey loam, light sandy loam, (which are the two grand objects,) a composition of one-fourth strong, with three-fourths light loam, half strong and half light, and one-fourth light and three-fourths strong. These, by a proper treatment, and with the proper application of manures, may be rendered productive of any of the known and commonly cultivated vegetables in the highest degree of perfection.

"But, in order to improve a soil, we must be guided much by its nature, so as, if possible, to render it serviceable for general purposes. And hence our duty is to endeavour to hit on that happy medium which suits the generality of esculents, in the formation or improvement of the soil in the kitchen-garden. Such a soil should be sufficiently tenacious to adhere to the roots of plants, though not so much so as to be binding, which would certainly retard their progress and extension in quest of food.

"Hence a loam of a middle texture, rather inclining to sand, may be considered as the most suitable soil for the purpose here in view, and that on a double account, viz. the greater part of the valuable kinds of kitchen vegetables delight in such soil, and it is worked at less expence than a stiff one; neither in severe droughts is it apt to crack, or be parched, nor in hard frosts is it so apt to throw out tender plants or seeds.

"If soils be too strong, the tender roots of plants push weakly in them; sicken, canker, and perish; and if a soil be too light, and if it be poor withal, plants deposited in it will push their roots far, and in vain, in quest of that stability and nutriment which is necessary and essential to their support. So that if the butt of our aim be perfection in the production of wholesome and well matured vegetables, we must put aside careless indifference in the formation of a proper soil, nor trust entirely to the force of dungs, were they even to be had in the greatest plenty; for dungs, by too free an application, have an effect on the quality of esculents not altogether salutary.

"Wherefore, that our efforts may be attended with success, let us bestow a moderate and prudent expence in the first outset, on composing or so improving the soil to be appropriated to this purpose, as that, in our best judgment, it may fully answer the intention.

"In many cases, the soil of the garden might be improved in a very considerable degree, at a small expence. Thus, where the bottom is wet, and the subsoil of a cankering nature, by judicious draining, which is certainly one of the greatest improvements in this case; where the soil is stubborn, by the addition of small gravel, sea-sand, wherein is a considerable quantity of small pebbles and shells, coal-ashes, lime, gravel, pounded brick-bats, brick-kiln ashes, &c., and, above all, by being carefully laid up in ridges in the winter months, and, indeed, at all times when not in crop, in such a manner as to give the greatest extent of surface for the weather to act upon; where the soil is a poor sand, or gravel, by the addition of clay, or strong clayey loam, scourings of ditches which run through a clayey subsoil, pond-mud in a like situation, or scrapings of roads which lie in a clayey district, &c.

"Soils that abound with metallic substances, and which generally make them appear of an iron color, are termed fox bent or till. These substances are often found to be intimately mixed, or rather consolidated with the soil, in considerable masses, which are adhesive and very ponderous. Such soils are the most unfavorable to vegetation of any, and are quite ineligible for the purpose here in view, without being much improved. For this purpose, lime will be found the most serviceable of all things, if judiciously applied, and the soil be frequently turned over by digging or trenching, so as that the soil and the lime may be intimately mixed together, and that the atmosphere may have full effect upon them; for without this, the lime will not operate so effectually, nor will the tilly particles of the soil be divided or meliorated so well.

"It may seem unnecessary to observe, that, according to the quantity of irony matter contained in the soil, lime will be required to reduce it. In order to ascertain this quantity, a magnet will be found useful, and one of the masses being calcined, and then reduced to a powder, the magnet will separate the irony particles from the soil, showing the proportion of iron and of earth. Thus we may fertilize the soil, taking for the extremes in ordinary cases, and supposing the lime of a middling quality, 150 and 400 Winchester bushels an acre; applying the lime in a quick or powdered state, and properly working the soil, being careful, in the first place, to drain it of superabundant moisture.

"Ridging up of land, as above hinted at, has the happiest effect, especially for stiff soils, and should never be omitted when the ground is not under crop. In dead sandy loams also, and in cankering gravels, it is of incalculable advantage, and greatly meliorates them. For it is a fact proved by experience, that exposing soil to the sun's rays in part, by throwing it into a heap, whereby it is also partly shaded, and trenching it once a month, or in two months, will sooner restore it to fertility than any other process, exclusively of adding fresh matter. And thus, if any ingredient noxious to vegetation abound in the soil, it may be expelled, or be exhaled by the action of the atmosphere, more particularly if the soil undergo a summer, and also a winter fallow. In the latter case, however, care should be taken to have the surface incrusted by frost, as often as possible, by turning it, and giving it a new surface each succeeding thaw." *Gard. Kalend.* p. 19.

" In selecting ground for a garden," Niel observes, " the plants growing naturally on the surface should be noted, as from these a pretty correct opinion may be formed of the qualities of the *soil* (550.). The *subsoil* should also be examined. If this be radically bad, such as an iron till mixed with gravel, no draining, trenching, or manuring will ever prove an effectual remedy; if, on the contrary, the subsoil be tolerably good, the surface may be greatly meliorated by these means. In every garden two varieties of soil are wanted, a strong and a light one, or, in other words, a clayey loam and a sandy loam; different plants requiring these respective kinds. For the general soil, a loam of middling quality, but partaking rather of the sandy than the clayey, is accounted the best." *Ed. Encyc.* art. *Hort.*

It appears to be generally agreed on by practical men, that there ought to be between two and a half and four feet of good soil over the whole surface of the kitchen-garden. This depth will rarely be found to exist naturally; or, if it does in some places, it will be deficient in others. The proper heights for the borders and quarters being fixed on, and the whole thoroughly drained, the next thing is to trench the soil to the proper depth from the given levels, whether these run under or over the present surface, removing all unfavorable subsoil, either to such hollows within the ring fence of the garden as require to be filled up to a greater depth than that fixed on for the good soil; or, what is preferable, placing it without the garden. This done, the next thing is to introduce as much good soil as will raise the surface to the thickness required. The strongness or lightness of this additional soil must depend on the nature of that already there, and on the object in view. In complete gardens, it may be desirable to have three qualities of soil, viz., a *strong loam* or *light loam*, and a *loam of medium* quality; the latter occupying the borders and about half of the quarters. The soils introduced therefore must be such as, with what is naturally there, will effect these objects. If, for example, the local soil is every where light or sandy, then one part, say that destined for strong loam, should receive as much of clayey loam as will bring it to the temperament desired; that for medium loam a lesser portion, with as much light earth as will bring it to the required depth: and if the natural soil is deemed too light, to that also must be added a portion of what is more cohesive, &c.

It may be observed, however, that the general object in selecting, forming, or improving the soil for a kitchen-garden, is to obtain, as Nicol expresses it, " a loam of a middle texture rather inclining to sand," such soil being *easy to work, little affected by either droughts, rains, or frosts*; and the greater part of the valuable kinds of kitchen-vegetables delighting in it. All the authors we have quoted above, may be said to agree in desiring such a soil for the whole of the kitchen garden. In peculiar situations, as where villas are built on rocky steeps, and other romantic situations, it may become a matter of great difficulty and expence to bring soil from a distance; and it may also be found equally difficult to find a bed for it, by the removal of rock, &c. In such cases, all that can be done is to select the most favorable spots (*a a, fig.* 288.); cultivate them to the utmost, connect them by walks and shrubbery; and place the economical buildings attached to the garden (*b*), and hot-houses, &c. (*e*), in the most commodious situations, and where they will not interfere with general effects. There are many very productive gardens of this description in the north of Scotland, and in the territory of Genoa.

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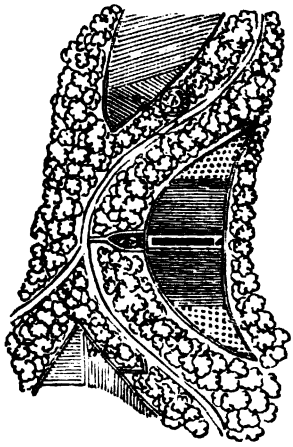

SECT. VI. *Water.*

1079. A copious supply of this material is essential to a good kitchen-garden, and, from whatever source it is furnished, should be distributed either in reservoirs or open cisterns, or in pipes, properly protected, over the garden and hot-houses. If the supply is from a pond or river, a system of lead or cast-iron pipes may be adopted, and the delivery effected by cocks at proper distances; but if from wells or springs, the delivery should be into open stone or cast-iron cisterns; or, in default of these, into tubs or butts sunk in the earth. In Tuscany, where the inhabitants excel in the manufacture of pottery, immense jars of earthenware are frequently adopted; in the Royal Garden at Paris, sunk barrels; and cisterns of masonry, lined with cement, are general in the best gardens on the continent. In these gardens, a system of watering is adopted, which, though rendered more necessary there by the climate, than it can possibly be in this country, yet in various respects deserves imitation.

Many kitchen-crops are lost, or produced of very inferior quality in this country for want of watering. Lettuces and cabbages are often hard and stringy; turnips and radishes do not swell, onions decay, cauliflowers die off, and, in general, in dry seasons, all the *cruciferea* become stinted, or covered with insects, even in rich deep soils. Copious waterings in the evenings, during the dry season, would, there can be no doubt, produce that fulness and succulency which we find in the vegetables produced in the *Low Countries*, and in the Marsh Gardens at Paris; and in this country at the beginning and latter end of the season. The vegetables brought to the London market from the Neat's Houses, and other adjoining gardens, where the important article of watering is much more attended to than in private country gardens, may be adduced as affording proofs of the advantage of the practice.

The watering the foliage of small trees, to destroy or prevent the increase of insects, and of strawberries and fruit-shrubs, to swell the fruit, is also of importance; and though the climate of Scotland is less obnoxious to great droughts, than that of the southern counties, yet we find that excellent horticultural architect, John Hay, adopting a system of watering in various gardens lately formed by him in the neighbourhood of Edinburgh.

The contrivance for watering or washing the foliage of the wall-trees in Dalmeny garden, laid out by this artist, deserves particular notice. Water is supplied to the garden from a reservoir, situated on an eminence, a considerable height above the garden-walls. Around the whole garden, four inches below the surface of the ground, a groove, between two and three inches deep, has been formed in the walls, to receive a three-quarter inch pipe for conducting the water. About fifty feet distant from each other are apertures through the wall, two feet and a half high, and ten inches wide, in which a cock is placed, so that on turning the handle to either side of the wall, the water issues from that side. The nozzles of the cocks have screws on each side, to which is attached at pleasure a leathern pipe, with a brass cock and director; roses, pierced with holes of different sizes, being fitted to the latter. By this contrivance, all the trees, both inside and outside the wall, can be most effectually watered and washed in a very short space of time, and with very little trouble. One man may go over the whole in two hours. At the same time the borders, and even a considerable part of the quarters, can be watered with the greatest ease when required. The conveniency and utility of this contrivance must at once be perceived by every practical horticulturist. The same plan of introducing water is adopted in a garden which J. Hay planned and executed for Lord V. Duncan, at Lundie-House, near Dundee; and after the experience of several years, it has been greatly approved of. The water at Lundie is conveyed to the garden from a considerable height, and is thrown from the point of the director with great force, and to a good distance. *Edin. Encyc.* art. *Hort.*

Justice recommends forming a large pond or basin in the centre of the garden, which shall at the same time contain fish. Water, he says, is absolutely necessary; well-water is far from being proper, but that which is impregnated by the sun's rays is highly conducive to vegetation. *Brit. Gard. Direct.* p. 2.

"Gardens," Forsyth observes, "should be near a river or brook, that they may be well supplied with water. From these, if the garden does not lie too high, the water may be conducted to it by drains; or, which is much better, by pipes, taking care to lay them low enough to receive the water in the driest season, which is the time when it will be most wanted. If there be no running water near the garden, and if the latter lies on a declivity near a public road, I would advise to make a hollow drain, or a cut, from the most convenient part of the road, to receive the water that washes the road in rainy weather, and convey it to a large cistern, or tank, in the upper part of the garden; this, if the road be mended with lime-stone or chalk, will prove an excellent manure. The water from the cistern, or from the river, may be conducted to the different quarters by means of pipes, which, having cocks at proper places, the water may be turned upon the different quarters of the garden at pleasure. Or the water may be conveyed in proper channels, and turned on the quarters in the same manner as in watering meadows. These pipes, channels, &c. will be a considerable expense at first; but they will soon repay it, by saving a great deal of time, which would otherwise be spent in pumping and carrying water. The most convenient time for turning the water on is, in general, during the night; and in dry weather it would then be of the most essential service.

"If the situation be such that you are obliged to pump the water from deep wells, there should be a large reservoir, in which it should be exposed to the sun and air for some days before it is used; it may then be turned on as above. If the ground be wet and spewy, it will be proper to make a basin of the most convenient place to receive the water that comes from the drains, and to collect the rain that falls on the walks." *Tr. on Fr. Trees.*

The use of water to a garden seems to have been better understood in former times than at present. Agriculture, Varro observes, is drought and misery without water. Switzer styles it the life and soul of a garden; and London and Wise, Evelyn and Hitt, are equally warm in recommending it.

"Water," Switzer observes, "is one of the most essential conveniences of a country-seat, and especially useful to a kitchen-garden; for, indeed, what can be made of any ground without it? *Anima mea sicut terra sine aquâ*, is a good metaphor to express it, as it really is, the soul and life of all vegetation; and whoever does not make that one of his principal considerations, deserves blame or pity."

Describing his design for the garden of Spy-Park as to water, the same author observes, "The square basins are not only designed for little stews for fish, but at each corner there are clay and elm pipes, with plugs to them that go under the alley, and communicate themselves with the adjacent divisions or quarters, which will, in an instant, float the same, because the little basins are designed to lie six inches higher than those divisions or quarters; and then the whole is so contrived by other larger elm-pipes, that the said little basins are filled by the canal and other conveniences."

Abercrombie is silent on the subject of water; but M'Phail observes, that a garden to bring the produce of the soil to the greatest perfection, "should be well supplied with water, to water the plants in dry seasons." *Gard. Rem.* 2d edit. p. 13.

"If water can be introduced," observes Marshall, "and kept clean with verdant banks around it, it would be very useful where a garden is large; but let it be as near the centre as possible, being the most convenient situation. It should be fed from a spring, and (if it could) be made to drip in the reservoir, because its trickling noise is agreeable music in a garden to most ears." *Introd. to Gard.* p. 42.

"If there be no natural stream that can be conducted through a garden," observes Nicol, "water should be conveyed from the nearest river, lake, or pond; soft water being most desirable for the use of the garden." *Kalendar*, p. 7.

Sect. VII. *Form.*

1080. Almost all the authors above quoted agree in recommending a square, (*fig.* 289. *a*), or oblong, as the most convenient for a garden; but Abercrombie proposes a long or unequal-sided octagon, in common language, an oblong with the angles cut off (*b*); by which, he says, a greater portion of the wall in the slips behind will be on an equality with the garden as to aspect.

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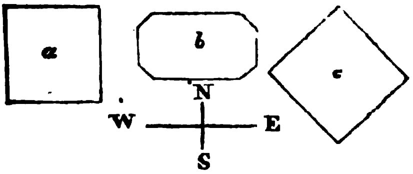


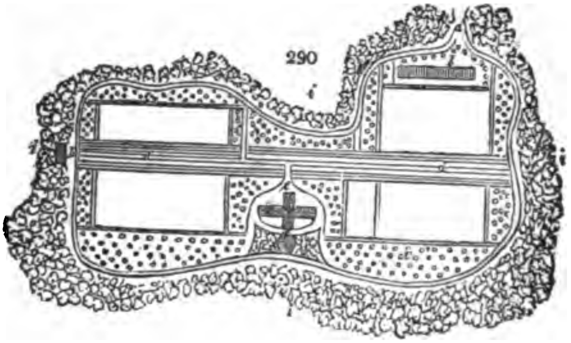
Hitt considers none more proper than a geometrical square, "set out in such a manner, that each wall may have as much benefit of the sun as possible, that is, with reference to the compass, set out as a rhomboid" (*c*).

M'Phail says, "A garden may be made and laid out in any form; but, I think, a square or oblong form is the most convenient." A square with a semi-circular projection on the north side (*fig.* 285. *d*,), or a paralellogram with a northern projection in the form of a semi-circle (*fig.* 285, *e.*), were favorite forms with the late W. Nicol.

These opinions, it is to be considered, refer more properly to the space inclosed by walls than to the whole garden, which ought to be considered as comprehending the entire space included in the ring-fence; which fence, choice or accidental circumstances may produce in any shape from the circle (*fig.* 292.) to the most irregular figure, (*figs.* 288. and 290.).

The oval, polygonal, and trapezium forms, have been adopted for the walls of a garden, in order to procure a more equal distribution of sun and shade; but the inconveniences attending the culture and management of the quarters of such gardens is considerable; nor does it appear an equal distribution of sun is so suitable, as that of having some walls as advantageously exposed as possible for the more delicate fruits; and others less so for hardier sorts, for retarding fruits, and for growing plants, to which shade is congenial in the borders. No figure whatever can add to the quantity of sun's rays received by the whole form, but merely vary their distribution.

Sometimes, though the figure of the whole garden be irregular (*fig.* 290.); yet, being surrounded by wood (*i*), and interspersed with fruit-trees, it will form very agreeable shapes in walking through it; and while the quarters are thrown into right-lined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figures to facilitate culture, the angles can be occupied with fruit-trees or shrubs, permanent crops, as strawberries, asparagus, &c. with the hot-houses (*e*), or other buildings (*b*), or with ponds (*f*), and other adjuncts. Some of the walks may be wavy (*a*), as a direction indicated by the outline of wood, and one main walk (*d d*) may be formed, broad and straight, to display the whole.

Sect. VIII. *Walls.*

1081. " The chief reason," Nicol observes, " for rearing walls round a garden is for the production of fruits. A kitchen-garden, considered merely as such, may be as completely fenced and sheltered by hedges as by walls, as indeed they were in former times, and examples of that mode of fencing are still to be met with. But in order to obtain the finer fruits, it becomes necessary to build walls, or to erect pales and railings.

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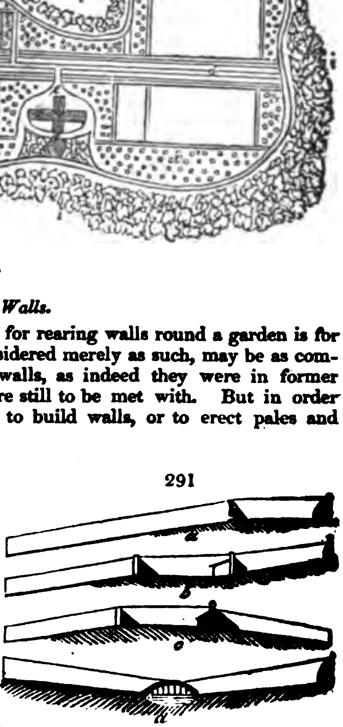

" In designing and laying out a modern garden then, a degree of taste, as well as of fitness or propriety, ought to be displayed; the basis of which is the right placing, proportioning, and constructing of the walls. If these be properly set down, so as to answer the cast of the ground (*fig.* 291.) and be raised to proper heights, according to its extent, the rest is easy, and follows as a matter of course.

" In this particular branch of gardening, utility and simplicity ought to go hand in hand, otherwise true taste will be wanting. It is not in curves, circles, and ogees, we shall find satisfaction. The walls, if the ground admit of it, should all run in direct lines, corresponding to the slopes on which they are placed (*a*, *b*, *c*, *d*,); they may be built level, or they may be inclined, so as to suit the general cast of the ground; but the nearer to a level the better they will please. The mind is dissatisfied and distracted in beholding any building apparently unstable. We can look upon a mast placed oblique, or on a tree growing aslant, with firmness and satisfaction, because we know the one is supported by ropes, and the other by roots; but on a wall running much off the level, we look with a degree of distrust or of fear.

" If the north wall can be placed quite level, and also the south wall on a lower level, and so as that the east and west walls shall fall, from north to south, a foot in thirty or in twenty-five; and if the ground be lengthened from east to west, in the proportion of three to two, the extent being two or three acres, on such a spot may be formed a garden that will not fail to please. Next, on a spot of the above, or of similar dimensions, sloping to the south, and not level from east to west, but sloping a few feet, perhaps one in fifty, to the east, in this case the opposite walls should run directly parallel to each other, both with respect to latitude and to inclination, otherwise the eye will be displeased by the distorted appearance of the coping when at the full height. Next, all as here described, and the ground sloping to the south and to the west. And next, a dead level spot, in which case particularly the walls should be of different heights. But ground falling to the north, or much distorted, should be avoided, as being very unfit for erecting walls or other buildings upon, on which a complete modern garden cannot be formed without considerable difficulty, and a great additional expence." *Kalend.* p. 142.

With reference to the kitchen-garden, walls may be considered as to aspect, height, construction and materials.

1082. In regard to *aspect*, south walls, as Switzer observes, " have been all along reckoned the best for fruits, though later observation and experience have not confirmed it; for when the days are something long, and the heat of the sun in its greatest strength, it is late before the sun shines upon them, and it leaves such a position as early in the afternoon. Besides, when it is mid-day, the sun is so much elevated above the horizon, that it shines but faintly and very slopingly upon them, which makes the heat to be much the less, inasmuch as a smaller quantity of rays fall upon such a wall, it being visible, that both before and after noon the sun shines hotter than when it is in its highest meridian. From whence, 'tis natural to infer, that a little inclination, either to the east or west, are the best aspects; but which of the two will maintain its precedence may be now enquired into. And in this enquiry, I shall venture to affirm, that the east, or rather south-east, are to be preferred to the west or south-west, though they are as much exposed to the sun as east walls are. Though it should be argued that the sun shines stronger in the afternoon than the morning, because it continues to act on air already warmed with the influence of the morning sun, yet, inasmuch as the rays of the sun are more healthy and cheerful then than after, and dispel the cold dews and vapors as before, it is more than equivalent to the extraordinary heat of the afternoon sun, as experience shows, which is generally languid and unhealthy. From whence I infer as before, that the south-east maintains its post against either the south or south-west. 'Tis from reasonings of this kind I would venture to establish it as my humble opinion, (and I think I have the suffrage of most eminent planters and gardeners to second me,) that a south wall, inclining about twenty degrees to the east, is preferable to any of the others, inasmuch as the sun shines as early on it as on a full east wall, and never departs from it till about two o'clock in the afternoon; besides it is something removed from those destructive winds that come from the west and north." *Pr. Fr. Gard.* p. 312.

Hitt proposes to have no south wall, but by the position of the four sides of his garden (*fig.* 289. *c*,) endeavours to obtain a comparatively equal distribution of solar heat. The plan he recommends contains two acres, the ground descending from the south-west side. "In respect to the aspect of the walls," he says, "the sun's rays continue no longer upon the north-west wall than three in the afternoon, which, I think, is the most proper aspect for grapes, peaches, nectarines, and all other kinds of fruit that require the most regular heat to bring them to perfection, and soonest to maturity, for though the sun leaves this wall so soon in the afternoon, yet in the morning this aspect will be of advantage to the trees and fruit; for, as apricots, peaches, nectarines, blossom early in the spring, at which time our climate is frequently attended with frosty nights, destructive of both blossoms and fruit, the sun's rays darting in lines at right angles upon the wall at nine o'clock, dissolve the congealed moisture much sooner than if they darted upon it at right angles at noon, which they must consequently do if the wall stands due south. 'Tis true, a south wall will receive more sun by three hours, that is, from about three in the afternoon till near six, (in the vernal equinox,) but that is no great advantage, for before that time of the day the air will be sufficiently warmed. Besides, if the wall is built full south, it will not be so proper for fruit-trees as a south-east aspect; for in the middle of the day the sun will cause the trees to exhale their juices faster than their roots can absorb them, which will render the fruit smaller and the pulp harder, and worse flavored, than those which receive the heat more regular. The south-east wall receives the sun about nine o'clock, which is a proper situation for some of the best kinds of winter pears, and which they well deserve, for they afford fine juices and rich flavors, when other fruits of the same quality are wanting. Some kinds of grapes, peaches, and nectarines will ripen well against it; and this has one equal advantage with the south-west wall, viz. of the sun's rays striking obliquely upon it at noon. The north-west aspects of these walls receive but little sun, for he shines not upon them till three in the afternoon, but they will serve for fruits which ripen in summer, as cherries, plums, and some kinds of pears." *Tr. on Fruit-Trees*, p. 33.

"The aspect," Marshall observes, "of a wall designed for the best fruits, may be full south, or somewhat inclining to the east, by which it will catch the sun's rays at its rise, the cold night dews will be earlier and more gently dissipated, and the scorching rays of the afternoon summer's sun are sooner off. By thus having the walls of a garden not directly to the four points, the north wall is greatly advantaged by having more sun."

Abercrombie, in his *Practical Gardener*, remarks only, "that the kitchen-garden is generally bounded by lines of walling for fruit, carefully planned as to aspect."

"Many gardeners are of opinion," Nicol observes, "that the best aspect for a fruit-wall in this country (Scotland,) is about one point to the eastward of south, such walls enjoying the benefit of the morning sun, and being turned a little from the violent west and south-west winds. South-east is, for the same reasons, accounted by many a better aspect than south-west."

Dr. Walker (*Essays on Nat. Hist.* p. 258.) states that the six hottest hours of the day are from eleven to five o'clock, and that it is not a wall of a south-east, but of a south-west aspect, which enjoys this heat.

1083. The *height of walls* for training fruit-trees generally approved is from ten to twelve feet; but it is more commonly determined by the size and form of the garden, and the inclination of its surface. The following judicious observations of Nicol are the best which have appeared on this subject. The irregular surfaces on which gardens are often obliged to be formed in Scotland, requires the greatest attention and nicety from the designer, and hence the fullness of his remarks.

"With respect to the height of fruit-walls, if considered merely as such, the matter might easily be determined. I would say, twelve feet, that height being very convenient for the operations of pruning, watering, gathering the fruit, &c. and admitting of a sufficient expansion of the branches of most trees. But the height of garden-walls should be regulated by the extent, or by the apparent extent, of the ground enclosed by them. I say by the apparent extent, as well as by the real extent, because much depends on the form and cast of the ground, in how much the eye shall be pleased. If it be a square, it will seem less than it really is; and if a lengthened parallelogram, larger; and according to its flatness or its elevation, the eye will be deceived.

"A small spot surrounded by high walls has a bad effect and a gloomy appearance. The walls being of different heights give relief. In a garden of an acre, being a parallelogram of the best proportion, and gently elevated, the north wall may be raised to the height of fourteen feet; the east and west walls to twelve; and the south wall to ten feet above the ground level. If the ground slope considerably, the breakings in the respective heights of the walls may be less; they may be only a foot; and the relief will be same, or nearly the same, to the eye, in ranging along their surfaces. In a garden of greater extent, the walls may be raised to a greater height; but by no means in proportion, if it extend to several acres. The extreme height should not exceed eighteen feet of the north wall of any garden; and contain, suppose four acres, the east and west walls should be fifteen, and the south wall only twelve feet high, in order that it may give the necessary relief to the eye.

"In a garden four hundred feet long and three hundred feet broad, which forms a handsome parallelogram, and contains something above two English acres, if the ground lie on an easy slope, a very eligible height for the north wall is sixteen feet; for the east and west walls fourteen; and for the south wall twelve. But if the ground be quite level, or nearly so, the north wall being the same height, the east and west walls should only be thirteen and a half feet, and the south wall eleven feet in height; or the east and west walls may only be thirteen, and the south wall ten feet high, if it be a dead level." *Kal.* p. 145.

Hitt observes that walls five or six feet high will do very well for peaches, cherries, vines, and figs, but he would not advise the planting of plums, apricots, or pears, on such walls, they requiring more room, and to stand longer before they bear.

"Supposing a garden" says Niel, "to be about an acre in extent, and the ground sloping gently to the south, the rule is, that the north wall may be fourteen feet high; the south wall ten; and the other walls about twelve. In a larger garden, containing about four acres, the north wall is sometimes eighteen feet high; the side walls, or those on the east and west, fifteen; and the south wall not more than twelve. On a dead level, the north wall is generally made sixteen feet high; the east and west walls, thirteen and a half; and the south wall, eleven. It may be observed, that walls higher than twelve, or, at most, fourteen feet, are necessary only for pear-trees, peach, nectarine, apricot, and plum-trees, seldom requiring more than twelve feet. The terms north and south wall are here used to denote the north and south sides of a square or parallelogram; but in speaking of wall-fruit, if it be said that peach or fig-trees require a south wall, this must be understood to mean a wall with a south aspect, or what is in reality the north wall of the garden. There are two motives, therefore, for raising this wall some feet higher than the others; first, sheltering the garden from the northern blast; and, in the next place, the procuring of ample space for training the finer kinds of fruit-trees on the south side of the wall, or best aspect of the garden. Under the denomination of finer kinds of fruit-trees are to be understood not only peaches, nectarines, apricots, and plums, but some of the French pears, such as the chaumontel, colmar, and crassane.' *Ed. Encyc.* art. *Hort.*

Forsyth prefers walls ten feet high, but says they may extend to fourteen feet.

"Many low walls, or stout ranges of paling," Abercrombie observes, "will produce a greater total of effect in accelerating fruit, than the same expenditure in high walls."

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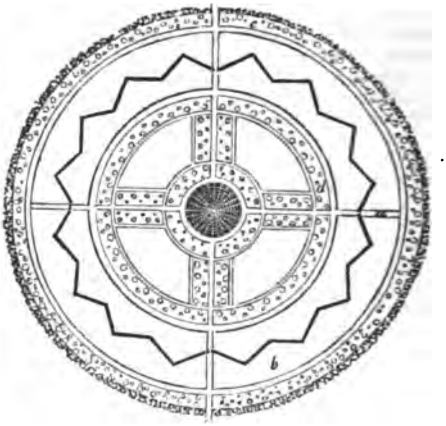

1084. With respect to *construction* for kitchen-gardens, the common upright, straight wall is now generally preferred to the sloping angular or curved walls, tried in several places about a century ago, and criticised by Justice, Miller, Switzer, and other authors of that day. There may occur cases, however, in which these uncommon forms, and others, which we have noticed (627.), may be a adopted with propriety. A very good application of the angular wall, when formed of boards, may be made in the case of a circular garden (*fig.* 292.) At each angle (*a*, *b*,) a light cast-iron post with grooves is to be inserted in the ground; and in these grooves, the ends of the boards, say in six or eight feet lengths, are to be inserted, and left without any fastening. If they shrink during summer, being loose, they will only drop a little, but never show any crevice; and, in order to let the trees be fully exposed to the weather in winter, or to paint, repair or renew the boards, all or any part of the latter may easily be taken out, leaving the cast-iron props in the grounds, and the trees as entirely detached as if they were standards or border bushes (*d*). In this way, a large surface of cheap and neat walling might be obtained in very little space, and on the whole an agreeable effect produced. A walk, shrubbery, and hedge (*c*), may surround the whole.

Hitt recommends founding kitchen-garden walls on piers, placing them at such distances as to admit one tree of the sort proper for the aspect between, and forming them of dimensions suitable to the size of the walls, and the nature of the foundations. The advantages he states to be a saving of material and intended pasturage for the root. If, however, the wall is to be planted with fruit-trees on both sides, the latter advantage is imaginary; and, indeed, the construction might often prove injurious by admitting the hardy roots of trees, fit for a northern exposure, to intermix with the more delicate ones of such as are planted on a south aspect.

Justice, having disapproved of curved and angular walls, says, " and as to the other methods of arching walls at their bottoms, that is still worse; for when the roots go out at the back-sides of the walls at their freedom, they draw all the rancid juices from the earths at the backs of the walls; in consequence of which, the fruit infallibly falls off, after it has acquired its magnitude, &c." *Brit. Gard. Direct.* 5.

A late writer, J. Robertson (*Hort. Trans.* iv. 95.), recommends such walls for peach-trees, but obviously on the supposition that no use is made either of the north side of the wall, or north border.

In regard to other modifications of kitchen-garden walls, Hitt observes, " I have seen some walls stuck with tiles projecting, called horizontal shelters, some built with large pillars, and others with curves; all these are attended with evils of one kind or other; for the horizontal shelters are great receptacles of noxious insects, particularly of the small green and variegated caterpillars. These insects devour the leaves and eat deeply into the fruit when grown to a good size; so that it perishes and drops off the trees. The shelters are likewise very prejudicial to both fruit and branches, by depriving them of the descending dews, from which they imbibe great nourishment. Large pillars or piers have almost the same ill effects; besides, they shade the rays of the sun from the trees part of the day, more or less, in proportion to their size. Though walls built with curves have, in calm seasons, the benefit of more heat than others; yet, in windy weather, the winds from some point or other rebounding from side to side, break and destroy the tender branches and blossoms of trees, whereby they are much more injured than the heat reflected from one wall to the other can be of advantage to them. I have found by experience, that walls built straight and upon arches, as mentioned before, are preferable to all others, having a coping which projects about two inches to shoot off the rain, in order to preserve the wall." *Tr. on Fruit Trees*, p. 40.

Switzer rejects the sloping or bevelled walls recommended by the author of " *Fruit Walls improved by inclining them to the Horizon;*" because, " though the author's very curious calculation is, perhaps, no whit inconsistent with truth, yet experience has taught (and that in a sloping wall at Belvoir-castle, I think, of the author's own directing), that though the sun may act with more vigor in its solstitial capacity on a sloping than on a perpendicular wall, yet it is as deficient in its performances in the morning; and by the author's own arguments, as well as the observations of almost every body that has made any observation at all, that dews are expelled at least an hour in the morning sooner from a perpendicular wall than a sloping one; so that what is gained at one time is lost at another." *Pract. Fr. Gard.* p. 314. and 315.

M'Phail recommends, that the foundation of a garden-wall should be dug out no deeper than the thickness of good earth on the surface, in order that as little wall may be lost as possible.

Forsyth approves of strengthening walls by piers, placed from forty to sixty feet apart, and projecting half a brick beyond the wall. Such piers are now made round, or rounded off, as the technical term is, which is more convenient for training trees. "I do not approve," the same author adds, "of fixed copings, especially when they project so far as they are generally made to do; I would rather advise to have a moveable wooden coping, fixed on with iron hooks, fastened to pieces of wood, built into the top of the wall; these copings would also be found very convenient to fasten the nettings, &c. to in spring, for sheltering the fruit-trees. If, however, any should prefer fixed copings, they should not project above an inch on each side of the wall; this small projection will be sufficient to preserve the wall, and will not prevent the dew and rain from falling on the upper part of the trees, which is of great service to them."

"With respect to the coping of garden-walls," Nicol observes, "much has been said, and opinions are at variance. Some insist that the coping should not project beyond the face of the wall; and others, that it should project several inches, in order to throw the dip off the foliage. Others, again, give it a slope to the north, or to the west side, in order to throw all the water to the first aspect, or to that not covered with trees. It may be right to throw the whole of the water to the side not covered with fruit-trees; but it is wrong to throw it all to the worst aspect, if that aspect be planted, by being disadvantageous to the trees trained on it, if there be any disadvantage in the rains falling upon them; which, indeed, is questionable, except, perhaps, just when the fruit is ripening off. The quantity of rain that falls on an ordinary wall, is but trifling; and if even a light breeze of wind prevail at the time, it is generally dashed against the foliage in dripping, or is scattered and dissipated. In short, it is quite as well for the trees that there be no projection at all, if the coping be fixed. A temporary coping of boards, projecting perhaps a foot or eighteen inches, may be of service to the trees in spring, while in bloom, in repelling the perpendicular frosts, that are often injurious to them at that time, and to the tender fruit. But such frosts are less hurtful than baneful frosty winds, which fall not perpendicularly, and which are better warded off by screens." *Kal.* p. 146.

"In some places," Niel observes, "projecting stone buttresses are set at intervals in the walls, in order to strengthen them, and break the force of the winds when sweeping along. From the external angles of the walls of Dalmeny Park gardens, where they meet at right angles, a wall (*fig.* 293. *a*,) is extended diagonally about seventeen feet. This extension is found very useful in breaking the force of the wind when ranging along the walls. At the same time it does away, in a considerable degree, the formal box-shape of the garden when viewed from the higher grounds in the neighbourhood." *Ed. Encyc.* art. *Hort.*

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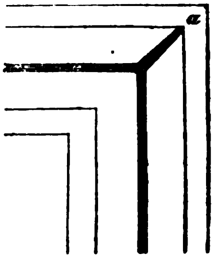

Comte Lelieur and T. G. Cullum approve of copings which project nearly a foot. In the best peach gardens at Montreuil they project four or five inches; and at Thomery, where the finest grapes are raised, the copings project ten or eleven inches over walls which do not exceed eight feet in height (*Pom. Franc.* p. 78.) T. G. Cullam has built, in Suffolk, a nine-inch wall with rounded piers, and copings of slate supported by oaken brackets, projecting a foot from the wall. The result answered his expectations. *Hort. Trans.* iv. 269.

On the whole, it appears both from the experience of a number of gardeners, and the most correct theories of dew (*Wells on Dew*, 1819, see 605.), and cold, (*Leslie* in *Supp. Encyc.* art. *Cold*,) that projecting copings are of use in spring to protect the blossoms from descending cold and dews; but as the copings must be injurious in summer by excluding light rain and air, and harbouring vermin, we should prefer the temporary coping of boards recommended by Miller, Forsyth, and Nicol.

1085. With respect to the *materials* for kitchen-garden walls, brick is almost universally preferred; Forsyth says, where brick cannot be got, it is better to dispense with walls altogether, or to adopt wooden ones. "Brick," Nicol states, "is best for the superstructure, and stone for the foundation and basement. Bricks give more warmth, and answer better for training trees to than stone. South, east, and west aspects should therefore be faced with brick, if the wall be not entirely built of it. If the wall be built entirely of stone, or be backed with stone, or be faced with bricks, and if trees are to be trained against such backing, the stones should be run in regular courses of from four to seven or eight inches thick, and each fifteen or twenty inches in length, by which there may be a frequency in joints, and that the trees may be properly trained against the wall.

"Dark-colored whinstone (the greenstone and basalt of mineralogists,) is the next best material to brick, when properly squared and hammer-dressed, as it absorbs heat; and next to that, a kind of blueish grey stone, (sandstone flag,) or, in parts of the country consisting of primitive rocks, clay slate, that rises in natural flags, the thickness, or nearly the thickness, of bricks, and which require but little dressing, or trouble in building. The nearer the stone approaches to black, the more valuable it is for the purpose; the preference being given to the darkest whinstone, merely because it absorbs and retains heat more than light-colored stones, and by reason of its close texture or grain, repels moisture better, or retains less of it than other stones. But good durable freestone (sand-stone,) being properly squared, hammer-dressed, and run in courses as above, make a very good wall for training the more common kind of fruits to; such as apples, cherries, pears, and plums, and may answer very well for east, west, and north aspects. But the better aspects, as south, south-east, or south-west, on which are to be trained apricots, figs, nectarines, peaches, and the finer sorts of pears and plums, should, if at all convenient, be faced with brick, or be built of dark whinstone.

"The basement of the wall should universally be built of durable stone, if it can be obtained, in preference to brick; whether the superstructure be of brick, or of stone in courses. In many cases it is cheaper than brick; in any case more solid and durable. Supposing a ground-level line to be determined on, the foundation or basement should be sunk at least a yard below it. If for a stone superstructure, it should be thirty inches thick; for a brick and a half brick thick wall, twenty inches; and if for a wall faced with brick, and backed with free-stone, two feet, or twenty-six inches thick, according to the size of the stones; that is to say, the basement should generally be six inches thicker than the superstructure, there being a shelf or scarcement of three inches thick on either side of the wall. If the basement be built with bricks, in order to save materials, the scarcement need not be made more than two inches; that is, the half breadth of a brick on either side; so allowing four bricks to the basement, and three to the superstructure." *Kalend.* p. 144.

"The foundation and basement of walls," Niel observes, "are often made of common building sand-stone, while the superstructure is brick; and sometimes the back part of the wall is of sand-stone, and the front only of brick. Sand-stone, which rises in flags, is the best substitute for bricks. Both kinds of materials admit of the branches of the trees being nailed in regularly, and without difficulty. Where the walls are of common rubble building, a trellis of spars is sometimes placed against them, and to this trellis the branches are tied with ozier twigs or rope yarn. This is regarded as a very good plan; but the expense is considerable, as, to prevent the lodging of insects, the trellis must be smooth and painted. The trees thus enjoy the shelter and regular heat of the wall, without being injured by its dampness in rainy weather; and as the wall is not injured by the driving and drawing of nails, there are fewer lurking places for the wood-louse and the snail. The rails of the trellis are made closer or wider according to the nature of the tree to be trained against it. In a few instances in Scotland, walls have been built of different kinds of whinstone, chiefly green-stone and basalt." *Edin. Encyc.* art. *Hort.*

Where brick is scarce and dear, Justice builds the foundation of stone, and lays one course of bricks on that side of the wall which has the best aspect, carrying up the other with stone.

Some gardeners require the courses of bricks in all kitchen-garden walls to be laid horizontally, or on a level; but Hitt, Nicol, and most modern designers, prefer them laid in lines parallel to the surface of the border, which, besides presenting a more agreeable effect to the eye, answers better for lateral or horizontal training, which, when adopted on each wall, the shoots are laid in parallel to the courses of brick and the surface of the ground. Were they laid in horizontally, there would necessarily be an unsightly blank at the top and bottom of each tree. This is a matter deserving attention, both on account of economy and the effect produced.

Different descriptions of wooden walls have been described (627.), and one or other of them may be adopted in small gardens, or in particular situations. Nicol affirms (*Kal.* p. 148.) that fruits may be produced on wooden walls, in as high perfection, as on those of brick. He acknowledges them, however, to be less durable.

Switzer describes a wooden fruit-wall, made from the boards or sides of "old shipping, which may be had at sea-port towns, and is, indeed, some of the best for fruit of any, not excepting brick-walls; for, being pitched and tarred, on account of its preservation before it goes to sea, time and the salt-water, and the different climates through which the vessel sails, so harden and incrustate the planks, that the heat of the sun strikes upon it to a degree not to be borne withal, as all that make voyages at sea can testify. These kind of wooden walls are generally made at half the expense of brick, and will last many years; and you may nail tolerably well into them."

"The last sort of walls to save bricks are those made of mud; but I do not," he says, "thereby mean such as were in old times made of those coarse materials, though I have, I confess, often seen good fruit on them, but such as they make at this time in Dorset and Wiltshire, (dry climates,) chalk and mud mixed together, with a proportionable quantity of old hay or straw mixed with it; of which, when the foundations are laid of brick or stone, or chalk, two or three feet high, which they often do, it is a very good wall for fruit, not disagreeable, nor of less use and concern for fruit-trees, than any of the walls before-mentioned." *Pract. Fr. Gard.* p. 300. See 627, and *fig.* 147.

1086. Instead of solid walls of any description, *open railings*, or lattice-work of timber or cast-iron, is sometimes used. The garden of the duke of Chandos, (Pope's Timon,) at Edgeware, was surrounded by a wrought-iron rail twelve feet high. We have, in the case of a garden of a north aspect, employed an open railing (*fig.* 294. *b*,) instead of the south-wall, and a boarded wall (*a*) as the fence on the north side. The advantage of this plan is, that the south border (*c*) of the north wall is sheltered at all times, and the north border and walk of the south rail (*e* and *i*) is exposed to the sun during winter and spring, when the trees trained against the rail are defoliated; while in summer, the same border is shaded by the foliation of the trees, and thereby as well adapted for salading and late crops, as the north border of any opaque wall. This garden had round ends; the semi-circular quarters (*f* and *g*) formed by which were devoted to fruit shrubs; and the other quarters (*k*), being rectangular, to the culture of the ordinary annual crops; at one end was a building (*h*), serving as a tool-house and watching-lodge.

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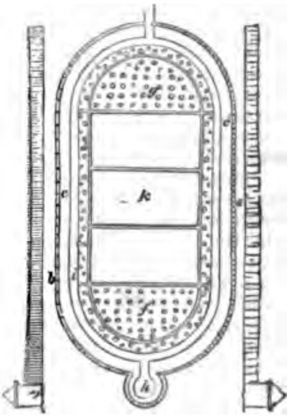

1087. *Hot, or flued walls*, have been in use in kitchen-gardens for more than a century; but till lately they were confined to walls with southern aspects. At present, however, it is not uncommon, where all the four walls of a quadrangular kitchen-garden are of brick, to flue the whole of them. The expense of a flued-wall is exactly the same as that of a solid one, what is lost in labor being gained in materials; and it is found of great advantage, in cold and late autumns, to apply fires for even two or three weeks, as well to ripen the wood, as the remaining fruit. In spring also, such walls, either with or without some of the different sorts of protecting covers (625.) are found of great use in forwarding vegetation, especially in all the northern counties of England, and in Scotland.

Flued walls are certainly not much recommended by *Abercrombie, M'Phail, Marshall*, or *Forsyth*, probably from the climate in which these authors gained their experience not requiring such aids. It is acknowledged also, that "this species of forcing is practised by many in a very injudicious way, and much mischief *done through* error to thousands of fine trees." Nicol, however, the author of this remark, subjoins, that "Flued walls are certainly eminently useful, particularly in the northern parts of these kingdoms, and are often necessary to the production of peaches and nectarines in bad seasons."

Switzer seems to have been the first to recommend them, giving various plans for hollow-arched and flued walls in his Practical Fruit Gardener, some of which had been executed and found to succeed in Lincolnshire and at Buckingham-House. Abercrombie says, we mention the hot wall without glass-work, as among the projects for forcing "an old tried one, but not to recommend it." The wall is heated with fire-heat, conveyed by flues behind, while the expence of glass-work is saved by a false economy: the plants are thus excited, on one side, by a strong artificial heat; and exposed to frost and damp violent winds, and heavy rains, on the other. Many practical men have found this contrivance calculated to produce an untimely show of blossoms, while the counteracting effect of their situation exposes both plant and blossom to perish. If not applied till the decline of summer, it may do some good in assisting fruit to ripen. *Pr. Gar.* p. 596.

Justice highly approves of them for the climate of Scotland; and, as they cost no more in erection than solid walls, it may be advisable in many cases to build them, whether steam or smoke heat should be applied or not. The facility with which the former is applied to walls through recent improvements (627.) is certainly a great argument in their favor. Our opinion is, that in all complete gardens, the whole of the walls should be flued or cellular, (*fig.* 146.), to admit of the application of artificial heat at pleasure. One boiler and furnace may easily be contrived to supply heat to both the hot-houses and walls.

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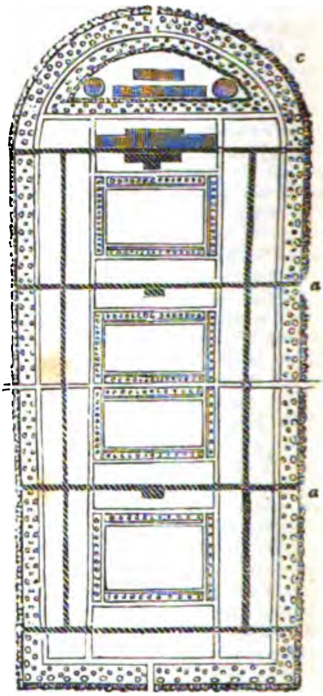

1088. *Cross-walls* (*fig.* 295. *a, b,*) are introduced where the boundary-wall is not sufficiently extensive to produce the desired quantity of fruit, and also to produce shelter to the garden. They are very generally flued walls in all modern gardens north of London, and are not unfrequently wholly or in part covered with glass. The direction of these walls is almost universally east and west, and their height is determined by the surrounding walls to which they are joined. These cross walls, Nicol observes, are not placed nearer to each other than one hundred feet; if they be two hundred feet separate, it is perhaps better.

1089. *Hedges* are sometimes introduced instead of cross walls; but it is obvious they possess only two of their advantages, that of affording shelter and shade. Where they are adopted for these purposes, evergreens, as the holly, box, laurel, spruce, &c. are to be preferred to deciduous trees; as from their surface being, at all seasons of the year, more compact than that of deciduous hedges, they are less liable to harbour birds and vermin. No hedge has a finer effect than one of shining green holly, decorated with its coral berries. See *Hort. Trans.* II. 354.

1090. Garden walls are generally left of the native *color* of the material of which they are constructed; but they have been also colored white or black, and the latter color is justly considered as absorbing and refracting more solar heat than any other, and thereby accelerating the maturity, and improving the quality of fruits, (H. Dawes, in *Hort. Trans.* III. 330.) From various trials, it appears that fruit-walls of every description, in the open air, may be blackened with advantage; but under glass, white is preferable, as reflecting light, which is there obtained with more difficulty than heat.

Sect. IX. *Ring-Fence and Slip.*

1091. In order to admit the use of the outsides of garden-walls, as well as to obtain a portion of ground in addition to what is inclosed, the walls are surrounded by a ring or boundary fence. This fence may either be an evergreen hedge, paling, low wall, or sunk fence, and with or without a wire-fence to exclude the smaller quadrupeds. It may be placed at any distance from the walls, according as accidental circumstances, or the purposes to which it is intended to devote the intervening space, may decree. This space is technically called the *slip*, and, according to M'Phail and most authors, should not be narrower than thirty feet, nor so wide as to throw the plantation for shelter too far off to produce its effect.

"The *slip*," Nicol observes, "should be at least twenty feet broad, in order to afford a sufficient border for the trees, and a walk; but it may be as much more in breadth as may be necessary to give ground without the space enclosed by walls for the supply of the family, and it may be enlarged on all sides, or on any particular side, for that purpose." *Kal.* p. 6.

The garden, Forsyth states, should be surrounded with a border, or *slip*, from forty to sixty feet wide or more, if the ground can be spared; and this again inclosed with an oak paling, from six to eight feet high, with a *cheval-de-frize* at top to prevent the people's getting over: it will also strengthen the paling. By making slips on the outside of the garden-wall, you will have plenty of ground for gooseberries, currants, strawberries, &c. You may allot that part of the slips which lies nearest to the stables (if well sheltered and exposed to the sun) for melon and cucumber-beds; and you can plant both sides of the garden-wall, which will give a great addition to the quantity of wall-fruit. *Tr. on Fr. Trees*, p. 294.

Sect. X. *Placing the Culinary Hot-Houses and Melonry.*

1092. The situation of these buildings is as various as the size and form of gardens. In very extensive establishments, as at Kew, and the Royal Gardens, Kensington, a garden or walled inclosure is entirely devoted for this department, including also the framing or melonry. In ordinary cases, however, the culinary hot-houses are either placed against the north wall of the garden, or against one or more of the cross-walls. Sometimes they are placed in the *slip*, which is made wider on purpose, either on the east and west sides of the garden, or to the north, when it is situated on a considerable declivity. Their effect, however, is almost always best when situated within the walls of the garden, either detached or on the north or cross walls. In this way they are sources of greater interest to the proprietor, and come more naturally into the general course of promenade: for it must not be forgotten, that the pleasure or satisfaction derived from even culinary hot-houses, does not wholly consist in being put in possession of certain fruits of excellent quality, (for if so, recourse need only be had to public markets,) but in marking the progress of the trees or plants on which these fruits are grown, in all their different stages; and, as Nicol observes, in being able to say, "these are the products of my own garden."

Nicol recommends that culinary hothouses should be placed together in a range with a directly south aspect, or one inclining to the east; and it may be here observed, that what is a desirable aspect for the north and best walls of a garden, will also be the best for the hot-houses. By placing them in a range, "there will be an evident saving in the division or end lights, besides the saving of trouble and work to those who attend to them. Being properly arranged according to their different lengths, breadths, and heights, very much beauty and variety may be given to the whole appearance." *Kal.* p. 272.

Abercrombie, without determining the local situation of hot-houses, says, "that wherever they are placed, they should stand upon a foundation naturally dry or effectually drained." As to aspect, he adds, the standard principle is, to set the front directly to the south.

Niel observes, "In many gardens, the hot-houses occupy a considerable part of the south wall, that is, the wall on the north side of the garden. In the area behind them are sheds for tanners' bark, rich mould, and other requisites; while there is a cart-access to the doors of the furnaces, and these with the rubbish necessarily attending the operations of forcing, are completely hid from view. In some places all the forcing-houses form a continuous range; but generally the pine-stove and succession pit, being of different dimensions, are placed separately." *Edin. Encyc.* art. *Hort.*

In small and old ill-arranged places, the greenhouse and plant-stove, or botanic hothouses, are united with those destined for culinary products, and this is very suitable, or is rather a matter of necessity in places on a moderate scale; but where variety and effect are taken properly into consideration, the ornamental or curious productions of gardening will be kept separate from those whose beauty consists chiefly or entirely in their utility. In this way two distinct and strongly-marked characters are produced, instead of scenery of a mixed, and as it were neutralized character.

1093. The situation of the *melonry* is generally in the slip, and where the range of hot-houses are placed on the north wall, and the ground sloping so as to shorten the shadow thrown by this wall in winter when the sun is low, the melonry is with great propriety placed in what may be called a bay of the slip behind the north wall. (*fig.* 295. *c.*) This may almost always be the case when the compost ground and melonry are placed adjoining each other, as the part most liable to be shaded may be devoted to the former.

"The reason," Forsyth observes, "for allotting part of the outside slip next the stable for hot-beds, for raising melons and cucumbers, are, first, because there will be no litter to carry in within the walls to dirty the walks; secondly, the beds will not be seen from the garden, and lastly, the convenience of carrying the dung, by which a great deal of time will be saved in carting and wheeling. It will be necessary, especially in exposed situations, to inclose the melon-ground with either a wall or paling from six to eight feet high. It was formerly a practice to inclose melon-grounds with reed-fences; but, although they are tolerably warm, and easily removed from one place to another (being made in separate pannels), they are very apt to harbour vermin." *Tr. on Fr. Tr.* p. 295.

In Dalmeny garden, Niel informs us, the melon-ground is situated on the east side of the garden, the garden-wall being extended on the north of it to the same height as the other walls, and flued like the rest of the walls which have a south aspect. The pine-stoves and pits are placed in this melon-ground.

The size of the melon-ground must be proportioned to the garden, and to the demands of the family for the productions of this department.

The *mould and compost ground,* as above suggested, should generally be combined with the melonry, and will be most convenient, if placed between the pits and hot-beds, and the garden-wall on which the range of hot-houses is placed; and thus, when the melonry is placed in the bay behind the north wall, the compost-ground occupies a space that would otherwise be too much shaded for hot-beds or pits.

SECT. XI. *Laying out the Area.*

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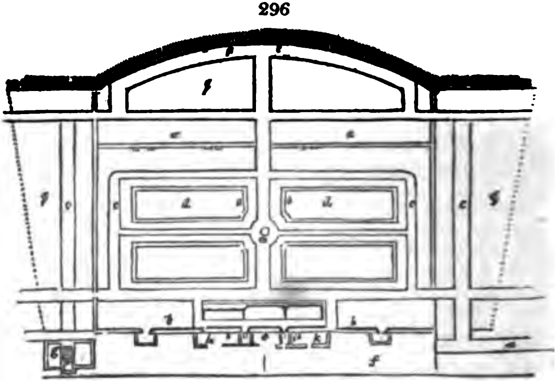

1094. The *space* inclosed by the garden-walls, (*fig.* 296. *a, b,*), is usually formed into quarters, or large compartments (*d, d,*) and borders, or narrow slips (*a*), running parallel to the walls (*b*), and walks (*c*). The magnitude and number, both of quarters and borders, as well as of the walks, depend on the size of the garden, and partly also on the taste of the designer. Rectangular figures are almost universally preferred for both. Wall borders are generally formed of the breadth of the height of the accompanying wall; they may be broader, but do not produce a good effect when narrower. In a garden of an acre within the walls, the walks are never less than six feet broad, the surrounding or wall-border from ten to thirteen feet, and the marginal borders from seven to eight feet wide. In the latter, an espalier rail is frequently fixed about five feet from the edging of the wall, in other cases, the trees are planted along the middle of the border, and trained as dwarfs; an alley or path, commonly two feet wide (*o*), separates the borders from the quarters. In the slip may be formed irregular quarters or borders (*q*), the gardener's house (*g*), and the compost and melon-ground (*f*). The fence on the south side may be an open railing (*p*), and on the north a wall or close holly hedge, the whole surrounded by a plantation nearer or more distant, according to circumstances. The hot-houses being placed against the north wall (*b*), behind them are placed the sheds, and on a moderate scale these may contain a working-room (*h*), fruit and seed-room (*e*), tool-houses (*k*), and the furnaces (*i*). To the open space behind (*f*), for composts and hot-beds, there should always be a carriage entrance (*n*), for bringing in earth, fuel, dung, &c. In the centre of the garden may be a fountain or basin of water (*m*), and in the gardener's house an upper bed-room to overlook the whole. In smaller gardens (*fig.* 297.) the same general plan is adopted as far as their extent admits. Where ornament is to be conbined with use, the standard fruit-trees and shrubs may be planted in borders accompanying the walks (*c, c,*); but where economy of ground is the object, the trees and shrubs may be collected together in quarters (*a, b,*), and borders altogether omitted.

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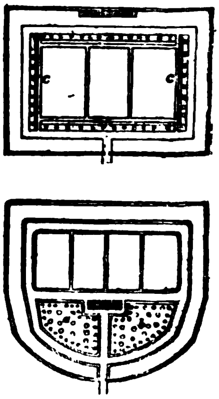

1095. "In laying out the *quarters* of a garden," Forsyth observes, "you must be guided, in a great measure, by the form and size of the garden; but do not lay them out too small, as in that case a great part of the ground will be taken up with walks and borders. The best figure is a square, or oblong, when the garden is of that form; but if not, they may be laid out in any other figure that is thought to be most convenient.

1096. Abercrombie recommends the *borders* next the walls to be made "from eight to twelve feet wide, and extended under the walks, by prepared soil, in order to allow a liberal width for the roots to spread without impediment. Next to the borders, leave a space for a walk entirely round the garden, from four to six feet wide. Some persons also choose to have a border on the inward side of the walk, for the cultivation of espaliers, and esculents of dwarf growth; others divide the central parts at once into main quarters or divisions. The walks or alleys must be regulated by convenience of access. Where the ground is extensive, the centre should be traversed by a walk, with parallel borders, from which cross walks may branch, if necessary." *Pr. Gard.* p. 4.

"The *borders* under the walls should, in the inside, be from ten to twenty feet wide, according to the size of the garden, to give full liberty to the roots of the trees to spread. There should be a foot-path, about two feet and a half from the wall, for the greater convenience of nailing the trees, gathering the fruit, &c. This walk should be from two, to two feet and a half wide, (to admit a barrow or barrow-engine for watering the trees), and covered with sand; or, which is better, coal-ashes, about two or three inches thick, but without any gravel or rubbish below. *Tr. on Fruit-Trees*, p. 294.

"The borders for wall-trees," Nicol directs, "should not be less than twelve feet in breadth; but fifteen or eighteen feet is not too much. That is to say, the soil should be prepared for these breadths, if it be not naturally good, and perfectly answerable for the different kinds of trees to be planted.

"But it is not enough that the upper soil only be improved. The subsoil must also be attended to, and be laid comfortably dry; otherwise success in the rearing of fruits will be precarious and doubtful. Draining, as before observed, is the basis of every improvement in horticulture, being in the first place the basis of improvement in the soil. In this particular case, of preparing fruit-tree borders, it is indispensable. It is also necessary that the roots of the trees be kept out of the subsoil, if it be of a cankering quality, as till, or corroding sand. This matter has appeared evident to many, and various means have been taken to prevent them from getting down to a bad substratum, at much trouble and expense. I shall here submit a method, the least expensive, and most effectual of any which has been successfully practised for several years.

"If the subsoil be wet and cankering, let the border be cleared out its whole length, to the depth and breadth before-mentioned. Lay the bottom in a sloping manner from the wall to the walk, giving it a fall of six or eight inches. Run a drain along by the conjunction of the border and walk, a few inches lower than the bottom thus formed, which shall be capable of completely draining off both under and surface-water. It may be a rubble-drain, or a box-drain, according to necessity.

"Now, lay over the bottom, thus formed and smooth, two inches of good earth; if clayey, so much the better; which pulverize and pass the roller over; then an inch of clean pit or river gravel, which also pass the roller over; another inch of earth, as above, which also roll; and, lastly, an inch of gravel, also, as above. This should be done with the materials rather in a dry state; but now moisten the whole moderately with a watering-pot, and roll until the surface acquires a hard, shining consistency. Keep rolling and watering alternately, till the whole becomes firm and glazed, and till the earth and gravel be intimately mixed and incorporated. Thus may a bed be formed for the roots of fruit-trees, much superior to one of stone or brick, and at an expense greatly less; of a nature more kindly, and which no root will penetrate.

"The compost earth should now be thrown in, having been previously prepared and laid up in a ridge, along the outer edge of the border, before the floor thus made get damaged by wet, or other accidents; and care must be taken that at no future period it be disturbed in digging or trenching the border.

"A fit composition for apples, apricots, cherries, and figs, is, three-fourths hale lightish earth, and one-fourth strong loam; being properly composed, and moderately enriched with cow-dung, or a mixture of cow and hog-dung, or of cow and stable-dung; avoiding the latter, however, if the two former can be obtained, for the cooler dungs answer best for fruit-trees. The average depth of the borders for these kinds should be thirty inches.

"Peaches, pears, and plums, require a stronger body of earth. A very fit soil for them is, three-fourths loam, and one-fourth sandy earth, being well mixed, and moderately enriched, as above. The depth for peaches and nectarines may be thirty inches, as above; but for pears and plums, it should not be less than three feet on the average, that is, two feet nine inches at the walk, and three feet three inches at the wall, or thereby.

"Although I have here classed the above fruits, and specified two distinct and particular soils for them; yet, generally speaking, they will all thrive in hale, loamy earth, of a middling texture. But if it be necessary to prepare a bed or floor for the roots of the trees, as above directed, it will rarely happen that it will not also be necessary to add depth to the borders, and a quantity of fresh earth; in doing of which, such compositions as the above may be imitated, or, in better judgment, may be improved. The compost, however, of whatever sort, should be duly prepared before planting the trees, and should be rendered, by frequently trenching and turning it, perfectly homogeneous." *Kal.* p. 153.

"With respect to borders," Niel observes, "in many situations and circumstances, it is found impossible to form a soil for fruit-trees, with the care, and at the unavoidable expence, which have here been supposed. In these cases, it is necessary to adapt the kind of trees to the soil. On soils naturally very light, gravelly, and sandy, peach and nectarine-trees do little good; it is better to plant apricots, figs, or vines, which agree with such soils, and, when trained against a wall having a good aspect, will, in the southern parts of the island, afford excellent crops of fruit. On such soils, even espalier and dwarf standard apple-trees are short-lived, subject to blight, and produce only stunted fruit. Next to renewing the soil, the best remedy is to engraft and re-engraft frequently, on the best wood of the trees, giving the preference to grafts, of those kinds which experience has shown to be the most productive and healthy in that particular place. In shallow soils, some have been in the practice of making troughs or hollows, and filling them with rich earth, for the reception of the trees; but this is not to be approved of; the roots of the trees will probably be confined to the trough, and it is possible that water may be retained in it." *Edin. Encyc.* art. *Hort.*

1097. "The number and breadth of *walks*," Marshall observes, "must, in a measure, be determined by the quantity of allotted ground, exceeding in these particulars where there is room. But few and wide walks are preferable to many contracted ones. If the garden is small, one good walk all round is sufficient; and if long and narrow, the cross walks should not be many: six or eight-feet walks are not too wide for a moderate sized garden."

After the garden is planned, and laid out into compartments, the borders should have their outer edges, in contact with the walls, made up firm and even. Where the design or intimate communication with the house requires *edgings*, box is superior to every thing else. In extensive kitchen-gardens, edgings of vegetables, particularly of box, are dispensed with as inconvenient, and apt to harbour slugs. At the same time the margins of the beds and main walks should be kept even, and well-defined; for this purpose, nothing is, more neat and lasting or better fitted to save trouble, than narrow edgings of brick a single course wide. In the interior quarters, parsley may be sown for an edging; so slips of thyme, winter-savory, hyssop, and other aromatic herbs, may be planted; as long as such herbs flourish, or remain ungathered, they form a verdant edging, in character with the kitchen-garden." *Pract. Gard.* p. 5.

Grass-walks may do where gravel is scarce; but the latter is so clearly preferable, that, except for a little variety in large gardens, where there are many walks, grass-walks will hardly be made choice of, as they are troublesome to keep in order; and if much used are apt to get bare, and out of level, especially when narrow: they are also frequently damp to the feet. Camomile has been used also to form green or carpet-walks, planting it in sets about nine or ten inches asunder; which, naturally spreading, the runners are fixed by walking on them, or rolling. Sand may be adopted for walks, and there is a binding sort of it that does very well; but lay not any of it too thick, as it is the less firm for it. Drift-sand is a good substitute for gravel. Coal-ashes, strewed thinly in the alleys, are better than nothing, as they at least serve to keep the feet dry and clean. If the garden be a strong soil, these ashes (when worn down) should be thrown out of the walks, with a little of the earth, and will prove a good manure for the quarters. *Introd. to Gard.* p. 35.

"The middle walk," according to Forsyth, "should be about seven feet, which is wide enough to admit a cart; and the others about three or four feet broad, with a border on each side, five or six feet wide, at least, between the walk and the fruit-trees. Walks, in kitchen-gardens, are generally gravelled, and but seldom laid with turf, as the frequent wheeling and treading soon destroys the grass, and renders them very unsightly; but a binding sand makes good walks, and they are easily kept; for when moss or weeds begin to grow, they may be cleaned with a horse-shoe, or scuffled over with a Dutch hoe, in dry weather, and raked a day or two after, by which they will be made always to look neat and clean. I, however, give the preference to sea-coal ashes, which, in my opinion, makes the best walks for a kitchen-garden, and they are easier kept than any others, being firm and dry, and cleaner to walk on than sand, especially after frost. The bottoms of the walks should be filled up with brick rubbish, chippings of stones, or gravel and stone: those raked off the quarters will do very well, and by using them you will save carriage. If the soil be stiff and wet, or subject to detain the moisture, there must be underground drains made to carry off the water. In this case, let the main-drain be carried under the walk, to receive and carry off the water from those under the quarters. Draining, when the soil is wet, is absolutely necessary, otherwise the trees will never produce good-flavored fruit, and your kitchen plants will be much injured; the drains, also under the walks will keep them dry and firm, and make them fit for carting and wheeling on in wet weather.

"If the garden be very extensive," Niel observes, "the centre is traversed by a broad walk. If it be of the largest dimensions, and possess a cross wall, or cross walls, the arrangement of the walks falls to be altered accordingly; a main walk proceeding directly to the door, in the centre of the cross walls. The rest of the garden is divided into compartments; and most of these compartments, in some of our best gardens, are laid out in beds four feet wide, with narrow alleys. So many alleys, no doubt, occupy a deal of room; but advantages of conveniency and neatness, in enabling the workmen to clean and gather the crop, without trampling the ground, seem to compensate the sacrifice of space. For currant, gooseberry, and raspberry bushes, the quarters are, of course, reserved undivided; and narrow beds are unnecessary in the case of large perennial plants, such as artichokes or rhubarb. Border-edgings are not in use, excepting for the walks next the walls, and the cross-walks in very large gardens; for these, dwarf-box is almost universally employed. In the interior quarters, parsley may sometimes be observed, forming an edging; and thyme, winter savory, or hyssop, are occasionally employed in the same way, and harmonize very well with the culinary crops around.

1098. In laying out the *slips*, those parts not occupied as the melonry, or compost-ground are disposed of in two borders, the one for fruit surrounding the wall, and of suitable breadth and composition as to soil; the other next the boundary, of such breadth as the width of the slip allows. The walk between these borders is made of the same width and materials as those within the wall. The outer border is commonly occupied by low fruit-shrubs, or common kitchen crops; but in small places, and where the garden is of a mixed character, it is arranged as a shrubbery, and, where Forsyth's advice is taken, the shrubs are mixed with the more hardy fruit-trees.

1099. In gardens where any thing like beauty or perfection is aimed at, a part of the slip should always be set apart as a *nursing department*, in which to raise plants, some in pots, others in the open ground, to supply vacancies within the walls. Whatever crop is sown or planted in the garden, a small portion of it should, at the same time, be sown or planted in the nursing department, by which means, when any blanks occur in the former, they can be filled up from the latter. One part of the nursing department should be devoted to propagating fruit-trees and fruit-shrubs for the same purpose, and also for giving away to poorer neighbours, and for stocking and encouraging cottage and farm gardens.

The best *seasons* for forming a garden are undoubtedly the spring and summer; but, at all events, at whatever time the operations are begun, they should be arranged so as to be finished early in autumn to admit of planting the fruit-trees and laying the edges of the walks at that season, or very early in the succeeding spring.

Chap. II.

Of the Distribution of Fruit-Trees in a Kitchen Garden.

The walls being finished, and the quarters and borders prepared, the next thing is to select and arrange a proper collection of fruit-trees, and plant them in their appropriate situations. This subject naturally comprehends, 1. *Wall* trees. 2. *Espaliers* and *dwarf standards* for the borders. 3. *Standards* for the quarters. 4. Fruit-shrubs.

Sect. I. *Of the Selection and Arrangement of Wall Fruit-Trees.*

1100. The information communicated by the early writers on this subject cannot now be satisfactorily used, from the names of sorts being changed, or the sorts themselves lost or not to be had in modern nurseries. We draw our information, therefore, on this subject exclusively from modern authors.

"*Wall-trees*," Marshall informs us, "should not be older than two years from grafting or budding. Much disappointment has been the consequence of planting old trained trees, through their being accustomed, perhaps, to a contrary soil, or by damage done the roots in taking the trees up, and thus, instead of saving time, it has frequently been lost, being obliged, after some years, to be replaced with young ones. But if trained trees are to be made use of, let them be planted as early, and with as full roots as possible, and in a right good soil.

"The *distance* to plant should be about eight or nine inches from the wall, and let apricots, peaches, and nectarines, be twenty feet asunder, more or less, according to the height of the wall, though for the small early sorts fifteen or sixteen feet will do. As the larger apricots, however, grow freely, and do not well endure the knife, they ought to have twenty-five feet allowed them. This is for a wall of nine or ten feet high; if higher, the distance may be less, and if lower, the contrary. This room may seem to some too great; but when trees are planted in a confined space, after a few years it is troublesome to keep them pruned within bounds; and the cutting they must have, makes them run to wood, and thus to become less fruitful. Fig-trees require as much room as the apricot, or rather more, as they grow freely, and are to extend without shortening. Though other trees are best planted in October, the fig should not be planted till March.

"The *intermediate* spaces between peaches, nectarines, and apricots, may have a vine, a dwarf-cherry, or currant, or gooseberry-tree, of the early sorts, as the smooth green and small red gooseberry, to come in early, and improved in the beauty, size, and flavor of their fruit, by the advantge of situation. But wheresoever grapes can be expected to ripen, there let a young plant, or cutting, be set, though the space be confined; for the vine, freely as it shoots, bears the knife well to keep it within bounds. If the wall be high, the cherry or plum may be half-standards or riders, which being after a while kept above, will be more out of the way of the principal trees, though dwarfs may be trained so as not to interfere. Some have planted half-standards of the same kind of fruit as the dwarfs, but whichever way is used, let the intermediate trees be pruned away below in good time, in order to accommodate the principals freely as they mount and extend. The better way however is, when the wall is tolerably covered, to extirpate the intermediate trees, as, when large, they impoverish the border, and too much rob the principals of nutriment: if taken up well, in season, and pruned properly, they may be planted elsewhere. Something merely ornamental may occupy the vacancies also, as some double-blossomed fruit-tree, passion-tree, roses, &c., or in a fine situation, a pomegranate, any of which may be removed when their room is wanted.

"Plums, cherries, and pears may occupy the other walls, the two former at about fifteen, or it may be twenty feet asunder. Cherries, except the morella, will not do well in a full north aspect; but any sort of plum (rather a late one), and summer pears, and also nut-trees, will, if you choose to train them. There should always be some currants and gooseberries in an east and north situation, at the distance of eight feet, where they will be easily matted, when the fruit is ripe to come in late, as October, November, or perhaps December. Pear-trees of free growth are hardly to be kept with tolerable compass on low walls; but if attempted, should have at least thirty feet allowed them. The best sorts of winter pears deserve a southerly wall to ripen them well, and improve them in size and flavor. The gable-end of a house is well adapted for a pear-tree, as it affords room, which is what they require more than any fruit-tree. Apples may do on a wall, and if any on a good wall, let it be the golden-pippin: yet the practice is seldom adopted in England. The same may be said of mulberries, though they come to bearing much sooner against a wall, but they need not have a south aspect; indeed, it has been asserted that they do best in a north one. For furnishing walls, choose trees of moderate wood rather than strong; young, well-rooted, clean, and healthy." *Introd. to Gard.* p. 32.

1101. Abercrombie, in his *distribution* of wall-trees, directs that the best border and wall be allotted to the vine, the peach, nectarine, fig, and apricot: let the vine take the first place for aspect, as it is difficult to bring it to ripen out of doors north of London. Where the peach, nectarine, fig, and apricot cannot have a south aspect, the south-east and south-west are the proper alternatives. Some early sorts of the apricot will ripen on an east or west wall. The west is the middling exposure, and by no means on a par with the east.

The cherry in general may have an exposure looking to any point of the compass, except full north, yet choice early kinds deserve a south border, nor do they attain the climax of perfection without.

The morella cherry, the pear in general, the plum in general, the apple in general, and the mulberry, will do on any wall; but all late fruit is universally improved in proportion to the goodness of the aspect from the west and east through all the intermediate points to the south, and some of the high-flavored French pears require a fine wall to grow here in perfection. The end of a building is a good site to a free-growing pear-tree; which, if a garden-wall is not uncommonly high, will require a deal of lateral room. A long and high wall is also fittest for a fig-tree. The mulberry, medlar, quince, filbert, currant, gooseberry, and raspberry, answer well on espaliers.

The distances at which wall-trees should be planted, depends on the general growth of the species, connected with these other things: whether the individual plant has been dwarfed by the mode of propagation, or is a free grower; whether the species will bear to be kept in bounds by the knife; and, lastly, on the height of the wall: thus, a higher wall is a compensation for a reduced distance, and a lower will make it necessary to increase the intervals. Supposing the wall to be twelve feet high, the following are good average distances for planting the kinds named. Vines, from ten to fifteen feet asunder, or in vacant spaces between other walls where the distance is less, because the vine bears pruning well, and can always be reduced to the prescribed limits. Peach-trees and nectarines, from fifteen to twenty feet. Fig-trees, eighteen to twenty feet, or more, as the bearers are not to be shortened. Apricot-trees, fifteen feet for the dwarf early sorts, eighteen to twenty-four for the free-growers, as the plant does not bear the knife well. Cherry-trees, from fifteen to twenty feet. Pear-trees, twenty feet, if on dwarf stocks; thirty feet, if on free stocks. Plum-trees, from fifteen to twenty-four feet. Apple-trees, if on dwarf stocks, fifteen feet; if on free stocks, twenty-five or thirty. Mulberry-trees, fifteen or twenty feet. Along the line of the walls only nine feet high, increase the intervals to one-fourth as much again; and of walls six feet high, and espaliers, to one half.

"While the principal wall-trees are making progress, riders may be introduced between them; these should be confined to sorts which are the quickest in coming into bearing, for else, as soon as the trees become productive, it will be time to remove them. Against low walls, currants, gooseberries, and raspberries, may be placed instead of riders. Plant a wall-tree nine inches from the wall, to give the root some room behind; detach or shorten the roots pointing towards the wall, so that the parts left on that side may not be cramped." *Pr. Gard.* p. 189.

Sorts. "I have long made it my business," says Nicol, "to persuade my employers, in the planting of new gardens and orchards, to limit the *varieties* of fruit, in the firm conviction that I was acting for their interest; for certainly the rage for multiplying them, and of having a numerous collection, has too much prevailed of late. It were better to be contented with a few good kinds that produce well in most seasons, than to plant many sorts (even of those reckoned the finer) for the sake of variety, of which a crop is obtained, perhaps once in three, or in seven years.

It is no doubt of very much importance to select and adopt the kinds to the climate, soil, and aspect, and in some cases, a greater variety may be planted with propriety than in others. This matter must be determined by existing circumstances, by the fancy of the proprietor, and by the discretion of the gardener. The following list exhibits a collection, in my opinion, ample enough in any case, though, perhaps, according to better judgment, certain kinds may be substituted for some here named, that may be equally valuable. Certain kinds may also be placed differently with respect to aspect, as may be thought proper, according to the climate and local situation. Those marked with an asterisk (*) I consider the most valuable kinds, and such as should be preferred in the planting of small gardens, where the walls are of little extent.

Apples.	
Golden Pippin,	S., S.E., or S.W.
Oslin Pippin,	E. or W.
Ribston Pippin,	Ditto.
Golden Russet,	Ditto.
Royal Russet,	E., W., N.E., or N.W.
Nonpareil, S.,	S.E., or S.W.
Hawthorndean,	E., W., or N.
Yorkshire Greening,	Ditto.

Pears.	
Jargonelle,	S., E., W.
Crassane,	S.E., S., or S.W.
Colmar,	Ditto.
Beurre de Roy,	S., E., W.
Gansell's Bergamot,	E. or W.
Autumn Bergamot,	Ditto.
Swiss Bergamot,	Ditto.
Achan,	Ditto.
Yair,	Ditto.
St. Germain's,	Ditto.
Summer Boncretien,	Ditto.
Chaumontelle,	S.

Cherries.	
May-duke,	S., E., W.
Arch-duke,	Ditto.
Black Heart,	Ditto.
White Heart,	Ditto.
Harrison's Heart,	Ditto.
Morella,	E., W., N.

Plums.	
Green Gage,	S.E., S., or S.W.
Yellow Gage,	Ditto.
Blue Gage,	E. or W.
Fotheringham,	Ditto.
La Royale,	S.E. or W.
White Magnum Bonum,	E. or W.

Apricots.	
More Park,	E., W., or N.
Orange,	Ditto.
Breda,	Ditto.
Brussels,	Ditto.
Roman,	Ditto.
Masculine,	S., E., W.

Peaches.	
Red Magdalen,	S.E.S. or S.W.
White Magdalen,	Ditto.
Noblesse,	Ditto.
Royal George,	Ditto.
Montauban,	Ditto.
Admirable	Ditto.
Teton de Venus	Ditto.
Late Purple	Ditto.

Nectarines.	
Elruge,	S.E., S., or S.W.
Duc de Tello,	Ditto.
Fairchild's early,	Ditto.
Murray,	Ditto.
Scarlet,	Ditto.
Temple,	Ditto.

Figs.	
Blue, or Black Ischia,	S.E.S. or S.W.
White, or Brown Ischia,	Ditto.
Black Genoa	Ditto.
White Genoa	Ditto.

Kalend. p. 163.

1102. The following are the *distances* at which the different kinds of fruit-trees may be planted on garden walls, taking the medium height at twelve feet, and varying the distance accordingly; that is, for a low wall, the more distant; and for a high wall, the less.

Apples, eighteen or twenty feet; apricots, twenty to twenty-four; figs, fifteen or eighteen; cherries, twelve or fifteen; nectarines and peaches, twelve or fifteen; pears, twenty-four to thirty; and plums, eighteen or twenty-feet.

Forsyth recommends cross-rows of dwarfs in the quarters to shelter the garden; the distance between the rows to be from forty to seventy yards.

Nicol recommends the same varieties of fruits for dwarfs as for espaliers; and observes, that "some think dwarfs or buzelars, (trained *en buisson*, or as bushes,) have a better effect than espaliers:" adding, "this is a mere matter of taste; but if equally well managed, they are equally useful. They ought to be kept within due bounds, and should not rise too high, nor spread too widely." *Kal.* p. 150.

"Dwarf trees," says Niel, "were formerly much in vogue; and, strange as it may appear, the prospect of fruit was generally sacrificed to a fine shape. It was thought necessary that the lower branches should spread horizontally near the ground, and should decrease in width upwards, so that the tree should have a conical form. Now, it is well known that the fruit-buds of pears and apples in general, and of many sorts of plums and cherries, are produced at the end of the former year's shoots, which therefore should remain at full length; yet these were necessarily shortened, in order to preserve the desired shape, and it may easily be conceived that trees so dressed could not prove fruitful. For these reasons, the training to espalier-rails has generally been preferred. A few dwarf trees, however, prove ornamental, and they sometimes afford a great deal of fruit." "Dwarf-standards," Niel adds, "produce large fruit, and in considerable abundance, while so humble is the tree, that the fruit may often be reached by the hand. The French frequently train them to a cylindrical, or somewhat pyramidal shape (*en quenouille*); in this way their appearance is improved, and the ground is less shaded; but, in general, the giving this shape must prove detrimental to the fruitfulness of the tree."

1105. *Distance.* "Pears on quince stocks are planted from twenty to twenty-five feet asunder. Dwarf-standard apple-trees, on paradise stocks, may be planted very closely, as they occupy but little room; they do not require more than ten or fifteen feet; on crab stocks they need, at least, twenty-five. Plums are now seldom planted as dwarf-standards; cherries more frequently; apricots scarcely ever."

Sect. III. *Of tall Standard Fruit-Trees in a Kitchen Garden.*

1106. Though these are more generally confined to orchards, yet they were formerly common in the kitchen-garden, and are still occasionally introduced in the circumferential portion, called the outer border of the slip.

According to Marshall, "The fewer *standard* trees in a garden the better, as they take up much room, and by their shade prevent the proper growth of vegetables that are any thing near them: so that if a garden is small, there should be no trees except those of the wall. The case is different where there is ample room; and the blossoms of fruit-trees (apples particularly) are so delightful, that if they produced nothing for the palate, there would be a sufficient inducement to plant them for ornament."

M'Phail considers them as hurtful to crops of vegetables.

Abercrombie says, "Full standards are trained with a single stem, to the height of six or seven feet, or higher, for a circular head of branches; and are adapted for orchards and other grounds not occupied with esculents as principal crops, and for those kinds of trees that grow and ripen their fruit most easily.

"Half standards are trained with shorter stems, from three to five feet high, equally with a circular head, but lighter and smaller. Compared with full standards, they bear sooner, and ripen the produce better, because the heat reflected from the ground is stronger; and where it is necessary to distribute trees in a small garden, these do less injury to kitchen esculents growing near, and can be more easily kept within limits by pruning."

"In the interior quarters, some full and half standards may be introduced; being thinly scattered towards the angles of the quarters, not to overspread the ground, nor placed nearer together than forty feet; indeed, many designers of horticultural plantations would restrict the full standards to the orchard and pleasure ground, as plants cultivated underneath them are apt to suffer from drips." *Pr. Gard.* p. 5.

Forsyth recommends their being mixed with other trees in the shrubberies which surround gardens. Nicol concurs in this opinion; and in general prefers standards in the outer border of the slip, or in the orchard.

For the sorts of fruit-trees proper for standards, see Chap. III.

Sect. IV. *Fruit Shrubs.*

1107. By these are to be understood the gooseberry and currant tribe, raspberry, cranberry, &c. They are almost universally planted in the walk borders, at regular distances of from six to ten feet. Plantations of them are also formed in the quarters, and in the outer border of the slip.

"Currants and gooseberries, as *bushes*," Marshall observes, "should be planted three feet from the edge of the border, and full six feet asunder. Some of these very useful shrubs should grow in every aspect of the garden, in order to have a succession of their fruits, as long as may be. Those who choose to plant whole quarters of currants and gooseberries, ought to do it at six feet asunder in the rows, and the rows eight feet from one another, keeping them well pruned.

"Raspberries may be set in plantations, in rows five feet asunder, allowing three feet between the plants. Though these shrubs are best by themselves, yet here and there, by the walks, a detached bunch may be kept, or here and there one against a warm wall."

Currants, gooseberries, and raspberries, he adds, do well espaliered, as to a production of early and fine fruit.

Abercrombie observes, "Gooseberry and currant bushes may be planted in single rows, in cross rows, or in plantations by themselves: — plant some near the outward edge of the main quarters; others along the borders where there are no espaliers; others again in cross rows, to divide large compartments. Raspberries may occupy other borders and quarters. Currants and gooseberries should stand six feet by nine asunder. Raspberries, from three to five feet in a line, by four, five, or six between the rows." *Pr. Gard. 5, and* 189.

Forsyth recommends planting gooseberries "in a quarter by themselves, at the distance of six feet between the rows, and four feet from plant to plant; or round the edges of the quarters, about three feet from the path. Never plant them under the shade of other trees, as it will injure the flavor of the fruit."

"With respect to gooseberries," Nicol observes, "they have been multiplied out of all measure; and it may safely be said there is not one in twenty of the kinds enumerated in many of the catalogues worth planting. I shall here only name a few; marking those to be preferred with an asterisk (*).

Green.

Early, *gascoigne, *walnut, goliah, globe.

Red.

*Ironmonger, *nutmeg, *walnut, *large rough, *champaigne, *smooth, *captain, admirable.

Yellow.

*Golden drop, upright, *champaigne, *golden knap, *conqueror, *sulphur, *amber globe, *honeycomb.

White.

* Royal george, orleans, * chrystal, matchless.

Currants.

The red, white dutch, black, champaigne or grizzly.

Raspberries.

The common red, common white, red antwerp, white antwerp, red cane, and twice-bearing, — are all good sorts.

1108. "*Of the manner of planting small Fruits.* Currants and gooseberries are often planted in lines, by the side of the walks or alleys of the garden; but in that way, especially if not well managed, they are generally more cumbersome than useful. It is a better method to plant them in quarters by themselves, and to make new plantations every sixth or seventh year, as young plants are found to produce more handsome fruit, and also more plentifully, than old ones.

"The same thing may be said of raspberries, which produce the finest fruit when young; that is, about the third or fourth year after planting, if properly managed.

"It is proper to plant some of all the above fruits on a north border, or other shaded situation, in order to prolong the season of them, if that be an object, besides planting them out in quarters, as hinted above.

"From four to six feet square, according to the quality of the soil, may be deemed a proper distance at which to plant the above fruits; that is, in good land, six feet; in middling land, five; and in poor land, four feet. Some may also very properly be planted against vacant places on any of the walls, pales, or espaliers. An Antwerp raspberry, in particular, and some of the kinds of gooseberries, are highly improved in size and flavor, if trained to a south wall.

"The cranberry was first introduced as a garden-fruit by Sir Joseph Banks, and is grown to most advantage in bog earth, kept moist. The margins of ponds, or other reservoirs, in the slip, are good situations for this plant: but when the dewberry, billberry, and other fruit, bearing bog-earth plants are introduced, we would recommend a border or other compartment in a shady situation, furnished with bog-earth; and to which water could be readily applied, either by the watering pot, engine, or by means of under-ground channels." *See Hort. Catal.*

For the culture, in the kitchen garden, of the fruit-trees, enumerated, and the situations and treatment of various others, as, the mulberry, quince, &c. See Chap. III. and *Hort. Catal.*

Sect. V. *Choice of Plants.*

1109. Most authors agree in recommending the choice of plants one year from the graft, or two from the bud, and which are commonly called *maiden plants;* and some indulge a feeling of declamation against the trees to be procured in public nurseries, where, according to Hayward, "it is almost impossible to find one plant in twenty that is worth transplanting."

Without examining into the justice of these charges, which we believe to be in most cases without foundation, we shall only observe, that no better mode exists at present, than having recourse for trees to the most reputable nurseries; and with M'Phail and Nicol, we would recommend, instead of maiden plants, "if they can be had, to make choice of those not very young, but such as are healthy, and have been *transplanted several times*, and been in a state of training for two or three years at least." A safe mode is, to plant partly maiden, and partly trained plants, by which means, those which come early into fruit, should they prove bad sorts, may be replaced by others; meanwhile, those sorts which are approved of, will afford an early return for the labour and expence incurred.

Record of Sorts. Forsyth, Abercrombie, and others, agree in recommending the placing the names of the sorts on tablets, with the time of ripening, and fixing them *by*, or what is better, hanging them *on*, the lower part of the stem of each tree. An excellent mode in conjunction with this is, to have a large plan of the garden, and write the name of each tree in its actual situation. The mode of registering by series (619.) may also be adopted. By either of these modes, any derangement in the tablets can readily be rectified.

CHAP. III.

Of the Formation and Planting of an Orchard, subsidiary to the Kitchen Garden.

1110. Where the kitchen-garden is small, or does not contain an adequate number of fruit-trees to supply the contemplated demand of the family, it is usual to make a separate plantation of the hardier fruit-trees, in what is called an *orchard*. Sometimes this scene adjoins the garden, and forms a part of the slip; at other times it forms a detached, and, perhaps, distant inclosure, and not unfrequently, in countries where the soil is propitious to fruit-trees, they are distributed in the lawn, or in a scene, or field kept in pasture. Sometimes the same object is effected by mixing fruit-trees in the plantations near the garden and house.

Most of the observations which have been already submitted as to the situation, exposure, soil, and shelter of kitchen-gardens, will apply to orchards; but there is this difference, that as the latter are not generally surrounded by walls, the surface may be much more irregular; and in regard to form, it is a matter of no great consequence; size will of course be regulated by the quantity of produce desired, and nothing can be more simple than the arrangement of the trees which, in regard to position, is almost always that of the *quincunx*, the distances between the plants being greater or less according to the sorts made choice of. "An orchard, that is, a spot to plant standard fruit-trees in, that are forbidden a place in the garden," Marshall observes, "should not be a small spot. The front row of trees may be half-standards, or before these may be a row of dwarfs; observing to plant the most towering sorts of the full standards behind. If the ground be naturally uneven, it will not be proper to level it, as this would rob the higher parts, and needlessly enrich the lower. A strong cool soil does best for an orchard, but it must not be wet." *Introd. to G.* p. 44.

"An orchard," says Abercrombie, "is a plantation of standard fruit-trees, which in general have stems high enough to keep the boughs, leaves, and fruit, from the reach of cattle; but where cattle are excluded, dwarf and half-standards may occupy two rows next to the sunny side.

"*Site.* As to the site of an orchard, land sloping to the east or south is better than a level; a sheltered hollow, not liable to floods, is better than an upland with the same aspect; and yet a gentle rising, backed by sufficient shelter, or the base of a hill, is eligible. A good loam, in which the constituents of a good soil predominate over those of a hot one, suits most fruit-trees: the sub-soil should be dry, and the depth of mould thirty inches or three feet. Before planting, drain if necessary; trench to the depth of two feet; manure according to the defects of the soil; and give a winter and summer fallow; or cultivate the site for a year or two as a kitchen-garden, so that it may be deeply dug, and receive a good annual dressing.

"*Manure.* Trees do not like the hot dungs alone, nor any dung in a fresh crude state; but the cooler dungs, which are less esteemed in manuring for esculents, are serviceable in compost for trees when the soil is deficient in animal or vegetable remains. Whatever dung is turned in just before, or at any time after, planting should be well reduced: mixed with road stuff, or with fresh earthy ingredients, and a small proportion of the ashes or soot of coals or wood, it is in almost all cases more beneficial than when alone.

"*Screens.* In a situation much exposed, plant shrubs or wilding fruits as screens or as nurses: forest trees may be planted as an outer screen, but on a distant line, whence their roots will not draw the soil to be occupied with fruit-trees. Where ornamental grounds present a good aspect as well as prepared shelter, fruit-trees are distributed in them to great advantage.

"*Selection of kinds.* In an orchard for private use, the most useful sorts of fruit, as far as such and such trees are likely to flourish under the circumstances both of soil and aspect, ought to be planted in greatest quantity. In an orchard for raising crops for sale, that fruit is the most profitable for which there is the greatest demand. Apples are first in utility; but pears, cherries, plums, and most other fruits in the subjoined alphabetical list, are acceptable for dressing in paste, for preserving, or for pickling, as well as in the dessert. According to the extent and nature of the ground, mulberries, medlars, quinces, services, walnuts, chesnuts, and all the sorts which will ripen their produce sufficiently on standards, may be introduced.

"*Age from the Nursery.* Maiden plants, such as have been grafted one year, or budded only two, are to be preferred to older trees with advanced tops; but established bearers with heads of six years' growth are frequently removed.

"*Temporary and Final Distances.* In a good soil, the final distances at which the plants should stand is twenty or twenty-five feet for full standards; of those kinds which reach but a moderate size as trees, and thirty or forty feet for the larger growing sorts. Temporary plants of such kinds as bear fruit soon may be planted at half the final distances, in order to be pruned down, and at last removed, when the principals require it.

"*Culture to sustain the Soil.* For a course of years, while the trees are growing up to their situations, the soil may be strengthened and improved by an annual light crop of vegetables; the ground receiving some annual dressing suitable to the wants of the soil. Afterwards two different methods may be pursued, which have both their advocates: 1. To sow the field with grass; and when a turf is formed, to thorn the trees, and turn in small cattle. 2. The opposite practice, which prevails in Herefordshire, is to keep the land under tillage; and although the trees may ultimately, by shading, dripping, and extending their roots, discourage the repetition of annual crops, still to turn the ground once a year by the plough or spade, carefully rooting up all weeds; and to hoe three times in the growing season. Where roots run near the surface, the ground is stirred with a fork as a substitute for digging. The progress of young plants to the state of making profitable returns, the health of the trees in all stages, and the flavor of the fruit, are best promoted by this method, if the tillage be well-timed and clean. But where an orchard is part of the domestic grounds, it forms a more agreeable scene kept under grass."

1111. "Orchards," *Forsyth* observes, "are appropriated to the growth of standard fruit-trees only where a large supply of fruit is wanted; and generally consist of apple-trees, pear-trees, plum-trees, and cherry-trees; but a complete orchard should have, besides, quinces, medlars, mulberries, service-trees, filberts, Spanish nuts, and barberries; as also walnuts and chesnuts; the two latter of which are well adapted for sheltering the others from high winds, and should, therefore, be planted in the boundaries of the orchard, a little closer than ordinary, for that purpose. In choosing your trees, too much care cannot be taken to admit of none but such as have good roots, fair, clean stems, and proper heads. In selecting your pears and apples, especially the latter, be careful to procure a proper assortment for the supply of your table during the whole year; a very few of the summer sorts will suffice; more of the autumn, and still more of the winter, will be required; as upon this last you must chiefly depend for supply from the month of January to July.

"In cider-making counties, such as Hereford, Worcester, Gloucester, Somerset, and Devon, they have large orchards of apples; and in some counties, Kent in particular, there are orchards wholly of cherries. In general orchards, however, there ought to be a much larger proportion of apples than of any other fruit. Orchards, in proper situations, are very profitable; beside, the trees have a delightful appearance when in blossom, and also when the fruit is ripe.

"What has been said respecting the situation and soil of a garden is also applicable to an orchard. The situation of an orchard should be rather elevated than low; on a gentle declivity, and open to the south and south-east, to give free admission to the air and rays of the sun, (to dry up the damps and disperse the fogs,) which will render the trees healthy, and give a fine flavor to the fruit. An orchard should also be well sheltered from the east, north, and westerly winds, by plantations, if not naturally sheltered by rising grounds. These plantations of forest-trees should neither be too large nor too near the orchard; as they would in that case prevent a free circulation of the air, which would prove injurious to the fruit-trees. But, if the ground will not admit of such plantations, I would advise planting cross rows of fruit-trees, as directed for gardens. I would also recommend planting some of the largest growing trees nearest the outsides exposed to those winds; two or three rows of which should be planted closer than ordinary, which would greatly shelter those in the interior parts of the orchard. Walnut and chesnut-trees, as has been already observed, are well adapted for this purpose.

" As to the size of an orchard, it may be from one to twenty acres, or more, according to the quantity of fruit wanted, or the quantity of ground that you may have fit for the purpose.

" That soil which produces good crops of corn, grass, or garden vegetables, will also do for an orchard; but a loamy soil is to be preferred; though any of a good quality, not too light or dry, nor wet, heavy, or stubborn, but of a moderately soft and pliant nature, will be found to answer the end. Shingly and gravelly soils disagree very much with fruit-trees, unless there be loam intermixed. They will succeed much better on a chalk bottom. On such a soil, I have seen roots twelve feet deep, and trees thrive well. If the bottom be clay, the roots should be cut-in once in four years, to prevent them from penetrating the clay, which would greatly injure the trees. The soil should be from two to three feet deep; before planting the trees, it should be trenched two spits deep, and ten feet broad where the rows are to be planted, and a spit below loosened, unless it be clay, which should be trodden down. If it be pasture ground, it should be ploughed, and well summer-fallowed, till the grass be killed: otherwise, when it is laid in the bottom in trenching, which it generally is, it will be very apt to breed grubs, which will do much mischief.

" Some only dig holes large enough to receive the roots, especially in grass ground which is to be continued so. Others prepare the ground by deep ploughing, if the orchard is to be of great extent. The sward, if pasture, should be ploughed in some time in spring: give it a good summer-fallow, in ploughing it two or three times, which will rot the turf. A fortnight or three weeks before planting, give the ground a good deep ploughing, to prepare it for the reception of the trees. The best time for planting on a dry soil is in October; but if wet, the latter end of February, or the month of March, will be a fitter season.

" In planting, endeavour to suit the trees as well as possible to the soil, and to plant them at proper distances from each other; which may be from forty to eighty feet, according to the size of the trees when full-grown. Fruit-trees, as has already been observed, when planted too thick, are very liable to blights, and to be covered with moss, which robs the tree of a great part of its nourishment, besides spoiling the flavor of the fruit. Procure your trees from a soil nearly similar to, or rather worse than that where you intend to plant them; for trees transplanted from a rich soil to a poorer never thrive well; but if from a poorer to a richer soil, they will generally succeed."

1112. " Before proceeding to plant an orchard," *Nicol* observes, " it becomes necessary to think well of its situation and soil, and what prospect there is of ultimate success.

" With respect to private orchards, it is often necessary, and always proper, provided there be scope, and the soil be answerable, to connect them with the kitchen-garden. In this case, if the ground be not naturally sheltered, care must be taken to do so, in as effectual a manner as possible, by plantations of forest-trees or hardy shrubs, placed so as to screen the fruit-trees from heavy, and from prevailing winds. The orchard may be placed on any side of the kitchen-garden most suitable to the cast of the ground, and according to conveniency; or it may lie all round the garden, either simply as an orchard, or as an orchard combined with the shrubbery.

" The latter method is a very good way of obtaining fruit, without lessening the pleasure-garden, in cases where ground is scarce or valuable, or where economy is an object. Indeed, by growing fruit-trees among shrubbery, the value and beauty of the pleasure-garden is greatly enhanced. In spring, the blossoms of fruit-trees charm us; and in autumn, the fruit delight us. I have planted several orchards in this way, which have given general satisfaction.

" In bleak situations, and yet where it is wished to rear an orchard, and in cases where ground cannot be obtained, on which to plant distant screen plantations, it is an excellent method to intermix hardy shrubs and forest-trees among the fruit-trees, which act as nurses to them, and defend them from the bad effects of the weather. But in this case, care must be taken to thin away the shrubs in proper time, especially from the interior of the orchard; reserving, however, a screen of hardy trees or shrubs all round the margins, or on the sides most exposed.

" In less bleak situations, it may be proper to plant an outer row, or a double row, of hardy trees, shrubs, or fruits, (as hazel, walnut, chesnut, &c.,) when it may be thought improper to intermix the whole orchard with shrubs; but when the fruit-trees are to be planted at double thickness, as hinted at below, these would act as an outer screen, and be very useful. Indeed, few situations occur, where it is not necessary to be at less or more pains in rearing screens for the orchard; which never can be too well sheltered, if it be not shaded from the sun."

" Most fruit-trees will thrive in loamy earth, of a middling texture, provided it lie on a wholesome substratum, and be of a competent depth. Large tracts of such soil are to be found, and often, also, in good situations. But we frequently meet with an excellent situation for an orchard, where the soil is various; where some is good, and some very indifferent. In such a case, it becomes necessary to improve the bad soil; and in planting, to suit the kinds of fruits to the nature of the different soils contained in the intended orchard.

" It would be in vain to plant where the bottom is not naturally dry, or is capable of being rendered so by draining. Therefore the wet or spouty spots should be carefully drained in the first place, and pains should be taken to prepare a proper bottom for the roots, as directed in the preceding section; otherwise little good may ultimately be expected of the trees planted on such spots.

" Care should also be taken to form a soil of a competent depth for the respective kinds to be planted; by trenching, if the soil be naturally deep enough, and by the addition of fit manures; or by the addition of other soil, if it be too shallow, and also of fit manures."

" It is not to be expected, however, in planting an extensive orchard, that equal pains are to be taken in preparing the soil, as for wall-trees; but it is necessary to go a certain length, in order to be successful, and the farther the better. The soil should be trenched and prepared to the depth of two feet at least."

The kinds of fruits proper for orchards, recommended by Nicol, are as follows, the sorts marked with an asterisk (*) being preferable:

Apples.

*Ribston pippin, *oslin ditto, *gogar ditto, *kentish ditto, *royal codling, *kentish ditto, *carlisle ditto, *royal russet, wheeler's ditto, *royal pearmain, *loan's ditto (good), *golden rennet, *kentish ditto (good), *grey leadington, scarlet ditto, summer queening, winter ditto, *yorkshire greening, *margill (very good), margaret apple (good), *white hawthorndean, *norfolk beafing (good), strawberry, *pursemouth (very good).

Pears.

*Jargonelle, crawford or lammas, *carnock or drummond, *grey achan, *swan egg, *moorfowl egg, *yair, *golden knap (good), longueville, *summer bergamot, *autumn ditto, *scots ditto, musk robin (good), saffron *hanging leaf (very good), the pound pear, cadilac, warden (for baking).

Cherries.

*May-duke, *Holman's-duke, *black heart, *morella, *Kentish, *large gean.

Plums.

*Orleans, *damask (black, good), damson (black, ditto), white perdrigon, *blue ditto, blue gage, *white magnum bonum, red ditto or imperial, white bullace, *black ditto, *drap d'or (yellow, good), *queen claude (ditto, ditto).

Kalend. p. 179.

1113. The *age of the plants*, and the *distance* at which orchard trees should be planted, according to the same author, is as follows: " Maiden plants, or such as are only two years from the bud or graft, of all the above kinds, are to be preferred to older trees: having boles or stems of three or four feet in length; the apples being worked on crab, and the pears on free stocks.

" The ultimate distance at which apple and pear-trees should stand, in a properly planted, and close orchard, is from thirty to forty feet, less or more, according to the quality of the soil; taking, as the medium, thirty-six feet. In a poor soil, and a bleak exposure, where the trees may not be expected to grow very freely, thirty feet is sufficient; whereas in good soil, and a sheltered situation, forty may not be too much.

" Cherries and plums may be planted at from twenty-four to thirty-six feet, according to soil and situation, as above; taking, as a medium, thirty feet for the ultimate distance at which they are to stand clear of one another. But it would be advisable, in the first instance, to plant four trees for one that is intended ultimately to remain; planting the proper kinds at the above distances first, and then temporary plants between them each way; which temporary plants should be of the free growing sorts that begin to bear early, such as the nonsuch and hawthorndean apples, the may-duke cherry, and the Crawford and yair pears; or any others better known to produce fruit soon after planting. These should be considered, and be treated as temporary plants from the beginning, and must give place to the principal trees as they advance in growth, by being pruned away bit and bit, and at last stubbed up entirely. If orchard-trees be planted among shrubbery, &c. they may be planted at any distance, exceeding forty feet, that may be thought proper; but they should not be planted nearer, otherwise they will too much confine the shrubs. In this case, it will not be necessary to plant temporary trees, as the principals will be nursed by the shrubs. In bleak situations, if forest and other hardy trees be planted among the fruit-trees, it may not be necessary to plant so many (if any) temporary fruit-trees; or these may chiefly consist of the hardier sorts, such as the hawthorndean apple, the may-duke and morella cherries, and the Scotch geans, which produce fruit the soonest."

1114. In a design which we recently composed (*fig.* 298.), for combining an extensive kitchen-garden with a flower-garden and orchard, the last surrounded the two former, and served to shelter them. The kitchen-garden (*d*, *u*, *u*,), occupied a parallelogram in the centre; the flower-garden (*q*, *q*,), with its botanic hot-houses (*g*, *h*, *i*,), a semi-circular area at the south end; the gardener's-lodge (*b*), gardener's-house and garden offices (*c*), and nursing departments (*pp*), a similar area at the north end; and the orchard (*t*, *r*,) surrounded the whole. The south and north-ends (*b* and *e*,) were approached by carriage-roads (*a*, *a*, *a*,), and the sides by walks (*t*). The hot-houses were partly in north and south ranges, glass on all sides, for main crops of grapes and peaches (*m*, *m*, *k*,), and partly placed against walls (*n*, *n*,), for more early forcing. The pine-pits and melonry (*n l*, *k n*,), and the compost-ground (*u*, *u*,) were within the walls, and approached by carts by a subterraneous road from the concealed part of the orchard (*s*). The hot-houses, pits, and walls, were heated by steam from a central tower (*f*), two ponds (*r*, *r*,) supplied water to a system of pipes, which distributed it over the open garden, and the hot-houses were supplied from a cistern under the glass roof of the tower (*f*): a room for eating fruit, or repose (*d*), occupied a situation which overlooked the whole.

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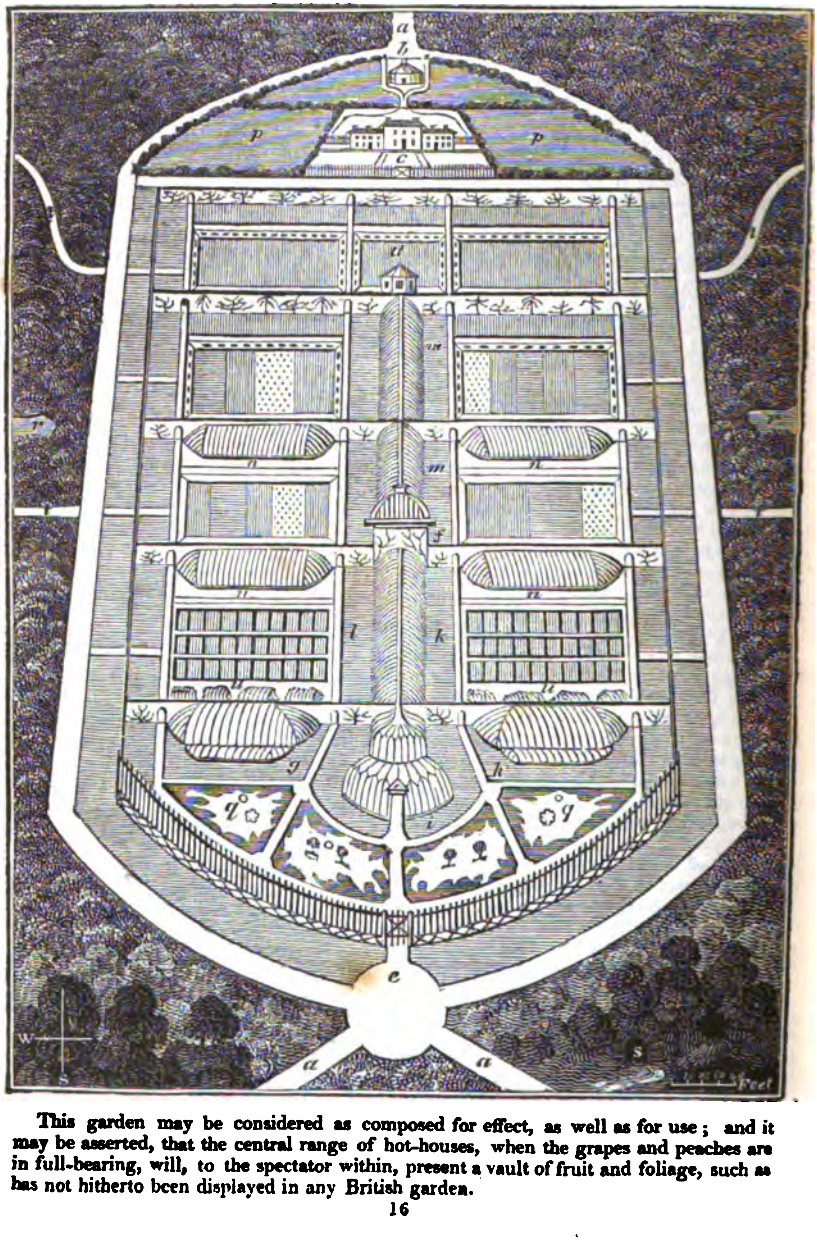

This garden may be considered as composed for effect, as well as for use; and it may be asserted, that the central range of hot-houses, when the grapes and peaches are in full-bearing, will, to the spectator within, present a vault of fruit and foliage, such as has not hitherto been displayed in any British garden.

Chap. IV.

Of the general Cultivation and Management of a Kitchen Garden.

The *cultivation* of a garden includes the performance of all those things that are requisite, in order to a reasonable and prolific production of the various vegetables and fruits grown therein. By the management of a garden, is to be understood the keeping it in such order, as that it may not fail in those impressions of pleasure it is calculated to afford. A kitchen garden, as well as a garden professedly ornamental, may and ought to be agreeable to walk in, as well as profitably cultivated. A gardener may be well acquainted with the culture of individual vegetables and fruits, and yet very deficient in the general cultivation and management of his garden. The following sections relate entirely to general practices conducive to these objects, and they deserve to be carefully studied by the young gardener who aspires at any degree of eminence in his art.

Sect. I. *Culture and Management of the Soil.*

1115. "The *soil*," Marshall observes, "must be first attended to, always to keep the fruit borders in heart, and the quarters in a proper state for use, when called upon to receive either seeds or plants. Ground should never lie long without stirring; for the soil of a garden should be in a free, sweet, and rich state, by proper digging, &c. or no great things can be done, as to forward, handsome, or well-flavored productions. It should be free, that the roots of plants may not be impeded in the quest of food; sweet, that the food may be wholesome; and rich, that there may be no defect of nutriment.

"Trenching the vacant ground in a garden does good to all soils in the autumn and winter seasons, and that in proportion to its strength, being indispensably necessary for clays to separate and ameliorate the parts. The light soils may do by being only rough dug, which is a method that stronger soils will be also benefitted by. The soil would be still farther improved, by re-trenching, or rough-digging, once or twice more in the winter, if the opportunity offers, particularly if strong or stubborn. Let the ridges lie E. and W. except the ground be a slope, when they may correspond."

"Divisions of the garden, to which annuals are assigned," Abercrombie observes, "should be dug over, and trenched once a year. The trenching of vacant ground, and the turning of the trenches, should be forwarded as much as possible in winter, and early in spring. By repeatedly exposing a new surface to the action of the frost, a greater quantity of the soil is ameliorated. In every case where it is intended that the ground shall lie fallow any time, it is advisable, in digging trenches, to turn up the earth roughly in ridges; forming, parallel to each trench, a single ridge of the same width, in order that the soil may be the more effectually mellowed, pulverised, and renovated by the weather. These ridges can be expeditiously levelled, for the reception of seeds and plants; which is a further improvement of the ground.

"Trench-digging may be performed from one to three spades deep. Two full spades is the most common depth to which trenches are dug, owing to the want of good soil at a greater depth."

Nicol's mode of conserving the fertility of kitchen-garden soil, seems the most scientific of any; and is that practised by the best Scotch gardeners. He observes, that, as kitchen vegetables do best on what is termed new land, it is a common complaint among gardeners that their ground, by being, as it were, worn out, will not produce certain kinds of vegetables; not that it is poor and hungry; or altogether unfitted to the production of them, having formerly produced them in great abundance; but that the surface has become tired of these crops, in the same way as a field sown with the same sort of grain for two or three years in succession, ceases to produce that grain in perfection.

The method which he practised with success is as follows:

First, it is necessary to have a depth of soil from twenty-four to thirty-six inches; in which case it is obvious, that whatever the depth of the natural soil is deficient of, twenty-four inches must be made good by carrying in soil from fields of good quality.

"The method is this. To take three crops off the first surface, and then trench *three* spit deep, by which the bottom and top are reversed, and the middle remains in the middle. Take three crops off this surface, and then trench two spit; by which the top becomes the middle, and the middle the top. And take also three crops off this surface, and then trench three spit; whereby that which was last the middle, and now top, becomes the bottom; and that which is now the bottom, and was the surface at first, now becomes surface again, after having rested six years. Proceed in this manner alternately; the one time trenching two spit deep, and the other three; by which means the surface will always be changed, and will rest six years, and produce three.

"Hence there will always be new soil in the garden for the production of wholesome vegetables; and hence also will much less manure be required, than when the soil is shallow, and the same surface constantly in crop."

He adds, that he would not advise the soil to be more than three feet deep, as the surface might be buried too deep from the action of the weather, and influence of the sun. Where the soil is only so deep as to allow of trenching two spit, by trenching every third or fourth year the ground will rest half its time; and if judiciously managed, and cropped in proper rotation, wholesome vegetables may be produced on it for many years successively. It is not intended that the whole garden should be trenched over the same season, "one half, or a third part at a time may be more advisable, and also more convenient." *Kal.* p. 16.

Sect. II. *Manure.*

1116. "When manure is applied," Marshall observes, "the ground is not to be glutted with dung; for a little at a time, well-rotted, is sufficient, so that it comes often enough, as opportunity, and the nature of the cropping, may dictate. It is indeed a sort of rule with gardeners, that ground should be dunged every second year; but circumstances may make more or less of it necessary, and rules should never be indiscriminately applied. If dung is pretty well reduced (as it were to earth) much less will do, and let it not be buried too deep; but if it is otherwise, lay it low, to be dug upwards another time, when it is more consumed.

"It is an excellent way of manuring, where the superficial soil is much exhausted, to dig slightly, and spread over rotten dung, late in autumn, in the winter, or early in spring, and so let it remain, till the ground is wanted, before it is dug in; which should however be slightly dug before the manure is put on, or forked in a little afterwards. This method is particularly to be recommended where crops of onions, leeks, and such superficial rooting plants are to be.

"Dung used in great quantities, and lying in lumps, breeds worms, grubs, and insects, and makes plants grow too rampant and rank-flavored. Carrots it cankers, and it disagrees with many things; apt also to make the ground parch, and burn the crops sown upon it in a hot summer. On these accounts some persons have been induced to dress their gardens only with rich fresh earth; which, if they do not overcrop, will do very well, being accompanied with good tillage; which alone is of much use, and is essential to due cultivation. Vegetables are always sweeter, the less dung is used, and little need be used, when the natural soil is good and deep; for the earth may be so dug, that what is at the top one year may be at the bottom the next: which is a manœuvre evidently advantageous, as a good part of the strength of the top soil washes downwards. The method just recommended, of letting dung lie on the surface for a time, is good also, as it abates the rankness of it. Lime sweetens."

"Occasional manure," Abercrombie observes, "will be necessary. If the original soil be poor, it may require aid from dung every year; but, in general, the quarters in which annuals and biennials are cultivated will want to be thus recruited at least once in two years, when the last autumn crops are off the ground. Beds occupied by perennials cannot sometimes receive any material accession of new earth, or compost, for a number of years; and therefere, when the stools are worn out, the repairs of the soil should, in proportion, be substantial, and go deep. Dung is fit to manure beds for receiving many sorts of plants, when it has lain in a heap from three to six months, and is beginning to be well rotted. But for particular purposes, it should lie from one to two years. Apply it for annuals, two or three inches thick; for perennials that are to stand long, six or eight inches thick; spreading it equally, till the bed into which it is to be dug is covered: then trench it in a moderate spade deep, that it may be within easy reach of the roots of the plants. In preparing ground for perennial stools, a portion of the dung should be deposited six inches deeper."

"Manures," according to Nicol, "are to be applied either as simples or compounds; but the latter method is certainly the most eligible. He agrees with Jethro Tull in stating that if they have not undergone a proper fermentation, their effects are, giving a rank and disagreeable flavor to fruits and vegetables; and if an immoderate quantity be applied, of producing a considerable degree of unwholesomeness, and tainting the juices of all plants.

"A mixture of stable-dung, sea-weed, lime, and vegetable mould, which has lain in a heap for three or four months, and has been two or three times turned during that period, will make an excellent manure for most kinds of garden-land. Also, cow-dung, hog-dung, and sheep-dung, mixed with soot, or with wood-ashes. Pigeon-dung and vegetable mould, well mixed, will also make an excellent manure for heavy land; or even for lighter soils, provided the pigeon-dung be used sparingly.

"Neats-dung and hog-dung, slightly fermented, are very fit and rich manures for light, hot soils. For those of a dry, absorbent nature, none answer better, or last longer; by reason that they retain moisture for a greater length of time, and also ferment more slowly than other dungs.

"Pigeon-dung, lime, soot, ashes, &c. should never be applied as simples; the quantity required being comparatively small, and the regular distribution of them difficult, without the admixture of other matter. But these should generally be applied in compost of good earth, turf, or sward, or of cow, or other dung of a cool nature; applying them in quantity according to the cold, or the hot nature, of the soil to be manured, allowing the compost a sufficient time to incorporate, and mixing it thoroughly.

"Marl is a good munure for almost any soil; and it may be applied as a simple, with as much propriety as any of the kinds of cattle-dung, or even of vegetable earth. The kind called shell-marl, is much to be preferred, and should be freely applied to strong lands, but more sparingly to light; the loamy kind being best adapted to light lands.

"Stable-dung, if used as a simple, should not be applied in too rank a state, nor should it be much fermented. It should generally lie in a heap for four or five weeks; during which time it should be turned over once or twice. A ton of it in this state is worth three that has been used in the hot-bed, and is a year old. This manure, and indeed dung of any kind, when applied as a simple, should never be carried from the heap to the ground, till it is to be digged in; as, by exposure to the air, its virtues evaporate, and it is the less effectual.

"The necessity of the instant application of sea-weed, after landing, if used as a simple, is even greater than the above; as it instantly corrupts, and its juices flow downwards, and are lost. If this manure be used as a compound, the heap in which it is compounded should be more frequently turned on its account; that none of the juices may be lost, but that the other part of the compost may absorb them.

"Horse-dung, and the dung of sheep, deer, and of rabbits, are most eligible for cold, wet soils; and all these, or any of these in compost with lime, will be found beneficial. For such soils also, a compost of coal-ashes, pigeon-dung, and lime; or of wood-ashes, whin-ashes, fern-ashes, and stable-dung; or of deer-dung, rabbit-dung, soot, and burnt sward, will make a good manure.

"Manures being valuable in proportion to the salts and the oils they contain, are to be applied in quantity according to their quality. Hence the dung of pigeons should be used in much smaller proportion than that of horses, it containing a greater quantity of volatile salts; and so the ashes of vegetables containing a portion of fixed alkaline salts, being more powerful, are to be applied in still smaller quantity. So also, lime, being the most powerful of the calcareous kind, should be applied, in ordinary cases, in much smaller quantity than marl.

"Vegetable mould may either be used as a simple, or as a compound, and may be applied with equal propriety to all soils. None can be hurt by it in any degree, since almost every plant will grow luxuriantly in it alone, without the aid of any soil or manure whatever. It seems to be the ambrosia, and the dunghill drainings the nectar, of vegetable life. The latter, however, if too freely indulged in, is rather of an intoxicating nature.

"The importance and effect of manure being now generally credited and acknowledged, it would appear to be the indispensable duty of every gardener and cultivator of the earth, to be careful in the collection of it, and also to distribute it with skilful frugality. For this purpose, a well, or cistern, should be contrived so as to collect the dunghill drainings; and, in the application of manure of any kind, the greatest care should be taken to divide it equally, according to the quantity to be applied.

"All animal substances, when properly applied, are good manures; and as animals derive their sustenance, either immediately or ultimately, from vegetables, these, when properly decomposed, become great promoters of vegetation. Hence dungs, in general, are superior to other manures; and are the more valuable in their kinds, according to the proportion of the oils they contain, which are most easily reducible, by the nitrous acid of the air, into that species of mucilage, allowed to be the essential pabulum or nutriment of plants. Our duty, therefore, is to collect these with care, and apply them with attention.

"The dunghill may also be considerably increased, by throwing the haulm and leaves of all kinds of vegetables into a common heap, letting them remain till well rotted, and afterwards mixing them with lime, marl, ashes, or soot; or mixing them in the process of collection. By watering the whole frequently with the drainings of the dunghill, the value would be greatly enhanced."

The effects of manures, when properly applied, he defines to be "correcting tenacity, crudity, and porosity, in the soil; exciting its fermentation, communicating nutritive matter, and affording nourishment to the roots of plants; thereby promoting vegetation, and the perfection of vegetables."

"It is now an established fact," Niel observes, "in practical gardening, that for the greater number of culinary plants, and for all fruit-trees and flowers, composts or compound manures are far preferable to simple dungs, and that till the latter be completely rotted, they should not in any case be suffered to touch the roots of the plants. Even composts should not be too rich. Trees especially are very apt to be injured by the injudicious and excessive use of manure. A very rich compost will stimulate them for a few years to preternatural exertion; but, as remarked by T. A. Knight, will, in all probability, become the source of disease and of early decay. A very good practical gardener, David Weighton, recommends for cold clayey land a compost made up in the following proportions: three parts light mould; one part rotten stable dung; one part sharp sand; one part coal-ashes; half a part lime, with a small proportion, perhaps an eighth part, of pigeons' or sheeps' dung. For a light sandy soil, the following are the ingredients and proportions: to two parts of the natural soil, three parts of pond earth, or the scourings of ditches, and three of strong loamy earth; one part of clay, or rather clay-marl, if it can be got; and two parts of stable or cow-house dung.

" In the opinion of some gardeners, the best mode of applying compost manures, is to trench deep, and put compost in the bottom, to the thickness perhaps of eight inches; then to lay on the old garden soil, and to cover the whole with compost to the depth of some inches. In this way, the old or worn-out soil is placed in the middle, and is exposed to the effluvia which may arise from the lower stratum, and at the same time is incorporated, by digging, with the upper."

1117. Where economy, rather than the flavor of culinary crops, is an object, *recent dung* is unquestionably to be preferred (592.), and, in fact, is so by most market-gardeners. John Wilmot, an extensive market-gardener at Isleworth, bears testimony to this fact. A given weight of recent stable dung, he says, will not only go farther than the same weight of rotten dung from old hot-beds; but will serve as a manuring for the succeeding crop, which, with old dung, is not the case. *Hort. Trans.* iv. 55.

Sect. III. *Cropping.*

1118. " In the occupation of ground," Marshall states, " the *change of crops* will be proper, as each sort of plant draws a somewhat different nourishment: so that after a full crop of one thing, one of another kind may often be immediately sown; but it should be contrived that a wide crop may follow a close one, and contrariwise.

" *Close crops,* as onions, leeks, carrots, &c. are conveniently and neatly cultivated in beds of from four to five feet widths, with alleys of a foot to eighteen inches between them.

" The *seasons* proper for furnishing the ground with every particular vegetable, should be well attended to, that each may be obtained as early as its nature will permit; and of the seeds and plants we use, care must be taken to procure the best of the kind, lest after all the trouble of cultivation, disappointment as to vegetation or quality should ensue.

" The quantity sown and planted is (in a degree) to be determined by the portion of ground that can be spared; but it should be always a rule, to sow and plant more than probably enough for the family, as more may happen to be wanted than expected, and a cross season or other accident may occasion a failure. As exact rules cannot be laid down, the exercise of a little judgment will be necessary, in order to proportion crops aright; for to have too much of one thing, and too little of another, is disagreeable and discreditable. Respect should be paid to the natural duration of crops, some going off soon, and others being lasting, and that too according to the season they are propagated in.

" Seeds and plants should be adapted as much as possible to the soil and situation which best suits them; for in the same garden some difference will be found, not only as to sun and shelter, but the earth; as some will be richer, some poorer, some deeper, some shallower, and some (perhaps) heavier, some lighter, in due attention to which, advantage is to be reaped."

1119. " Nothing tends more to relieve the soil," Abercrombie observes, "than a *Rotation of Crops;* for plants of different constitutions not only strike to different depths, and in different directions, with their roots, but the terminal fibres or feeders of the roots appear to take up separate and peculiar constituents of the soil, and to be indebted for support to some property imparted by the earth in very different degrees. The duration of the vegetable, its short or protracted existence, is a great cause of diversity of effect as to the quantity of aliment drawn from the soil. Another mark of distinctness in constitution is the character of the root, as it may be fibrous and tender, or fibrous and woody, — or bulbous, or tuberous, — extended or compact; another, the form and magnitude of the herb, and the proportion of fibrous or ligneous substance in the stem and branches. A fourth index of a separate nature is the succulency, or hardness, of the leaves, and the quantity of pulpy or farinaceous matter in the parts of fructification, — as the leaves may be the edible part, before the plant is matured; or the seed-vessels, as in pulse, may hold the produce for the table; or the esculent part may consist of fruit inclosing seeds.

"To apply this practically:—we will suppose a strawberry plantation requires to be renewed; and the stools seldom continue fully productive more than three or four years;—instead of introducing young strawberry-plants into the same bed, entirely eradicate the old plantation, and let it be succeeded by a crop of beans, or of some other esculent as different as may be in constitution and habit. In the same manner, let the new plantation of strawberries follow some light crop which left the ground in a good state, or which allowed it to be trenched and fallowed for an interval, whether it were an annual or biennial. It is a rule, from which only extraordinary circumstances can warrant a departure, never to plant a new set of perennial stools on the ground whence a plantation of the same or a similar species, having worn itself out, has just before been removed. On the contrary, crops which strike deep, and occupy the ground long, should be succeeded by plants which pierce but a little way under the surface, are drawing in the least degree, and soon come off from the short term of their vegetable life. (See 576.)

1120. "In farming," Nicol observes, "a proper rotation of crops forms one of the best features of good management. So it does in gardening; but in the latter it cannot be so effectually followed out as in the former, for these obvious reasons: a garden is smaller than a farm; the articles cultivated in it are more numerous, and also more nearly related in kind, than those cultivated in the farm. A complete rotation can only be followed through, and full justice done to the land, when the crops that are to form the rotation are of a nature quite different, and when the manner of culture is distinct. Under certain crops, land is exhausted, and under others, strength may be restored to it. But in all cases, under good management, land must be fed. It must not be laid down to rest without having had, as one might say, its supper. The practice of not manuring land, but managing by what are termed resting crops, has been found fallacious, and is now justly exploded.

"Market-gardeners, who are generally good managers, and must of necessity make the most of their ground, in order to maintain their families, and be able to pay high rents, have found out the utility of resting their land, and of following a regular rotation in cropping it, at least in the culture of the principal articles, and as far as the nature of the thing will admit. The best managers sow out a portion of their ground every season in grass, clover, or barley, which is used as green food for their horses and cows. Very generally the barley is sown along with the clover, merely to nurse and shade it, being cut down and not allowed to ripen. The clover is sometimes dug up after the first season, if land for market crops be scarce, but more generally it is allowed to lie a second year. By good managers, the ground is never sown down in a hungry state.

"Land that has been under esculent crops for many years together, and is, perhaps, glutted with manure, may be cleansed, as it is termed, by a scouring crop of oats, wheat, or rye, which, if thought necessary, may be repeated. If trenched to its full depth afterwards, it will again be fit for the production of culinary crops in great perfection.

"By quartering out currants, gooseberries, and raspberries, instead of growing them in single lines, particularly if these be properly managed, an opportunity of changing crops might further be afforded; as these should not stand longer than seven or eight years together, but the plantations should be renewed.

"Strawberry plantations, under proper management, should be renewed every four or five years; and thus likewise might an opportunity of changing crops be afforded. Also, by the renewal of artichoke and asparagus plantations, which should be done every seven or eight years. In managing all the above-named articles on a large scale, new plantations should be made every year, to a certain extent, which would throw a certain proportion of ground regularly into the rotation.

"In the culture of esculents, even on a small scale, a sort of rotation, though not very complete, might be aimed at, and would be very considerably furthered by classing certain vegetables; as the Brassica or cabbage kinds; the Leguminous or pea kinds; the Tuberous or carrot-rooted kinds; the Bulbous or onion kinds; and the lighter crops, as sallads and herbs.

"But in all cases a studied rotation is advisable, so as that no crop of the same class may immediately follow another. To facilitate this measure, the kitchen ground should be divided into many quarters or portions, and a journal or note-book should be kept, with a reference to their numbers. In this journal, whatever relates to their cropping, manuring, trenching, or fallowing, should be recorded, for reference and guidance as to future cropping. Nicol, while practising as head-gardener at Raith-Wemyss castle, and other places, kept a regular journal of this sort; he published it in his *Kitchen Gardener* in 1802, and he tells us, in 1816, that it had been approved and adopted by many practical gardeners. (See the *model* in page 483.)

1121. "The principal time for sowing and planting the articles raised in the kitchen garden falls in the spring months. It is necessary to lodge some sorts in the ground as early as January; but February, March, and April, are the months in which the principal supplies from summer crops are provided for. From April till September, and even October, many sorts are sown and planted, in smaller portions, for successive crops. Particular hardy esculents are also sown, or transplanted, principally in autumn, for a supply as well in winter as in spring and early in summer. Other kinds are inserted occasionally as late as November and December, to stand wholly over the winter, in rising growth, for early crops and for main crops the following summer; such as peas, beans, cabbages, and cauliflowers. To obtain early crops of favorite esculents which are more tender, several kinds are sown and planted in hot-beds in winter and spring; respecting which full directions are given under the separate heads in the Kitchen Garden."

"In the pricking out and planting out of crops," Marshall observes, "be sure to do it as early as may be; let every thing be regular, (not sparing to use the line,) allowing always room enough for this work; and being thus treated, vegetables will come forwarder, larger, and altogether of a superior quality."

The season for planting trees "extends from the fall of the leaf till just before the bursting of the bud, in spring. On light and dry grounds, much time is gained by planting at the commencement of November, because the plant, aided by the moist condition of the atmosphere, may put out some small fresh roots before the close of autumn, which will be a great advance towards its perfect establishment under the excitement of spring. Between the beginning of November and the first of March, rainy weather is not only incommodious to the planter, but also hurtful to the trees, because the mould is then too apt to be like mortar in consistence; and, with the mould in that state, contrary to what many suppose, it is not so easy to settle all cleverly, under, about, and close between the roots, without leaving some intervening hollow, into which loose and friable earth would have trundled.

"On cold and moist soils, it is well to postpone planting till the end of February, because the roots can do nothing all winter, and are more likely to be spoiled than preserved, before fine dry weather arrives to qualify the wetness of the soil.

"On soils which are neither arid nor moist to excess, the planting of hardy trees may proceed in the mild intervals of winter. It is too often deferred to these intervals, without regard to the nature of the ground, merely because many other branches of work in the open garden are suspended." *Introd. to Gard.*

SECT. IV. *Thinning.*

1122. "The *thinning of seedling crops*," Marshall observes, "should be done in time, before the young plants have drawn one another up too much. All plants grow stronger, and ripen their juices better, when the air circulates freely round them, and the sun is not prevented from an immediate influence; an attention to which should be paid from the first appearance of plants breaking ground.

"In thinning close crops, as onions, carrots, turnips, &c. be sure that they are not left too near, for instead of reaping a greater produce, there would be a less. When they stand too close, they will make tall and large tops, but are prevented swelling in their roots: better to err on the wide side, for though there are fewer plants, they will be finer and better flavored."

1123. *Thinning the Leaves of Fruit-Trees.* "The leaves," Abercrombie observes, "have too essential an office as organs of growth to the entire plant, to be lightly parted with; and where the climate is not deficient in heat, compared with the habitat of the plant, or the portion of year in which its season for vegetating falls, their shade is more likely to be serviceable than detrimental, even in the last stage of fruiting. Thus, cherries, raspberries, strawberries, currants, and other species whose full term of fructification is more than comprehended in our summer, reach perfect maturity, and acquire the color proper to each, though ever so much covered with leaves: whereas for those kinds which ripen with difficulty here, because the direct rays, and most intense reflection of the sun, is scarcely equal to the heat in the shade during the full summer of their native climate, — it is proper, when the fruit has nearly attained its full size, and is naturally losing its absolute greenness, to remove some of the leaves which shade it too much. Were the leaves thinned sooner, it would prejudice the growth of the fruit; and should they even now be swept off unsparingly, the growth of the year's shoots might be arrested. The leaves which cover the fruit, whether peaches, grapes, late pears, or other exotics, must be removed gradually; that is, at two or three times in the course of five or six days; otherwise the unusual full heat of the sun darting upon the fruit, would occasion the rind to crack."

Nicol says, "My practice has been, as the fruit begin to color, to pick off every leaf that may overhang them; thus very much enhancing their beauty and flavor."

"In late seasons," according to the same author, "if the leaves of wall-trees hang longer than usual, they may be brushed off, in order to let in the sun and air the better to ripen the wood. This brushing, however, should be cautiously performed, never brushing much at a time. The leaves should not be forced off violently. Some use a common stable-broom for this purpose; but a better instrument is a hazel, or strong willow withe, or a small smooth cane. The shoots from which the leaves are to be displaced, should be gently stroked upwards, and outward; but never the reverse way, else there is danger of hurting the buds. Trees exposed to the wind seldom require this care; but sometimes espaliers may, and if so, the same course is to be pursued as above."

1124. *Thinning Stone-Fruits.* "Thinning," Nicol states, "the over-abundantly set fruit on apricot, nectarine, peach, and plum trees, is a necessary duty; as many of these, in good seasons, set more than they can nourish or bring near to perfection. This thinning, however, must be cautiously performed, and by degrees. If the trees have set their fruit very thick in particular parts only, such parts should be moderately thinned out now, and the other parts not yet. But if the fruit be very quickly set all over the tree, let it be generally thinned off to half its extent at this time; referring the final thinning till the *stoning* be over; that is, till the shells be quite hard, and the kernel be formed. For most trees, especially those anywise unhealthy, drop many of their fruit in the time of stoning; so that the thinning had better be performed at two or three different times; always observing to reserve the fullest, brownest, and best-formed fruit."

Stone-fruits must be again looked over in June, and a few more fruit thinned off where too thick; and the final thinning must take place in July, when the stoning of stone-fruits is over, and previously to their beginning to swell off for ripening.

"With respect to the quantity or number of fruit proper to be left on a tree, much," according to Nicol, "must depend on its size and strength, and whether it be full grown, or be yet in training. A full grown tree, in a healthy state, may be allowed to produce considerably more than one in a weak condition. And if a tree yet in training, that is, one not having filled the space allotted to it, be allowed to ripen all the fruit it may set, its extension will be much retarded in consequence. On the More-park apricot, and the larger kinds of peaches, in a healthy full-bearing state, a fruit to every foot square of the superficial content, or surface of the tree, may be taken as a good medium; that is to say, a tree covering a space fifteen feet by twelve, may be allowed to ripen about two hundred fruit. The smaller kinds of apricots and peaches, and of nectarines in general, may be allowed to produce a third part more, if in a healthy state. The larger and better sorts of plums may be thinned in proportion, and according to their sizes; and may be thinned out to from three to six inches a-part, if on the shoots of last year, or so as to hang quite free of one another, if on spurs.

"I am aware, that many will think thinning to this extent an extraordinary measure; but I would have such be convinced of the propriety of doing so, by comparison. If they have two trees of a kind, both healthy and well loaded, let the one be thinned as above, and allow the other to produce as it has been wont; or thin it even to half the extent. It will be found, that the tree fully thinned will produce an equal, if not a greater weight of fruit, and these incomparably more beautiful, and higher in flavor. Observe, the comparison must be made the same season, else it would not be fair; as the size and flavor of the fruit might be very different, according to the goodness or badness of the weather in different years.

"Apples and pears should also be moderately thinned, and good account would be found in the practice. This should be done when the fruit is about half grown, or when all apprehension of its dropping is over. Nothing tends more to keep fruit-trees in good health, than regularly to thin their over-abundant crops, and that always before they begin to swell off for ripening; for if this be delayed till they are nearly full grown, the mischief is, in a great measure, already done, both to the tree and to the fruit left."

Sect. V. *Pruning and Training.*

1125. These operations being practised together, are here treated under the same head, the more especially, as some authors include the operation of pruning under the term training.

Pruning newly-planted Trees. "Trees planted one year from the graft, or two from budding, must be pruned as though still in the nursery, in order to furnish them with a head. At the end of March, or the beginning of April, as the wood-buds begin to shoot, one of these courses must be taken; either shorten the shoots of the preceding summer; or head down the tree to two, three, or four eyes, taking all those shoots off. The latter course is most commonly expedient on the peach-tree, or nectarine, or apricot. If the first shoots happen to be unexceptionably placed for beginning the figure, instead of heading down the stem, cut these into two or three eyes. On wall-trees and espaliers, rub off the fore and back wood-buds.

"On all trees during the tender stage of infancy, spring, exclusively of autumn and winter, is the fit time of pruning, even for wood, and for proceeding in the formation of a head, as successive sets of new branches are yearly obtained by shortening the last. Something may also be done in summer to promote this object.

"If between the end of May and the end of June, a pair of shoots have not started as desired, one on each side from a stem headed down, or from the mother branches shortened; and in lieu of such, one solitary shoot has arisen, or two, both on one side, or not equally proper to be retained, the desired end may yet be attained, and a season saved. Pinch down the solitary shoot two or three eyes: this will force out new shoots in the course of summer. In the case of two shoots, one of which is evidently unfit for beginning the head, take off the one rejected without delay, and pinch down the other to two or three eyes. Of two shoots on the same side equal in regard to strength and direction, to preserve the lower on wall-trees and dwarfs is a rule to which an exception can scarcely be imagined. The summer pruning of heads progressively forming, will afterwards fall in with that of established trees.

1126. "*Summer Pruning.* The buds and shoots to be preserved claim the first attention; for if the precious germs of future fruit or wood are carelessly destroyed, the work of reparation is difficult and tedious: whereas the removal of spray not of service as branches or bearers, though necessary to prevent confusion, and to stengthen the plant, is to be conducted in subservience to the vital object of fertility. For the present retain all the fruit-buds and fruit-shoots, and as many well-placed wood-shoots as will afford a selection for winter pruning: but rub off ill-placed and superfluous wood-buds, as they can be certainly discriminated, or after waiting till appearances are no longer doubtful, pinch off the shoots from such wood-buds before they are above three inches long. In some kinds, to avoid the destruction of wood-buds, or the germs of fruit-spurs, the disbudding ought to be postponed until the wood-shoots can be distinguished from spurs, and pinched off without injuring the fruit-buds. The species which alternately produce spurs on the one-year-old shoots, are, the apple, pear, apricot, cherry, and plum. The peach and nectarine rarely emit spurs. While you avoid displacing infant spurs on plants which bear on such, be as careful to discourage the wood-buds and shoots on old spurs, for shoots from these are cumbersome and unprofitable. If any spray that wants displacing has got woody, use the knife, lest the bark of the mother-branch be torn.

"The mode of bearing, and the duration of the bearers, is the first thing to be adverted to for regulating the proportion of new wood to be retained. Thus, in the kinds which bear on spurs, a less quantity of advancing wood is necessary for future supply, according to the time that a bearing branch continues fruitful; but as the *fruit-shoots* on some of these kinds are two, three, four, and even five years in coming into bearing, the difficulty of exercising a proper foresight is increased. On the sorts which bear on the shoots of last year, although a greater reserve, and constant annual succession is wanted, it is more easy to suit the provision to the expected vacancy. In both classes, the leader to a stem yet under training as a wall-tree is to be carefully preserved: also a surplus number of buds to the right and left must be suffered to sprout, till it can be known whether shoots will spring at the desired places; and afterwards a selection from these for forming the tree: further, the leading shoot to each side branch should be always left, if the limits admit. Well-placed shoots, between the origin and the extremity of a lateral, are to be retained in pairs, until a good leader has sprung, and is sufficiently established to be laid in; when they are to be cut away close, unless a vacancy requires their permanent cultivation.

"As the new laterals fit to be preserved extend, lay them in close to the wall in a straight easy direction, at a convenient average distance; nailing them farther onward as the extremities want support.

"The spring and summer growths will require three revisions: one beginning at the end of April; another in July; and the third in September: all which have a preparatory respect to the winter pruning.

"Stone-fruit trees, if much wounded in summer, are apt to gum; so that if superfluous shoots have not been removed before they get woody, it is best to defer the retrenchment of these to the winter pruning. A weak tree is strengthened by reducing its spray; let it, however, be low and compact, rather than naked. To keep a luxuriant tree full of wood tends to make it less rampant: but a crowded intricacy is to be avoided; for the air stagnates in a thicket of spray and foliage, while the sun cannot penetrate it: hence the new shoots grow long-jointed, and do not ripen thoroughly; and the blossom-buds forming on the bearers for the following year will be fewer and less plump.

"All the shoots rising after midsummer are to be displaced, unless a vacuity cannot be furnished without reserving some of them; or unless the excessive luxuriance of a plant makes it proper to cut it as little as possible, and to let the sap expend itself in numerous channels.

"The spring shoots laid in are generally to be preserved at full length, as far as the limits will permit, until after the fall of the leaf; because to stop them in summer would cause them to shoot from almost every eye, and fill the wall with spray; hence, when a vacancy wants several branches to furnish it, it is a good resource to shorten a strong contiguous shoot to three or four eyes. This is the exception to the rule.

1127. "*Winter Pruning.* Now a final selection is to be made from the last year's shoots retained as candidates during the summer. On established trees which have fully ripened their shoots, and of which the young wood is not succulent, and therefore susceptible of injury from frost, there is a wide latitude of time for the capital or winter pruning, extending from the fall of the leaf to the time of the sap's rising, or just before. To prune in autumn strengthens a plant, and will bring the blossom-buds more forward: to cut the wood late in spring, tends to check a plant, and is one of the remedies for excessive luxuriance. At the opening of spring, the blossom-buds can be certainly distinguished, which is a great guide to the judgment in many critical cases; but on the other hand, if the blossom-buds get much swelled, they are liable to be bruised or knocked off, in the various operations of untacking, cutting, and renailing the branches. Supposing the common course of winter pruning to be divided into three periods — autumn, the cold months of winter, and the beginning of spring — the plants to be excepted from the first two, are, uniformly the fig, when not in a forcing-house, the vine for the most part, because the autumn is seldom hot and fine sufficiently long to ripen the year's shoots. Some except the peach and nectarine from the middle period, but not from the first; because they say, that if a severe frost happen immediately to follow the pruning, the points of the unripened shoots, and particularly the wood-bud next to the cut, are generally so much hurt, that there must be a second shortening, farther in than was intended to furnish these shoots with leaders.

"The number of good shoots to be retained is limited by the character of the tree, the size to which the fruit grows, and the compass to be given to the head.

"The branches of a wall-tree may be from five to ten inches asunder, according to its strength and the size of the fruit. Of fruit-shoots those are the best which are short-jointed, and show a competent number of blossom-buds, and on which the series of blossom-buds commences nearest to the origin of the shoots, especially on that class which must have the bearers annually shortened. Bad shoots, alike for wood and for fruit, are spongy, or disproportionately large and gouty; but good shoots for wood may be above the middle size, if the buds are well defined; and the best shoots for fruit may incline to slenderness, if not wiry and sapless; disproportionably large shoots are seldom fruitful. In choosing large supplies for wood, other things being equal, the lowest new branches on the tree, and the last year's laterals nearest to the origin of a branch, are to be preferred. Begin at the bottom and middle of the tree; keep these furnished without intricacy; and the extremities will be easily managed. Such shoots as are preserved, whether to come in immediately as bearers, or to furnish naked parts in the figure, or future supplies of wood, are to be treated according to the mode of bearing.

"Class bearing on distinct branches. On those species which bear at the ends of the branches, or on spurs for several years in succession, the leading shoot of a fruit-branch is always to be retained, on a double account; and the fruit-branches are not to be shortened where they do not exceed the assigned limits for the tree; because, if stopped, these would send out strong wood-shoots, where blossom-buds or fruit-spurs had otherwise been produced.

"Exception to this rule: on young trees under training, to be furnished with a head, shorten the branches until the designed figure is complete; again, though a tree be established, occasionally shorten a branch, to bring out wood to fill a vacancy. The surplus of the last year's shoots which would crowd, or disfigure, or too much weaken the tree, or occupy it without promise, are to be cut out clean to the parent branch; also cut away any old branches which appear decayed, or of which the spurs begin to get barren. Finally, take off close the naked barren stumps left at previous amputations.

"Class bearing on last year's wood only. On trees which bear on the last year's wood, there is a necessity for annually shortening alternate divisions of the branches, in order to provide a supply of new shoots for bearing the next season. We prune the longer branches of a luxuriant plant, and the shorter of a weak plant in an inverted proportion. Were the strong tree much cut in, it would produce only the more wood; while the weak tree, unless relieved by short pruning, would not long continue to bear. Very strong shoots may be left eighteen inches long, or lose but a fourth of their length; extremely weak shoots retrench to half their length, whether that be five, six, eight or ten inches; prune shoots of medium growth to the extent which best consults the double object of leaving as many blossom-buds as may be on the shoot, and of forcing out new wood at a well-placed eye.

"In shortening, cut out a leaf or wood-bud that is likely to yield a leading shoot. Leaf-buds are distinguished by being oblong, narrow, and depressed; blossom-buds by being rounder and bolder. If a leaf-bud at a suitable distance is found between twin blossom-buds, so much the better. A leading shoot at the point of a bearing branch draws nourishment for the intervening fruit.

"The thinning of rejected shoots, and decayed or worn-out bearers, is nearly as for the other class.

"Mixed class. — There is a small anomalous class which bear frequently on spurs of several years' continuance as well as on annual shoots, but chiefly on the latter. These are to have a mixed treatment, preserving the fertile spurs as much as may be.

"Having finished pruning a tree, lay in the branches and shoots directly; tacking them in a neat manner to the wall or trellis.

1128. "*Winter Pruning to be revised.* Revise the pruning when a sufficient time has elapsed to see it with another eye; or when the expansion of the blossoms decide the competition between probationary fruit-shoots which have been laid in too close. In those stone-fruit trees which bear on the last year's shoot, such as the peach and most kinds of the apricot, it is particularly necessary to revise the winter pruning at the time of blossoming; because, if on any branch the blossoms are observed to have been spoiled either by gum, by blight, or spring frost, that branch is quite useless as a bearer, and unless it has made some shoots which may prove bearers the following year, is to be entirely cut away: but if the blighted branches have made well-placed shoots, shorten them to these." *Abercrombie.*

Nicol's opinions on this subject may be considered as the same with those of Niel, who states them thus, "The two principal methods of training wall-trees which are followed in this country, are called the fan and the horizontal modes. In the former, the branches are arranged like the spokes of a fan, or like the hand opened and the fingers spread. In the other way, a principal stem is carried upright, and branches are led from it horizontally on either side. The Dutch style consists in taking a young tree with two branches, and leading these horizontally to the right and left, to the extent, perhaps, of twelve feet each way, and in then training the shoots from these perfectly upright to the top of the wall. This is now seldom practised here, excepting, perhaps, with fig-trees, or white currants. In some places, a few of the wall-trees are trained in a stellate form, the stem being led upright for about six feet, and then some branches trained downwards, others laterally, and others upwards. When walls exceed seven feet in height, the best gardeners seem to concur in giving the preference to the fan training, variously modified: in this way they find that a tree can much sooner be brought to fill its allotted space, and the loss of a branch can much more easily be supplied at any time. For lower walls, the horizontal method is preferred; and the same plan is adopted almost universally on espalier rails. Hitt strongly recommends this mode for most sorts of wall-trees; and for pears he adopts what is called the screw stem, or training the stem in a serpentine manner, the branches going off horizontally as in the ordinary straight stem." *Edin. Encyc.* art. *Hort.*

Nicol, as will appear by the following passage, agrees with most experienced gardeners, in preferring *fan training* to all other methods; and it may be observed, that this form comes nearer to that mode recommended by T. A. Knight, as affording "evidence of a more regular distribution of the sap," than any other mode. It agrees with the excellent general principles of pruning laid down by Quinteney, who first reduced this branch of gardening to scientific principles — to the practice of the celebrated growers of peaches at Montrueil, near Paris, and to the forms recommended by J. Hayward in his "*Science of Horticulture.*"

T. A. Knight, in his communication to the London Horticultural Society, on a new method of training fruit-trees, observes, "that when trees are, by any means, deprived of the motion which their branches naturally receive from the winds, the forms in which they are trained operate more powerfully on their permanent health and vigor than is generally imagined." "In this sentiment," says Nicol, "I perfectly agree; and I may be allowed to add, that I have been engaged in the training of fruit-trees these twenty-five years, and have trained them in a great variety of forms. Some in the Dutch style, running out two branches first, perfectly horizontal, right and left, to the extent of three or four yards each way, and from these training shoots perfectly upright, at nine inches apart, to the top of the wall; some with screwed stems and horizontal branches; some with upright stems and horizontal branches; some with stems six feet high, with pendant, upright, and horizontal branches, so as to appear like a star; and others in the fan manner; which last, I confess, I prefer to all other methods of training wall-trees. I have altered many from the above forms to this, both on walls and espaliers."

T. A. Knight's method of training the peach, (see *fig.* 278.) Nicol considers, as "evidently tending to produce a very ugly tree, without gaining any advantage; since the peach must continually be pruned, in order to obtain a supply of bearing wood. Neither can it well be accounted a new method; as it very nearly approaches to what has long been termed in this country, the *wad* method of training.

"I have more than once trained the branches of a peach-tree downwards, and to either side as occasion required, but could never discover better fruit on the pendant, or horizontal shoots, than on those trained upright, or fanwise. If there be a just reason for training the shoots of any fruit-tree horizontally, in my apprehension it is the pear, and that chiefly on account of its natural luxuriance in good soils.

"But it might be asked, what fruit-tree grows naturally in a horizontal manner? All, except the vine, perhaps, grow upright, or, more properly speaking, in the fan manner; spreading out their branches on all sides. Surely none grow like the larch, or the spruce; and it has been a universal maxim of the best horticulturists, to direct the cutting out of cross wood, and to keep the tree moderately thin of branches in the middle."

In the case of stone fruits against walls and espaliers, Nicol considers it of the greatest importance during summer to train in the shoots close to the wall or espalier, and to prune off all superfluous growth, as well to admit the sun and air to the shoots bearing fruit, as to ripen the wood so laid in. If this is not done, he very properly asks, "To what purpose do we plant trees against walls?"

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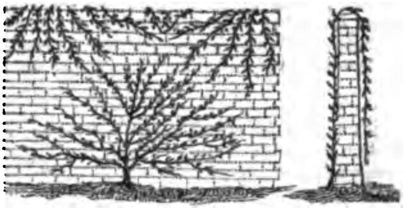

When opportunity admits, or want of space on one side of a wall requires, it is found conducive to the production of fruit to train the branches of trees over the wall and down the other side. This is found to increase the prolificacy of vigorous-growing kinds, as the pear; and it also succeeds well with the apple, cherry, and vine.

Edgings of box or other under shrubs must be *clipped*, and those of strawberries, or culinary herbs, as parsley, *cut* in the autumn, or, when the plants are not in active vegetation, so as to keep them of proper shape and dimension.

Hedges must be cut in autumn when the wood is ripe: sometimes it is done in summer, which is admissible, as far as respects the health of the plants, and consequent durability of the hedge when the lower ends of the shoots are nearly ripe. If this is not the case, the operation is injurious. The judicious gardener will weigh the circumstances of the case, and decide accordingly.

Sect. VI. *Weeding, stirring the Soil, Protecting, Supporting, and Shading.*

1129. *Eradication of Weeds.* The means of removal are hoeing and weeding; and of destruction, exposing them, when hoed or pulled up, to the sun and air; or, what is in all cases better, taking them at once to the dunghill or compost yard, to be destroyed by fermentation. These operations require to be performed almost every month in the year; but more especially in the beginning of summer, when the earth is teeming with vegetable life. Weeding in time, Marshall observes, is a material thing in culture, and the hand is generally more certain than the hoe.

Stirring the Ground among Crops is nearly as essential as weeding, and is in some degree performed by the operation of hoeing. But the most effectual mode of stirring, and that now adopted by the best gardeners, is by the two-pronged fork or two-pronged hoe (*figs.* 9. and 20.) Every crop, whether planted in rows, or sown broad-cast, ought to be subjected to this operation once or oftener in the course of its progress to maturity. Small crops, where the distances between the plants are not wide, ought to be stirred by a fork of two prongs, or even one prong. A narrow hoe is the usual instrument, but this always tends to harden the ground below, and form a sort of sole, which in many soils is impervious to air or rain. Besides, the operator is generally obliged to tread on and harden the ground stirred. "Breaking the surface," Marshall remarks, "keeps the soil in health; for when it lies in a hard or bound state, enriching showers run off, and the salubrious air and solar heat cannot enter. Ground," he adds, "should be frequently stirred and raked between crops, and about the borders, to give all a fresh appearance. There is a pleasantness to the eye in new-broken earth, which gives an air of culture, and is always agreeable." This last observation is particularly meant to apply in autumn, that the garden may not become dreary too soon, and so bring on winter before its time.

1130. *Earthing* up ought to go hand in hand with *stirring* in many cases; but rarely in the case of those plants which form their bulbs above the surface, as turnips and onions. This operation supports the stems of some crops, as the bean, cabbage, &c.

and encourages the fertility or improves the quality of others, as the potatoe, leek, celery, &c. In winter also it protects them from the frost, and may then be applied to the turnip as no longer in a state of growth.

1131. *Protecting, Supporting, and Shading.* These operations are too little attended to, or attempted in a slovenly manner, by many gardeners. The grand subjects of protection are fruit-trees; and we have already given (620, &c.) an enumeration of the various modes to which recourse is had. The simplest, and perhaps the best protection for general purposes, is that of throwing a net, either an old fishing-net or one formed on purpose of woollen yarn, over the whole tree, if a standard, or placing it against it, if trained to a wall, before it begins to blossom, and letting it remain there till the fruit is set. Marshall recommends this mode, justly observing, that after much expence and trouble to preserve blossoms from inclement weather, the business is often done to no purpose, or a bad one. Nicol's opinion is not materially different.

Single plants, as the raspberry, are to be *supported* by sticks, or rods, and rows of climbers, by rods, spray, or branches, as peas, kidney-beans, &c.

1132. *Shading* is but little attended to, excepting in the case of transplantation; but it is of great importance in the fruiting season to certain plants which naturally grow in shady situations, as the strawberry and raspberry; and properly applied and accompanied with watering, tends to swell these fruits and others, as the gooseberry, and heads and roots of certain vegetables in hot weather, as the cauliflower, turnip, onion, radish; and the whole vegetable, as in the case of lettuce and other sallads. The advantages of shading small fruits has been pointed out by Haynes, (*On the Culture of the Strawberry, Raspberry, and Gooseberry*, 8vo. 1812.) and are very strikingly displayed in the gardening of the south of France and Italy.

Sect. VII. *Watering.*

1133. "*Watering,*" Marshall observes, "is a thing of some importance in cultivation, though not so much as many make it. It is a moot point, whether more harm than good is not on the whole done by it. In a large garden it is an Herculean labour to water every thing, and so the temptation generally prevails, either wholly to neglect it, or to do it irregularly or defectively. To water nothing is too much on the dry side; but watering too much spoils the flavor, and renders esculents less wholesome."

It may be observed, that the practice of the market-gardeners near London and Paris, and many private gardeners who practice in the southern counties, is somewhat at variance with the opinion of this experienced and very judicious author. The reason may probably be, that the region of his experience, Northamptonshire, is high and moist. He adds, however, that "strawberries and cauliflowers should generally be watered in a dry season; strawberries more particularly when in bloom, in order to set the fruit; and the cauliflowers when they show fruit, in order to swell the head: in a light soil this ought unremittingly to be done. In very dry weather seedlings, asparagus, early turnips, carrots, radishes, and small sallads, will need an evening watering." He adds, "Water to the bottom and extent of the roots, as much as may be. The wetting only the surface of the ground is of little use, and of some certain harm, as it binds and cracks the earth, and so excludes the benefit of showers, dews, air, and sun, from entering the soil, and benefitting the roots as they otherwise would do. Wetting the surface of the ground, however, in a summer's evening, as it makes a cool atmosphere, a dew is formed, which pervades the leaves, and helps to fill their exhausted vessels."

He recommends "watering the roots of wall-trees in dry weather effectually; watering wall-trees with an engine in the evening refreshes them much, and helps to rid the trees and wall of insects and filth. Late in the summer, when the nights begin to get cold, it is time to leave off all watering, except things in pots and frames, which should have it then only in the morning. As watering is apt to make ground hidebound and unsightly, let the surface be occasionally stirred and raked, which will make future waterings enter the ground better: when the ground is hard on the top, the water runs away from its proper place, and half the labour is lost. Many things are impatient of being kept wet about the stalks, and therefore watering such plants should be generally at a little distance."

Abercrombie, Forsyth, and Nicol, strongly recommend watering the leaves of wall fruit-trees in dry weather every other day in the evening. Forsyth recommends watering infected trees with clear lime-water over the leaves, which he says soon destroys the red spider. Nicol uses water only; leaves off when the fruit approaches to maturity; and after it is gathered, recommences.

On the continent, and especially in France and Italy, watering forms an important part of garden, as well as of field, culture. On a large scale, it is performed by a system of gutters, which are distributed over every part of the garden (571), and on a small scale, recourse is had to manual labor. To lessen this, the ground among crops of a year or more's duration, and even among trees, is often covered with litter, leaves, sand, boards, or tiles. The latter article has been used in this country, in a late, dry and hot summer, by J. Maher at Arundel castle. "He sowed his seeds in drills, and covered the intervals between the drills with tiles, letting the edges of the tiles approach within an inch of the drills, and pressing them close into the earth. The tiles effectually preserved the roots from the scorching rays of the sun, and by preventing the evaporation of the moisture under them, afforded support as well as protection." *Hort. Trans.* vol. iv. p. 51.

Sect. VIII. *Vermin, Insects, Diseases, and Accidents.*

1134. Such vermin as moles, mice, and birds, are to be caught by some of the traps or snares already mentioned (622.). After all the various devices that have been suggested and practised for keeping under the grub, caterpillar, snail, and earth-worm, the most certain is gathering them by hand at their first appearance every season. The grub, wire-worm, and maggot, must be sought for by removing the earth from the roots of the plants where it is in action. The caterpillar gathered from the leaves beginning early in the season. The snail picked from the leaves or stalks of plants; or, in the case of new sown crops, by strewing the ground with cabbage leaves, the snails will attach themselves to their under surface in the night, and may be picked off in the mornings. Where the earth-worm is too abundant, they may be gathered in digging; or, before and during summer showers, when they expose themselves to the day. Ear-wigs, wood-lice, and similar insects, may be caught in hollow stalks of vegetables, or in the beetle-trap (*fig.* 126.). Wasps are best destroyed by suffocating them in their nests; when this cannot be done, recourse must be had to bottles of honied water, or other common modes. Watering is an effectual mode of destroying the red spider. Fumigation is generally resorted to in the case of the aphis and thrips; but in the open garden, watering and rubbing, or brushing them off, will effect their destruction.

Diseases in the vegetable kingdom are rather to be prevented than cured. A good soil on a dry subsoil is the grand foundation of health, both in trees and plants; and, on the supposition of proper culture, the judicious use of the knife to thin out superfluous, diseased, or injured branches, shoots, or leaves; and of the scraper, to remove mosses and rough bark already cracked and separating, are all that can be done to be depended on. Various unctions, oils, washes, compositions, and plaisters, have been tried and recommended for curing the canker, mildew, blight, blotches, barrenness, gum, &c.; but few or none of them can be depended on. For the mildew, canker, &c. the most effectual mode of procedure is to correct the deficiencies of the subsoil and soil, renewing the latter entirely, if necessary; to cut out as far as practicable the diseased or wounded part; and, in the case of barrenness, to cut in or shorten even the healthy wood. Wherever amputation takes place, the wound will heal, if the air is excluded by prepared clay or any adhesive mixture, provided always, that the principle of life exist in tolerable vigor in the tree. Every thing, indeed, in plants as in animals, depends on the *vis medicatrix naturæ.*

Sect. IX. *Gathering and Preserving Vegetables and Fruits, and sending them to a Distance.*

1135. A good deal of the satisfaction derived from a kitchen-garden depends on the judicious performance of this part of the gardener's duty. All kitchen crops are gathered by degrees; and in general it is desirable to begin to reap as soon, and continue gathering as long, as possible. At the same time, no vegetable ought to be gathered till it has attained the requisite degree of maturity, nor offered for use when it has begun to decay. What this degree is, often depends on the particular tastes of families, or their domestics: thus cabbages are most esteemed in Edinburgh when fully headed and blanched; while, in London, they are preferred open and green, &c. Equal differences in taste as to peas, celery, lettuce, and indeed most other kitchen crops, might be noticed. The operations of gathering kitchen crops are either cutting off the part desired, breaking or pulling it off, as in the case of peas, beans, &c. or pulling or rooting up, as in the case of onions, turnips, potatoes, &c. Each of these operations ought to be performed with due regard to the plant, where that is to remain, as in the case of the pea; and to the adjoining plants of the same sort, as in the case of pulling turnips, onions, &c. As soon as any plant has furnished its crop or produce, the root and other remains ought to be immediately removed to the dung or compost heap. (See 1071.)

1136. *Gathering Fruits.* This operation in the case of the small fruits, as the gooseberry, strawberry, &c. is generally performed by the under gardeners; but wall and espalier fruit ought to be gathered by the head-gardener. Where the utmost delicacy is desired, the berry gatherer (*fig.* 67.) ought to be adopted for the small fruits, and also for plums, apples, and other fruits on espaliers. For the finer fruits, as the peach, nectarine, &c. the peach-gatherer (*fig.* 66.) lined with velvet, ought always to be adopted.

The ice-house, Niel observes, is found particularly useful for *preserving* esculent roots, and likewise celery during winter. "Where parsnips and beet-roots are left in the ground over winter, they must be lifted at the approach of spring, as they become tough and woody whenever there is a tendency to form a flower-stalk. These roots may, therefore, at this season, be placed in the ice-house, and preserved there for a considerable time in excellent order. In the summer season during hot weather, various kinds of vegetables, as peas, kidney-beans, cucumbers, &c. can be kept fresh in it for several days; fruits gathered in the morning, which is the most proper time, may be here kept cool, and with all their freshness and flavor, until required for the dessert in the afternoon. Several ice-houses excellently adapted not only for the main purpose, but for these secondary views, which nowise interfere with the other, have lately been constructed in the neighbourhood of Edinburgh, under the directions of J. Hay, particularly at Dalmeny Park and Dundas Castle. These ice-houses have double walls, a passage being left between the outer and inner. In the thick wall immediately enclosing the ice, are four recesses, with stone shelves for receiving the vegetables or fruits. In the outer wall, the same object is provided for. The roof, it may be added, is arched with stone, and has a hole in the top, over the centre of the ice-chamber, for introducing the ice. The passage between the two walls is likewise arched, and has two or three small grated apertures, which are closed with fitted stones, and may be opened for the purpose of admitting light and air when wanted." *Supp. to Encyc. Brit.* art. *Hort.*

1137. There are few gardeners who have not occasionally to *send fruit and vegetables to a distance*, either to their own families, or in presents to others. It becomes then a part of his business to know how to do this properly.

Fruits of the most delicate sorts, it is well known, are sent from Spain and Italy to England, packed in jars with saw-dust from woods not resinous or otherwise ill-tasted. One large bunch of grapes is suspended from a twig or pin laid across the mouth of the jar, so as it may not touch either the bottom or sides; saw-dust or bran is then strewed in, and when full, the jar is well shaked to cause it to settle: more is then added, till it is quite full, when the supporting twig is taken away, and the earthen cover of the jar closely fitted and sealed, generally with fine stucco. In this way grapes may be sent from the most remote parts of Scotland or Ireland to the metropolis. When the distance is less, they may be sent enveloped in fine paper, and packed in moss. For extraordinary large bunches of grapes, the mode adopted by the Jewish spies (*Numbers*, ch. xiii.), and afterwards by Speechly, may be followed; that of carrying it suspended on a pole or staff resting on men's shoulders. The simplest mode for short distances is to wrap each bunch in fine soft paper, and lay them on a bed of moss in a broad flat basket with a proper cover.

Cherries and plums may be packed in thin layers, with paper and moss between each.

Peaches, apricots, and the finer plums, may each be wrapped separately in vine or other leaves, or fine paper, and packed in abundance of cotton, flax, fine moss, or dried short grass. Moss, it will be recollected, is apt to communicate its flavor to fine fruits, and so is short grass, if not thoroughly dried and sweetened. Cotton best preserves the bloom on peaches and plums.

Common culinary vegetables are seldom sent to a great distance. The great art is to preserve them fresh, for which purpose they ought to be laid loose in a close box, in the manner of botanic specimens; or closely packed in hampers, so as to exclude the air. The Brassica and lettuce tribe, if pulled up by the roots, and as it were replanted in a box of sand with a wicker-work cover, may be sent a journey of two or three weeks without injury, as practised in Russia. Celery, turnips, &c. may be packed in sand; potatoes and other roots, loose. Legumes and other summer crops generally in moss.

Sect. X. *Proportioning the Quantities of Vegetables to be grown.*

1138. On this part of a gardener's business hardly any instructions can be given; it depends on the extent of garden-ground and the wants of the family, as well as on the space occupied by particular vegetables. The pea requires the greatest breadth of surface; and next to this the cabbage tribe. The spaces for asparagus, artichokes, strawberries, sea-kale, &c. is in some degree fixed from the comparative permanency of these crops. Pot and sweet herbs require the least space, and ascending from these to breadths necessary for the pea and cabbage tribe, the proportions are as various as the kinds to be grown; and these can only be acquired properly by experience, and observation of what takes place in different gardens.

Some gardeners grow their own seeds *in part;* which, at first, is advantageous, as ensuring the continuance of particular varieties; but, after a few years, ends in their degeneracy. The best cultivators agree in the advantages to be derived from a change of seed, and this is most conveniently obtained by ordering them annually from reputable seedsmen. The care which the most eminent men in this line in London take to procure seeds of the best varieties of the Brassica tribe, the pea, the lettuce, and others, is very considerable, and such as could not, from limitation of soil and space, be equalled by any private gardener in all, though it might be in one or two varieties. Where rigid economy is followed, seeds of one or two sorts may be grown in such quantities as to procure, by exchange with a seedsman, all the varieties requisite for the garden.

The ordering of seeds from the seedsman is generally a matter of some difficulty to the young gardener, and Abercrombie is almost the only author who has endeavoured to remove it. The information afforded by his work, intitled the " *Seed Estimate*," will be found in the Horticultural Catalogue; where, under every culinary vegetable raised from seed, will be found the quantity, either stated in weight or measure, requisite for a certain space of ground; and this space generally that which is deemed sufficient for a considerable garden.

Sect. XI. *Miscellaneous Operations of Culture and Management.*

1139. In the foregoing sections many minor *points of practice* are necessarily omitted. Among these may be mentioned propagation of various kinds for the renewal of crops, mulching perennials, blanching leaves and stalks, rolling walks, preparing composts, regrafting trees to introduce better sorts, or a variety of sorts on one tree, performing operations on their roots or stems to render them more fruitful, &c. These and other practices described in the second part of this work (864 to 1070,) must be applied according to the judgment of the practitioner.

A garden, as already hinted, may be *managed* so as to produce good crops; and yet not so as to be agreeable to the eye. In general it may be observed, that the English gardeners excel in the former, and the Scotch in the latter part of practice. The Dutch and Flemish seem, in some degree to combine both, and this ought to be attempted, and persevered in till perfection is attained, by every British gardener.

The first requisite to good management is a proper establishment of laborers, and resources as to manure, seeds, repairs, &c. adequate to the extent and character of the garden. The next thing necessary is the entire *independence of the gardener*, as far as respects his province. The constant, irksome interference of masters and mistresses, stewards, or others, is justly complained of by every gardener who understands his business. Where the proprietor is as it were head-gardener, in that case he ought to make use of mere workmen, or of such gardeners as are not over-ambitious in their profession. In general it may be observed, that gardens so managed are ill managed, and often not well cultivated.

On the supposition that the head-gardener has a *thorough knowledge of his business*, the next requisite is a taste for *order and neatness*. This taste is generally acquired in youth, from the instruction or imitation of parents or masters; but it may be greatly increased in grown-up persons, when they perceive its advantages, and in head-gardeners, when a demand for it is created by their employers.

Industry and steadiness are perhaps in no line of life more necessary than in that of a gardener. Whole crops may be easily ruined by a day's neglect; and not only whole crops, as in the case of neglecting cucumber frames, for example, but the whole produce of a year, or of several years, as in the case of neglecting a peach-house for one hot day.

Unless a man is endowed with, and has well cultivated the faculty of *attention*, he can never excel in any thing. Without an *ever-active attention*, a gardener will not see what is out of order, or unsightly in his garden, and of course will not think of correcting it. Many people are so deficient in this respect, that their knowledge is entirely confined to the few objects with which their mode of procuring a living obliges them to be conversant. Something more than this is wanting in a gardener who would be master of his business; and it must be confessed, to the honor of many gardeners, that they excel in point of general observation and knowledge.

Our remarks on order and neatness already given (1071), are referable to every class of gardens; and the reader will here apply them, as far as respects the kitchen-garden. Marshall, after some judicious observations on the subject of managing a garden, thus concludes: " The management of a garden (summarily speaking) consists in *attention and application*; the first should be of that wary and provident kind, as not only to do well in the present, but for the future; and the application should be of so diligent a nature as (willingly) ' Never to defer that till to-morrow which may be done to-day.' Procrastination is of serious consequence in gardening; and neglect of times and seasons is fruitful of disappointment and complaint. It will often happen, indeed, that a gardener cannot do what he would; but if he does not do what he can, he will be most justly blamed, and perhaps censured by none more than himself." *Introd to G.* p. 59.

Chap. V.

Of the general Management of Orchards.

A private orchard is, in some cases, treated entirely as a kitchen garden, in which case the foregoing chapter contains the general outline of management. Vegetables and small fruits, however, are seldom well flavored when grown under the shade and drip of trees, and, therefore, orchards are commonly either but slightly cropped, or laid down in pasture, after the trees are a few years established.

Sect. I. *General Culture.*

1140. *Digging.* "Many orchards would bear much better," Marshall observes, "if the whole ground (as far as the roots extend) were, before winter, dug or ploughed over every second or third year, and dressed, by digging in some rotten dung, or sprinkling over the whole (when rough dug) soot and pigeons' dung, or that of any other poultry; this will wash in by rains and snows, and do much good. Or, if an orchard were ploughed, or rough dug, every year, immediately after the fall of the leaf without manuring, it would be very beneficial."

According to Abercrombie, "The taking of light, green crops near and among fruit-trees tends to keep the ground more effectually stirred and recruited, than if periodical diggings or hoeings were prescribed merely for the sake of the trees, because labor, for which the recompence is not direct, is constantly liable to be neglected. Nevertheless circumspection must be exercised, neither to dig too near, nor too deep among garden-trees, lest the roots should be loosened or injured."

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1145. *Mulching and Clothing the Stems.* These are operations of more importance than most modern gardeners are aware of. They were generally practised formerly, and are still carefully followed by the Dutch and Flemish as well as in France and Italy.

Mulching. To protect the roots of autumn-planted trees from the frost of the succeeding winter, and from drought in the summer, Abercrombie directs to "lay mulch about the stem, to the distance of two feet round, and six inches in thickness; or substitute dry litter in winter, or a thin layer of turf in summer."

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Chap. V.

Of the general Management of Orchards.

A private orchard is, in some cases, treated entirely as a kitchen garden, in which case the foregoing chapter contains the general outline of management. Vegetables and small fruits, however, are seldom well flavored when grown under the shade and drip of trees, and, therefore, orchards are commonly either but slightly cropped, or laid down in pasture, after the trees are a few years established.

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Clothing the stems of standard-trees by an envelope of moss, or short grass, or litter wound round with shreds of matting, is of great use the first year after planting, to keep the bark moist, and thereby aid the ascent and circulation of the sap in the alburnum. This operation should be performed at or soon after planting, and the clothing may be left on till by decay it drops off of itself; it is of singular service in very late planting; or when, from unforeseen circumstances, summer-planting becomes requisite. It is strongly recommended by Diel, and should, in the cases, at least of late and summer planting, go hand in hand with mudding in and panning and mulching.

SECT. II. *Pruning Orchard-Trees.*

1146. The first object in pruning a *newly-planted orchard or standard-tree,* is the formation of a head. According to Abercrombie, this ought in most kinds to be "circular, compact, and proportioned to the strength of the stem, with the branches well distributed, and sufficiently open in the centre to admit the free circulation of air."

For this purpose he directs, "In the first spring after a young standard has been planted, examine the primary branches, to see whether they will be sufficient, with the secondary laterals to be forced out by shortening, to form a good head. The primary branches should be so placed as to balance each other, and be equally distributed round the tree. Thus, three in a triangle; four at right angles; five, six, and even seven, shooting at pretty equal distances, might be retained: but it is seldom that more than four well placed offer, which is a good number. These first branches, if there be no secondary laterals, or none well placed, should be shortened down to two or four eyes each; or reduce a strong shoot to one-third of its length, and a weak shoot to two-thirds. The second spring, again revise the branches and secondary shoots, and reserve only so many as are vigorous and well distributed. Afterwards leave the head to form of itself, cutting out superfluous and ill-placed shoots, and shortening for the production of new laterals only to fill a vacancy. Luxuriant limbs, which are likely to be disproportionately large, should be rejected as weakly shoots. In the third or fourth year after planting a maiden tree, the foundation of a good head having been obtained by judicious shortening, and the plant sufficiently strengthened, it will become proper to let the tree proceed to bearing with no greater check from the knife than is unavoidable. To this end, the lower branches should not be shortened at all, and the upright leaders very little. But where two shoots cross, let the worst be cut out. Moderate-sized and slender shoots are more fruitful than strong luxuriant wood."

"The object in pruning young trees," Nicol observes, "is to form a proper head. Generally speaking, the shoots may be pruned in proportion to their lengths, cutting clean away such as cross one another, and fanning the tree out towards the extremities on all sides; thereby keeping it equally poised, and fit to resist the effects of high winds." "When it is wished to throw a young tree into a bearing state, which should not be thought of, however, sooner than the third or fourth year after planting, the leading branches should be very little shortened, and the lower or side branches not at all; nor should the knife be used, unless to cut out such shoots as cross one another, as above hinted."

1147. *Bearing-Trees.* "After an orchard-tree is come into bearing," Abercrombie observes, "continue at the time of winter pruning, either every year, or every two, three, or four years, as an occasion is perceived, to cut out unproductive wood, crowded spray, and decayed parts. Also reduce long and outrunning ramblers, and low stragglers, cutting them to some good lateral that grows within limits. Where fruit-spurs are too numerous, then cut the strongest and most unsightly. Also keep the tree pretty open in the middle. If it be necessary to take off large branches from aged trees, use a chisel or saw, and afterwards smooth the wound with a paring-knife. In case old wood is to be cut down to young shoots springing below, to make the separation in summer will be of more advantage to those young shoots, though it is not a common practice, on account of the liability of many stone-fruit bearers to exude gum, when a large branch is lopped in the growing season. Observe to keep the stem clear from all lateral shoots, and eradicate all suckers from the root."

1148. Nicol directs that "on *aged trees,* that have run into a confusion of shoots and branches, and whose spurs have become clustered and crowded, the saw and the knife may be exercised with freedom; observing to cut clean away all useless spray, rotten stumps, and the like excrescences. Thin out the spurs to a moderate consistency, so as to let the air circulate freely among the leaves and fruit in the summer season, and to admit the rays of the sun, so as to give the fruit color and flavor."

Marshall strongly recommends "thinning the branches of orchard-trees for the same objects," adding, "that it is in general much neglected." He recommends "a little pruning of standards every year; and a general one (rather free) every three or four years, to cut out what is decayed, and some of the older wood, where a successional supply of young may be obtained to succeed, as the best way to keep the trees in vigor, and have the best of fruit; for that which grows on old wood gets small and austere." The same author judiciously remarks, that trees with heavy fruit, as the apple and pear, should have, if possible, their branches rather upright; but that light fruited trees, such as the cherry, will admit of drooping branches. We have already quoted some excellent general observations from T. A. Knight to the same effect (see 955.).

1149. The *season* for pruning orchards is generally winter or early in spring — not later than February, according to Abercrombie and Nicol. Quinteney says, "A weak tree ought to be pruned directly at the fall of the leaf." And Abercrombie, "To prune in autumn strengthens a plant, and will bring the blossom-buds more forward; to cut the wood late in spring tends to check a plant, and is one of the remedies for excessive luxuriance."

1150. *Treatment of deformed or diseased trees.* Where a tree is stinted, or the head ill-shaped, from being originally badly pruned, or barren from having overborne itself, or from constitutional weakness, the most expeditious remedy is to head down the plant within three, four, or five eyes (or inches, if an old tree) of the top of the stem, in order to furnish it with a new head. The recovery of a languishing tree, if not too old, will be further promoted by taking it up at the same time, and pruning the roots; for as, on the one hand, the depriving too luxuriant a tree of part even of its sound healthy roots will moderate its vigor; so, on the other, to relieve a stinted or sickly tree of cankered or decayed roots, to prune the extremities of sound roots, and especially to shorten the dangling tap roots of a plant, affected by a bad subsoil, is in connection with heading down or very short pruning, and the renovation of the soil, and draining, if necessary, of the subsoil, the most availing remedy that can be tried. *Abercrombie.*

1151. *Diseases.* A tree often becomes stinted from an accumulation of moss, which affect the functions of the bark, and render the tree unfruitful. This evil is to be removed by scraping the stem and branches of old trees with the scraper; and on young trees a hard brush will effect the purpose. Abercrombie and Nicol agree in recommending the finishing of this operation by washing with soap-suds, or a medicated wash of some of the different sorts for destroying the eggs of insects.

Wherever the bark is *decayed or cracked,* Abercrombie and Forsyth direct its removal. Lyon, of Edinburgh, has lately carried this practice to so great a length as even to recommend the removal of a part of the bark on young trees. Practical men, in general, however, confine the operation to the cracked bark which nature seems to attempt throwing off; and the effect, in rendering the tree more fruitful and luxuriant, is acknowledged by Niel in his "Account of Scottish Gardening and Orchards," and by different writers in the London and Edinburgh Horticultural Transactions.

The other *diseases* to which orchard trees are subject, are chiefly the *canker, gum, mildew,* and *blight,* which, as we have already observed, are rather to be prevented by such culture as will induce a healthy state, than to be remedied by topical applications. Too much lime, Sir H. Davy thinks, may bring on the *canker,* and if so, the replacing a part of such soil with alluvial or vegetable earth, would be of service. The *gum,* it is said, may be *constitutional,* arising from offensive matter in the soil; or *local,* arising from external injury. In the former case, improve the soil; in the latter, apply the knife. The mildew, it is observed by T. A. Knight and by Abercrombie, "may be easily subdued at its first appearance, by scattering flour of sulphur upon the infected parts." As this disease is now generally considered the growth of parasitical fungi, the above remedy is likely to succeed. For the *blight* and *caterpillars,* Forsyth recommends burning of rotten wood, weeds, potatoe haulm, wet straw, &c. on the windward side of the trees when they are in blossom. He also recommends washing the stems and branches of all orchard trees with a mixture of "*fresh cow-dung with urine and soap-suds,*" "as a white-washer would wash the ceiling or walls of a room." The promised advantages are, destruction of insects, and "fine bark;" more especially, he adds, "when you see it necessary to take all the outer bark off."

Sect. III. *Of gathering and storing Orchard Fruits.*

1152. The *gathering* of orchard fruits, and especially apples, from standards, should be performed in such a manner as not to damage the branches, or break off the spurs. Too frequently the fruit is allowed to drop, or they are beat and bruised by shaking the tree, and using long poles, &c. Nicol directs that "they should never be allowed to drop of themselves, nor should they be shaken down, but should be pulled by the hand (or apple-gatherer, *fig.* 68.) This may be thought too troublesome a method; but every body knows that bruised fruit will not keep, nor will it bring a full price. The expence of gathering, therefore, may be more than defrayed, if carefully done, by saving the fruit from blemish." *Kal.* 257.

Forsyth says, "As apples shaken or beaten down with a pole never keep in winter, they ought all to be hand-picked by a person standing on steps made on purpose. The step-ladder should be light, in two pieces, to disengage the back at pleasure, by drawing the bolt; and they should have a broad step at top for a man to stand on, and to place a basket by his feet. In the larger baskets or hampers, in which the fruit is to be placed to be wheeled away, lay some short grass mowings, perfectly dry, (which ought to be provided in summer, and kept dry,) to prevent the fruit from being bruised.

In respect to the time of gathering, Nicol recommends "that pears and apples should not be pulled till their seeds be of a dark brown, or blackish color." The criterion of ripeness, adopted by Forsyth, is their beginning to fall from the tree. He says, "Observe attentively when the apples and pears are ripe; and do not pick them always at the same regular time of the year, as is the practice with many. A dry season will forward the ripening of fruit, and a wet one retard it; so that there will sometimes be a month or five weeks difference in the proper time of gathering. The method that I have practised is, to observe when the fruit begins to fall, (I do not mean what we call wind-falls, or the falling of such as are infested with the caterpillar, &c.), but sound fruit; I then put my hand under it; and if it comes off without any force being used, I take it for granted that the fruit is perfectly ripe; unless the tree be sickly, which is easily known by the leaves or fruit being shrivelled. If the foregoing observations are attended to, the fruit will keep well, and be plump; and not shrivelled, as is the case with all fruit that is gathered before it is ripe."

"Gather pears," Marshall says, "of the summer sorts rather before they are ripe, as when thoroughly so they eat mealy, if kept above a day or two; even when gathered as they ought to be, in a week or less they will begin to go at the core. They should not, however, be gathered while they require much force to pull them off. Autumn pears must also not be full ripe at the time of gathering, though they will keep longer than those of the summer. Winter pears, on the contrary, should hang as long on the trees as they may, so as to escape frost, which would make them flat in flavor, and not keep well. Generally they may hang to the middle of October on full standards, a week longer on dwarfs, and to the end of the month on walls; but yet not after they are ripe. The art of gathering, is to give them a lift, so as to press away the stalk, and if ripe they readily part from the tree. Those that will not come off easy, should hang a little longer; for when they come hardly off, they will not be so fit to store, and the violence done at the foot-stalk may injure the bud there formed for the next year's fruit. Let pears be quite dry when pulled, and in handling avoid pinching the fruit, or in any way bruising it, as those which are hurt not only decay themselves, but presently spread infection to those near them: when suspected to be bruised, let them be carefully kept from others, and used first: as gathered lay them gently in shallow baskets."

"The jargonelle pear," Forsyth observes, "keeps best on the tree, as if gathered, it rots almost immediately."

With regard to keeping of orchard-fruits, the old practice, and that recommended by Marshall and Forsyth, commences with sweating. Nicol, and most modern gardeners, omit this process, and spread the fruit thinly on shelves, or the floor of the fruit-room.

"As to the keeping of apples," Marshall observes, "those which continue long for use should be suffered to hang late, even to November, if the frost will permit, for they must be well ripened, or they will shrink. Lay them on heaps till they have sweated a few days, when they must be wiped dry. Let them then lay singly, or at least thinly, for about a fortnight, and be again wiped, and immediately packed in boxes and hampers, lined with double or treble sheets of paper. Place them gently in, and cover them close, so as to keep air out as much as possible. Preserve them from frost through the winter. Never use hay for the purpose.

"Some of the choicest table sorts of apples may be treated as directed for the best pears."

1153. "*Keeping* pears," says the same author, "should be laid in a dry airy room, at first thinly for a few days, and then put them in heaps to sweat; in order to which, a blanket thrown over them will help. The fermentation must be watched, and when it seems to have passed the height of sweating, wipe the fruit quite dry gently with fine flannel, or clean soft linen, and store them carefully. The *storing* is thus: those to be used first, lay by singly on shelves, or on the floor, in a dry southern room, on clean dry moss, or sweet dry straw, so as not to touch one another. Some, or all the rest, having first laid a fortnight singly, and then nicely culled, are to be spread on shelves, or on a dry floor. But the most superior way is, to pack in large earthen, or China or stone jars, with very dry long moss at the bottom, sides, and also between them, if it might be. Press a good coat of moss on the top, and then stop the mouth close with cork, or otherwise, which should be rosined round with about a twentieth part of bees' wax in it. As the object is effectually to keep out air, (the cause of putrefaction,) the jars, if earthen, may be set on dry sand, which put also between, round, and over them, to a foot thick on the top. In all close storing, observe, there should be no doubt of the soundness of the fruit. Guard, in time, from frost those that lie open. Jars of fruit must be soon used after unsealing."

"When the fruit is carried to the fruit-room," Forsyth directs "to lay some of the dry short grass on the floor, in the area of the room; then take the fruit gently out of the baskets, and lay it in heaps on the top of the grass, keeping each sort in a separate heap; the heaps may be from two to three feet high, or according to the quantity of fruit that you have. When the heaps are completed, cover the tops at least two inches thick with short grass, in order to sweat them. Let them lie a fortnight, then open the heaps and turn them over, wiping each apple or pear with a dry woollen cloth, which should be frequently dried during the process, observing now to lay in the middle the fruit which before was at the top. Let the heaps now remain eight or ten days, covered as before; by that time, they will have thrown out the watery crudities which they may have imbibed during a wet season; then uncover the heaps, and wipe the fruit carefully one by one, as before, picking out every one that is injured, or has the least spot, as unfit for keeping.

"During the time that the fruit is sweating, the windows should be left open, except in wet and foggy weather, to admit the air to carry off the moisture which perspires from the fruit. The perspiration will sometimes be so great, that, on putting your hand into the heap, it will come out as wet as if it had been dipped into a pail of water: when in this state it will be necessary to turn and wipe the fruit. In laying up fruit, the common practice has been, to lay it on clean wheat-straw; but I find, by experience, that, when any of the fruit begins to decay, if it be not immediately picked out, the straw, by imbibing the moisture from the decayed fruit, will become tainted, and communicate a disagreeable taste to the sound fruit." "The fruit on shelves," he adds, "should be turned two or three times during the winter; as delicate and tender fruit, by lying long without turning, is apt to rot on the underside, even if perfectly sound when laid up. Be particularly careful, however, to pick out all the damaged fruit. When the fruit is laid in, put the earliest sorts on the lower shelves, or in the lower drawers, according to their time of coming in, beginning with the nonsuch, golden rennet, and jenneting apples, and bergamot and beurré pears; thus, by proper management, you may have a constant succession of fruit from one season to the other.

"Those who keep their fruit in storehouses, for the supply of the London and other markets, as well as those who have not proper fruit-rooms, may keep their apples and pears in baskets or hampers; putting some soft paper in the bottoms and round the edges of the baskets, &c., to keep the fruit from being bruised; then put in a layer of fruit, and over that another layer of paper; and so on, a layer of fruit and of paper alternately, till the basket or hamper be full: cover the top with paper three or four times double, to exclude the air and frost as much as possible. Every different sort of fruit should be packed separately; and it will be proper to fix a label to each basket or hamper, with the name of the fruit that it contains, and the time of its being fit for use.

"But the best way of keeping fruit, is to pack it in glazed earthen jars. The pears or apples must be separately wrapped up in soft paper; then put a little well-dried bran in the bottom of the jar, and over the bran a layer of fruit; then a little more bran to fill up the interstices between the fruit, and to cover it; and so on, a layer of fruit and bran alternately, till the jar be full; then shake it gently, which will make the fruit and bran sink a little; fill up the vacancy at top with more bran, and lay some paper over it, covering the top with a piece of bladder to exclude the air; then put on the top or cover of the jar, observing that it fits as closely as possible. These jars should be kept in a room where you can have a fire in wet or damp weather."

Nicol's opinion, as to the sweating of fruits, is thus given: "I consider it an error to sweat apples, as it is termed, previous to storing them, either in the common way, with straw or hay, or as recommended by Forsyth, by the use of short grass. The fruit ever after retains a bad flavor. It should never be laid in heaps at all; but if quite dry when gathered, should be immediately carried to the fruit-room, and be laid, if not singly, at least thin on the shelves; the room being properly fitted up with shallow shelves on purpose, being well aired, and having a stove in it, that damp may be dried off when necessary." He adds, "If the finer fruits are placed on any thing else than a clean shelf, it should be on fine paper. Brown paper gives them a flavor of pitch. The finer large kinds of pears should not be allowed even to touch one another, but should be laid quite single and distinct. Apples, and all other pears, should be laid thin; never tier above tier. Free air should be admitted to the fruit-room always in good weather, for several hours every day; and in damp weather a fire should be kept in it. Be careful at all times to exclude frost from the fruit, and occasionally to turn it when very mellow."

Walnuts are generally beat off the tree with poles; but it does not appear that any harm would result to the fruit from leaving them to drop, or be shaken off by winds, or in part shaking them off. Sweating may be applicable to them, in order to the more ready separation of the outer or soft skin from the hard shell. This effected, they are to be spread thin till quite dry, when they may be preserved in bins or boxes or heaps.

"Walnuts for keeping," Forsyth observes, "should be suffered to drop of themselves, and afterwards laid in an open airy place till they are thoroughly dried; then pack them in jars, boxes or casks, with fine clean sand, that has been well dried in the sun, in an oven, or before the fire, in layers of sand and walnuts alternately; set them in a dry place, but not where it is too hot. In this manner, I have kept them good till the latter end of April. Before you send them to table, wipe the sand clean off; and, if you find that they have become shrivelled, steep them in milk and water for six or eight hours before they are used; this will make them plump and fine, and cause them to peel easily."

The chesnut is to be treated like the walnut, after the husk is removed, which, in the chesnut, opens of itself. Knight (*Hor. Tr.* i. p. 247.) preserves chesnuts and walnuts during the whole winter, by covering them with earth as cottagers do potatoes.

Filberts may always be gathered by hand, and should afterwards be treated as recommended for walnuts. Forsyth recommends packing nuts, intended for keeping, in jars or boxes of dry sand.

The berberry and cornel are used immediately, when gathered, as preserves.

The medlar is not good till rotten ripe. It is generally gathered in the beginning of November, and placed between two layers of straw, to forward its maturation. "Others," Marshall observes, "put medlars in a box on a three-inch layer of fresh bran, moistened well with soft warm water; then strew a layer of straw between them, and cover with fruit two inches thick; which moisten also, but not so wet as before." In a week or ten days after this operation, they will be fit for use.

Quinces are gathered in November, when they are generally ripe. After sweating in a heap for a few days, they are to be wiped dry, and placed on the fruit-shelf at some distance from each other.

The service, or sorb apple, never ripens on the tree in England. Where grown, it is gathered late in autumn, in a very austere state, and laid on wheat-straw to decay. It thus becomes eatable in a month. See 1032 to 1034.

Sect. IV. *Of packing Orchard and other Fruits for Carriage.*

1154. As it is a very common part of a gardener's duty to *send fruits* to his family while living at a distance, or in the metropolis, we shall here insert Forsyth's remarks on packing them for that purpose.

"If fruit be to be sent to any considerable distance, great care should be taken in packing it: which should not be in baskets, as they are liable to be bruised among heavy luggage, and the fruit, of course, will be injured. I would, therefore, recommend boxes made of strong deal, of different sizes, according to the quantity of fruit to be packed. The following are the dimensions of the boxes in which we send fruit by the coach to Windsor and Weymouth, for the use of his Majesty and the Royal Family; viz.

"The larger box is two feet long, fourteen inches broad, and the same in depth. The smaller box is one foot nine inches long, one foot broad, and the same depth. These boxes are made of inch-deal, and well secured with three iron clamps at each corner: they have two small iron handles, one at each end, by which they are fastened to the roof of the coach; in these boxes we send melons, currants, pears, peaches, nectarines, plums, and grapes, packed so as always to have the heaviest fruit at bottom. The melons are wrapped up in soft paper: the pears, peaches, nectarines, plums, and grapes, are first wrapped up in vine-leaves, and then in paper. The cherries and currants are packed in a flat tin box, one foot four inches long, ten inches broad, and four deep.

"In packing, proceed thus:—first, put a layer of fine long dry moss in the bottom of the tin box, then a layer of currants or cherries, then another layer of moss, and so on, alternately, fruit and moss, until the box is so full, that, when the lid is hasped down, the fruit may be so firmly packed as to preserve them from friction. Make a layer of fine moss and short, soft, dry grass, well mixed, in the bottom of the deal box; then pack in the melons with some of the same, packing it tight in between all the rows, and also between the melons in the same row, till you have finished the layer; choosing the fruit as nearly of a size as possible, filling up every interstice with the moss and grass. When the melons are packed, lay a thin layer of moss and grass over them, upon which place the tin box with the currants, packing it firmly all round with moss to prevent it from shaking; then put a thin layer of moss over the box, and pack the pears firmly (but so as not to bruise them) on that layer, in the same manner as the melons; and so on with the peaches, nectarines, plums, and lastly, the grapes, filling up the box with moss, that the lid may shut down so tight as to prevent any friction among the fruit. The boxes should have locks, and two keys, which may serve for them all; each of the persons who pack and unpack the fruit having a key. The moss and grass should always be returned in the boxes, which, with a little addition, will serve the whole season, being shaken up and well aired after each journey, and keeping it sweet and clean. After the wooden box is locked, it will be necessary to cord it firmly. My reason for being so particular on packing of fruit is, that I have known instances of its being totally spoiled in the carriage from improper packing. By pursuing the above method, we have never failed of success; and if fruit be packed according to the foregoing directions, it may be sent to the farthest parts of the kingdom, by coaches or waggons, with perfect safety."

1155. As in treating of kitchen-garden culture, so here various lesser points of *orchard culture and management* are omitted, which the judicious gardener will not overlook in practice; provided he has, as he ought to have, the whole art and science of gardening as it were stored up in his mind, and ready to apply on every occasion. Among these points, may be named the occasional grafting of orchard-trees, with a view, either to introduce new or preferable sorts, or to fill up the head of a tree. Thinning out temporary trees; introducing young trees in intervals of old orchards to succeed the old; guarding from thieves; and a variety of other matters, which circumstances will always suggest to the observing eye and fertile mind of a gardener attached to his profession.

In regard to neatness, order, and systematic arrangement, see 1071. and 1139.; and with respect to recent improvements, which have not yet been fully sanctioned by extensive adoption, they have been already enumerated in Part II. b. iv. *On the Operations of Gardening.*

Chap. VI.

Forcing and Culinary Hot-House Department.

Abercrombie and Nicol very justly eulogize this branch, as calculated to display the "top and mastership of the gardener's art." To be successful, a degree of skill, vigilance, constant and persevering attention are requisite, in proportion to the object to be attained. The general principles of the construction of hot-houses, whether for culinary or ornamental purposes, have already been laid down, (628. to 703.), and, therefore, the object, in this chapter, is to detail the most approved practice in regard to the particular construction of such as belong to the culinary and fruit garden. These are the *pinery, vinery, peach-house, cherry-house, fig-house, culinary-pits, frames, and mushroom-house.*

Sect. I. *Pinery.*

1156. The necessity, in hot-houses, of placing all plants intended to thrive near the glass, and a bed of bark or leaves for plunging pots, being most convenient, when flat or gently sloping, have led to a comparatively determinate form for pineries. The characteristic of this form is a low and rather flat roof, nearly parallel to the bark bed. This gave rise, many years ago, to the growing of pines in pits, as practised by the Dutch, and generally on the continent, and as recently adopted by most commercial gardeners; by Nicol, in giving designs for this class of buildings, and by Baldwin, one of the best pine-growers of the present day.

Justice, Speechly, M'Phail, Tod, and others, have given very good plans for pineries; for these structures, as Nicol observes, may be very differently constructed, and yet the plants thrive. But the following plan of this author we consider as preferable to most others.

"The culture of pine-apples is attended with a heavier expense than that of any other fruit under glass; especially if they be grown in lofty stoves, the erection of which is very expensive, and the keeping up proportionally more so than that of humbler stoves, or flued pits.

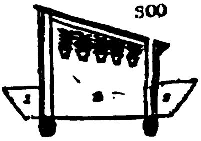
"But, independently of all considerations of expense, (which may not be valued by some, provided they can obtain good fruit), pine-apples may certainly be produced in as great perfection, if not greater, and with infinitely less trouble and risk, in flued pits, if properly constructed, than in any other way. I would therefore have the pinery detached from the other forcing-houses, and to consist of three pits in a range; one for crowns and suckers, one for succession, and one for fruiting plants. The fruiting pit to be placed in the centre, and the other two, right and left; forming a range of a hundred feet in length; which would give pine-apples enough for a large family.

"The fruiting-pit to be forty feet long, and ten feet wide, over walls; and each of the others to be thirty feet long, and nine feet wide, also over walls. The breast-wall of the whole to be on a line, and to be eighteen inches above ground. The back-wall of the centre one to be five feet, and of the others, to be four and a half feet higher than the front. The front and end flues to be separated from the bark-bed by a three-inch cavity, and the back flues to be raised above its level.

" The furnaces may either be placed in front, or at the back, according to conveniency; but the strength of the heat should be first exhausted in front, and should return in the back flues. The fruiting-pit would require two small furnaces, in order to diffuse the heat regularly, and keep up a proper temperature in winter; one to be placed at each end; and either to play, first in front, and return in the back; but the flues to be above, and not alongside of one another; as in that latter way they would take up too much room. The under one to be considered merely as an auxiliary flue, as it would only be wanted occasionally. None of these flues need be more than five or six inches wide, and nine or ten deep. Nor need the furnaces be so large, by a third or a fourth part, as those for large forcing-houses; because there should be proper oil-cloth covers for the whole, as guards against severe weather, which would be a great saving of fuel. The depth of the pits should be regulated so as that the average depth of the bark-beds may be a yard below the level of the front flues; as to that level the bark will generally settle, although made as high as their surfaces, when new stirred up. If leaves, or a mixture of leaves with dung, are to be used instead of bark, the pits will require to be a foot, or half a yard deeper.

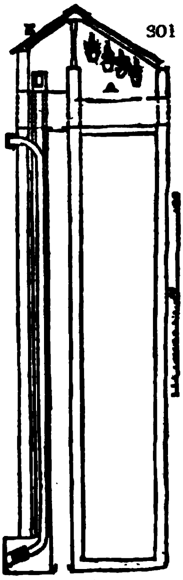
" It may be thought too much to insinuate, that those who have large pineries should turn them to other purposes, and erect such as are described above. There cannot be a doubt, however, respecting the satisfaction that would follow, if to have good fruit at an easy rate were the object. I have given designs for no other kinds of new pineries these six years past, but such as these; with some variations respecting extent, however, in order to suit different purses."

300



1157. The succession-beds or frame, according to Baldwin's plan (*fig.* 300.), in which the young plants are to remain both winter and summer, should be constructed of timber, seven feet wide, and seven feet three inches high at the back, the front being in the same proportion. The method of preparing the bed is as follows: — " Sink your pit (2.) three feet three inches deep, as long as you require, and sufficiently broad to admit of linings on each side (1, 1.); make a good drain at the bottom of the pit to keep it dry; then set posts, about the dimensions of six inches square, in the pit, at convenient distances, (say about the width of the top lights,) and case it round with one inch and a half deal wrought boards above the surface, and below with any inferior boards or planks. The dimensions of my succession-bed or frame, are thirty-nine feet long, and seven feet wide; containing two hundred and seventy-three square feet, which will hold three hundred and fifty suckers, from the end of September till the seventh of April." *Cult. of Anan.* p. 11.

301



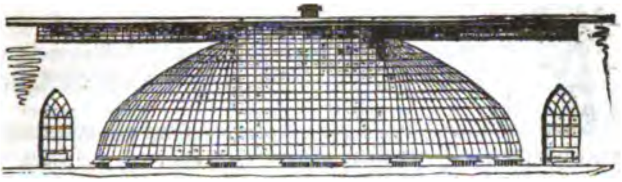
The fruiting-house of Baldwin (*fig.* 301.) is a pit with a walk behind; " in it the glass should be closely puttied, to keep out the cold air, and to retain the warm, and in the back there should be three lids (E.), to admit air; the dimensions of each to be three feet long and one foot deep. The flue makes only one course in the passage behind." *Cult. of Anan.* p. 19.

1158. The house which T. A. Knight devotes to the growth of pines, may be described as a pit forty-five feet long, nine feet nine inches wide, the front parapet eighteen inches, and the back wall nine feet high. The roof is constructed of our bar, fixed, and the bars curved, so that the versed sine of the segment is about twelve inches. Air is given by horizontal openings immediately under the copings of both walls. More light is admitted into such a pit in March, than into a common flat-roofed pit with wooden sashes in May or June.

In a house on the curvilinear principle (*fig.* 302.), erected of our bar, and from our designs, at Langport in Somersetshire, by Messrs. Bailey, already mentioned (635.), we have attempted to combine the advantages of a pine-pit and vinery. This house is fifty feet long by sixteen feet wide, contains 370 superficial feet of bark-pit for pine plants; 1400 superficial feet for training vines; and space for 500 pots of strawberries or

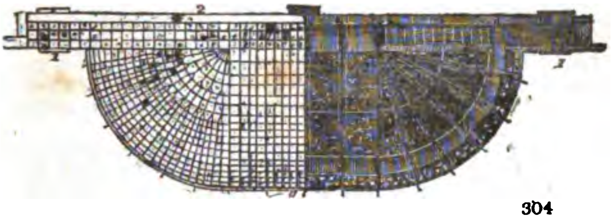
French-beans; quantities greater in proportion to the glass roof, than have hitherto been obtained in any hot-house of the common form and similar dimensions.

302



This house is entered by lobbies at each end (*fig.* 303. 1), which communicate with a back passage, having a glass roof and trellis for vines (2): in the back wall of this passage, and also in the front of the house, are glazed ventilators opening outwards (*fig.* 304, 3), through which the vines (5) are introduced and withdrawn at pleasure. The pine pits (7) are raised so as to be as near the glass as is desirable, by vaulting them beneath (6); against the front of these pits, shoots of vines are brought down from the roof, and trained (9), and pots are placed over the front flue (8). The vines, close under the roof, are trained on moveable trellis rods, composed of a centre rod and two side wires, and placed five feet apart; these rods are hinged to the front props, and supported in the middle of the roof, and at top, by chains and hooks, and in this way can be raised or lowered at pleasure. This house, since its erection, in 1817, has given the greatest satisfaction, and already produces considerable crops of grapes.

303



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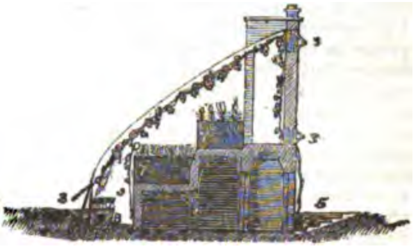
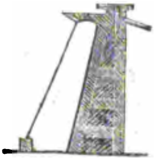


Sect. II. *Vinery.*

1159. The most useful, generally successful, and simplest construction of a hot-house, is that of a vinery; and the fruit-tree the most easily cultivated of all that are grown under glass, is the vine. For a crop which is to be forwarded by the natural influence of the sun, chiefly or alone, almost any form will suffice, provided the plants are trained near the glass. For very early crops, small houses with steep roofs (*figs.* 305 and 306.), in order freely to admit the sun in the winter and spring months, are most desirable, and the section (*fig.* 305.) of the steep-roofed house used by the Dutch, is not surpassed by any form adopted in this country. It is commonly supposed that pits are the best buildings for early forcing, and as far as respects artificial heat, they are not much inferior to the Dutch vinery; but as to light, without which forced productions are not worth using, they are, from the low angle of their roof, greatly deficient. A house for early forcing (*fig.* 306.) may be thirty feet long, eight feet wide; the glass (*a*) twelve feet high, placed at an angle of 15° to the perpendicular; the flue entering at one end (*f*) may pass under the front glass (*b*), and afterwards make two or three returns in the back wall (*d*); the vines may be trained on a trellis nearly parallel to the glass, between the flue and the back wall (*c*), and the shed behind may be fitted up with shelves (*e*), and used as a mushroom-house. Such a house, being small, will be very easily managed in the most severe winters.

305



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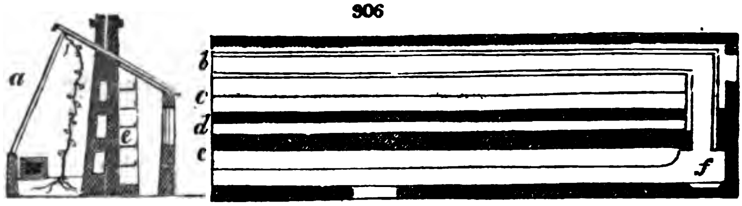


Speechly observes, that the frames or vineries made use of by the Dutch for early forcing, are generally about twenty-five or thirty feet long, about five feet wide at bottom, and at the top about three feet. The height generally about ten feet, which is that of the wall against which they are placed. The fire-place is at one end, and the flue runs along the bottom to the opposite end, and generally returns to a chimney built in the middle of the frame. The vines are brought down from the wall, and nailed all along the front close to the glass frames, and are securely covered at nights. The black and white sweet-water are the kinds preferred for this early forcing. As this kind of forcing spoils the vines, it is necessary to have the vine-walls at least five times the length of the frame, in order to furnish a succession of well-perfected wood. After the crop is over, therefore, the vines in the course of the ensuing winter are cut down nearly to the bottom, and they require a term of four or five years to recover themselves for another early crop. *Tr. on the Vine*, p. 127.

Similar forcing frames heated by a bed of dung within, have been adopted by P. Lindegaard, gardener to the King of Denmark. *New Method of forcing Grapes*, &c. 8vo. 1817.

According to Speechly, " Flued walls of about twelve or fourteen feet high, in a direction from east to west, with a roof, and glass lights covering a border of about ten feet wide on the south side of the wall, compose a proper vinery for this country. Upright glasses, two feet and a half or three feet high in front, to support the roof, are proper for vines to be forced at an early season, because it admits the sun and light to the border; but when grapes are not wanted at an early season, a considerable expence may be saved by adopting a low wall in front. The shade of this wall would be injurious to the border, if the vines were to be forced early in spring; but the meridian altitude of the sun, in the beginning of summer, renders it no way prejudicial at that season. Supposing a flued wall, twelve feet high, the breadth of the border ten feet, and the height of the upright glass frame, or wall in front, three feet, the roof will then form an angle of about forty-three degrees. Experience shows this to be a proper pitch for vines forced after the vernal equinox. I mention this circumstance, because some persons who give designs for buildings of this kind, lay so great a stress on this point, as to pronounce a vinery or peach-house incapable of answering the intended purpose, should the pitch of the roof happen only to vary a degree or two from their favorite angle. In Holland, the frames for winter-forcing are almost perpendicular, but for those forced in summer, they are almost as flat as those made use of for melons. Hence it follows, that the construction of the different frames, or buildings, for the purpose of producing grapes, should not only vary according to the quantity required, but also according to the season in which that fruit is intended to be produced. The roof should be steep for early forcing, and flatter for the summer." *Tr. on the Vine*, p. 99.

Perhaps no author has had more experience in the erection of hot-houses than Nicol, whose constructions for early and late graperies are as follow. The dimensions given by him, it may be alleged, are chiefly adapted to Scotland; but by adding from one foot to six to the lengths given, according as the site may approach the warmest climates of our island, retaining the directions of the flues, width of the house, &c. they become applicable to every part of Britain.

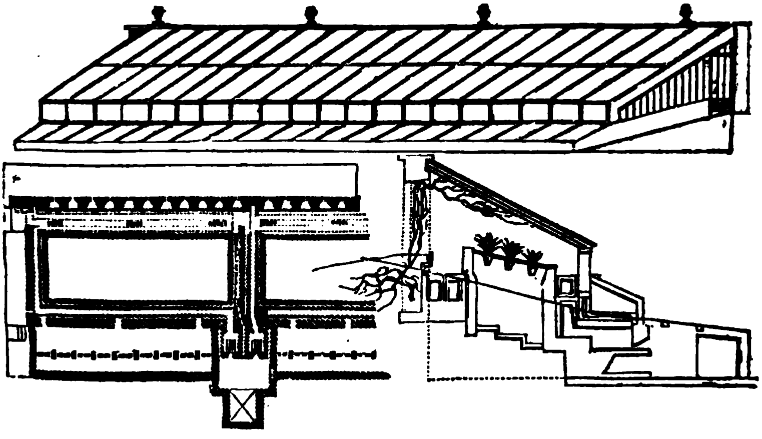
1160. " A grape-house for early forcing, to be commanded by one furnace, should not much exceed thirty feet in length. If it were forty or forty-five feet long, it would require two furnaces to be placed, and the flues to run, as described below. The width of the house may be ten or eleven feet, and the height thirteen or fourteen; the front, including parapet and glass, not exceeding four feet in height. But, if the roof were made to rest on the parapet, without having any upright glass, and if the parapet were about eighteen inches high, it would have a better pitch, and there would be a longer run for the vines.

" The front flue should be two feet clear of the parapet, should return in the middle of the border, and double by the back-wall, being separated from it by a three-inch cavity; that is, in the case of there being but one furnace for the house. But if the house be much above thirty feet in length, and require two furnaces, one should be placed at each end, in the shed behind, and the power of both should be brought to the front, the flue of the one to be placed within two feet of the parapet, and of the other close behind the first, being separated by a two-inch cavity only, and both to stand on a common foundation. The one may return in the middle of the house, and the other by the back-wall; but it will be unnecessary to have a double return to either of them; as a house of the above-mentioned width and height, to the extent of fifty feet in length, may thus be fully commanded.

"A late grape-house may be of any convenient length, from thirty to fifty feet; fourteen feet wide, and fifteen or sixteen feet high; with, or without, front glass, as above hinted. But if it have upright glass, both glass and parapet should not exceed five feet in height; as it is but seldom that any fruit grows below the angle of the rafter; and, if it do, it is never so well ripened as the fruit growing under the sloping sashes. The flues may be conducted, in every respect, as above directed for the early house, and the number of furnaces must be regulated by its length. If under thirty-five feet, one furnace may do; but if longer, it will require two furnaces, in order to have a perfect command of the temperature necessary for grapes. The parapet and front flue of both these houses should stand on pillars, three and a half feet deep under the ground-level, in order that the roots of the plants may have free scope to run to the border without the house; as the intention is to plant them inside, and train them, under the roof, to a trellis fixed to the rafters."

J. Hay seems to make very little difference in the slopes of glass-roofs for whatever purpose the house may be intended. In his very extensive designs for Lundie and Dulmeny (*fig.* 307.) the difference is inconsiderable. The same may be remarked of most of the ranges of houses built by G. Tod. See *Ed. Encyc.* art. *Hort.* and *Tod's Plans for Hot-houses*, &c. fol. 1812.

307



For a crop to ripen in July, Knight recommends an angle of 35°, Wilkinson (*Hort. Trans.*) and Miller (*Dict. in loco,*) 45°, which is that adopted most commonly for summer crops, both of grapes and peaches. Abercrombie says, "The diagonal side of a glass case, designed for a short periodical course of forcing, to begin the 21st of December, may be 55°; 21st January, 50°; 21st February, 46°; 21st March, 43°." He adds, "Too much importance must not be attached to the angle of inclination in the glass-work."

It is of some consequence to remark, that the roofs of vineries may be fixed, provided there are shutters in the front and back wall for ventilation, though for these, as for every description of house, gardeners prefer a roof in which the sashes slide, are raised up, or take off.

A grapery, on the curvilinear principle, with a fixed roof (resembling *fig.* 163.), was erected from our designs at Finchley, in 1818; no form or manner of construction can admit more light. The vines are trained close under the glass; ventilation effected by shutters in the front and back wall, and the whole is managed by one fire. It is a beautiful object, the vines have grown admirably, and last season, 1820, produced a small crop (their first) of highly-flavored fruit. Several other curvilinear-roofed vineries have been recently erected with roofs formed by the bar of our invention (*fig.* 160.), and from their decided superiority in admitting light, we have no doubt of curvilinear iron roofs being ultimately adopted, not only for vineries, but for every description of hot-house, as soon as the great importance of light to vegetation, and especially to the flavor of fruits, is fully understood by practical men.

Sect. III. *Peach-House.*

1161. Almost any shape will answer for a peach-house not intended for early forcing, provided that the trees are either standards or trained near the glass. Knight, and many practical gardeners, are of opinion, that the roofs of all peach-houses should be made to take off, in order to color the fruit, and afterwards expose the trees to the rains, &c. for the sake of destroying insects. The following is the result of Nicol's experience as to peach-houses.

" A peach-house for the earliest forcing, to be commanded by one furnace, may be of any length, from thirty to forty feet; eight or nine feet wide, and twelve feet high. It should have no upright glass. The parapet may be about eighteen inches in height, and the rafters should rest immediately upon it. The intention here is, to train the peaches and nectarines up the roof, in the same manner as vines, only a little nearer to the glass, and none against the back-wall. The front flue may run within two feet of the parapet, and should return by the back-wall, being separated from it by a three-inch cavity. The parapet and front flue must stand on pillars, three feet deep under the ground-level, in order to give full scope to the roots of the plants.

" A house intended as a succession house to the above, that is, not to be forced so early, may be of a like length, ten or eleven feet wide, and thirteen or fourteen feet high; also without upright, or front glass, and otherwise may be constructed in all respects as above. And,

" A late peach-house, to be managed by one furnace, may be forty or forty-five feet long; thirteen or fourteen feet wide, and fourteen or fifteen feet high. It may either have, or not have, upright glass in front; which should not, however, exceed four, or four and a half feet in height, including the parapet. The flues may be conducted as above specified for the early houses. The intention here is, to train plants on trellises against the back wall, and likewise half way up the roof, in the manner of vines; so that it may be termed a double peach-house."

M'Phail constructed a cheap pit or low house, for forcing peaches, of which the following are the outlines. " In the clear, I had it made sixty-four feet long, ten feet wide; the height of the back wall was four feet high, and the front five feet high, in pillars of brick-work four feet each in length, which supported the sill to support the frame for the lights to rest upon; so that there were in the front eight vacuities in width, four feet each between the said pillars, for the roots of the trees to extend into the border. In the inside of the pit, I had a wall built the whole length of the pit, and thirty inches distance from the front pillars. The wall was nine inches thick, and three feet six inches high, about one foot lower than the pillars of brick. I then made a border of good loamy earth, mixed with some very rotten dung, four feet deep, which left a vacancy between the pillars and the sill of nearly one foot, which were filled up with the earth of the border, which reached to the nine-inch wall within the pit, so that thirty inches wide of the border was in the inside of the pit. I had the border made fourteen feet wide." " I got the floor of the pit paved with bricks, and in the back side, between the pavement and the trees, there was between five and six feet, so that a person had room to walk under to prune and manage the trees." The door was made in the back wall, at the west end; and at the east end a fire-place was made, and a flue against the back wall, about three feet high, without a return. M'Phail began to force in the middle of March, and ripened abundant crops of fruit, in the month of July.

As a suitable peach-house, for early forcing, we would suggest a length of forty feet, width eight feet, and height twelve feet: the glass in two planes, each plane forming an angle with the perpendicular of fifteen degrees, and formed into sashes (*a*, *fig*. 308.) hinged at their upper angles, and opening outwards. The flue (*d*) entering the house at one end (*c*), passing under the front glass, and making two turns in the back wall; and the trellis (*e* and *b*), placed between the flue and back wall. Such a house will be easily managed, and, like the early vinery, may be covered by mats in front during the most severe nights of winter.

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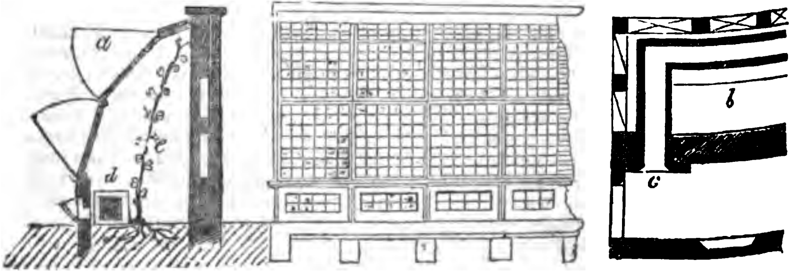
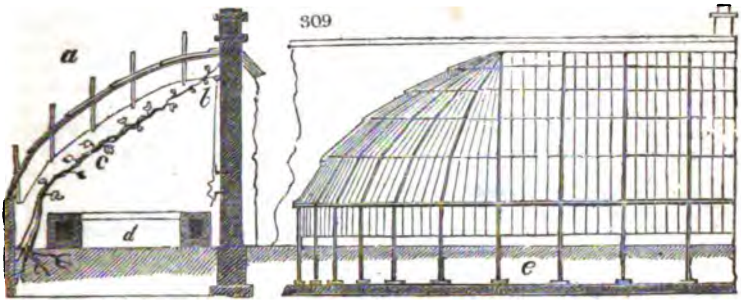
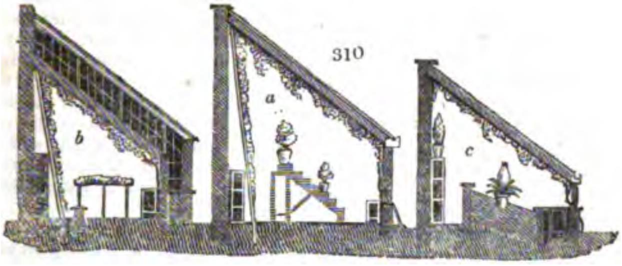


For a main crop, we would suggest a polyprosopic roof, with the sashes (*fig.* 309. *a*) opening on the principle of venetian blinds; the flue (*d*) may pass round the house, and the trellis (*c*) be placed between the flue and front glass; both the flues and front glass may be supported on cast-iron props (*e*). The length may be forty feet, breadth and height twelve feet.



It is a common practice to combine the vinery and peach-house, and to train the vines close under the glass, and the peach-trees against the back wall, (*fig.* 310, *a*); or to train the peach-trees against the back wall, and also on a flat or table trellis, in the middle of the house (*b*); but if the house be wide, neither modes are advisable, on account of the distance of the plants from the glass; and even in narrow houses, it can only be considered as a temporary expedient till the vines cover the roof. So important is light to every kind of plant, that, in our opinion, the vine should be very sparingly used even in pineries, where some plants are generally trained close under the roof (*c*), and where some gardeners think their shade beneficial.



Sect. IV. *Cherry-House and Fig-House.*

1162. Any form will answer for a *cherry-house*. Some market-gardeners grow them in houses placed south and north, glazed on all sides, as Andrews at Lambeth; others in pits, and some in moveable glass cases (*fig.* 134.) The following are Nicol's directions on this subject.

" A cherry-house, to be worked by one furnace, may be from thirty to forty feet in length; from ten to twelve feet wide, and twelve or fourteen feet high. The parapet a foot or eighteen inches, and the front glass two feet, or two and a half feet high. The front flue to stand on the same foundation with the parapet, and its return to be by the back-wall; but both flues to be separated from the walls by a cavity of three inches. The front parapet and flue to stand on pillars; which pillars should be thirty inches deep under the surface; the depth, or rather more than the depth requisite for the border. The back wall to be trellised for training cherries to; and the border to be planted with dwarf-cherries, or with dwarf apricots and figs, or with all three. The front and end flues to be crib-trellised, (*i. e.* shelves of lattice-work to be placed over them,) for pots of strawberries, kidney-beans, or the like."

Any form, not lofty, will suffice for a *fig-house*. One constructed like the cherry-house, Nicol considers, will answer " perfectly well." " The figs might be trained to the trellis at back, and either dwarf figs, apricots, or cherries, or all of these, might be planted in the border." As figs are not a popular fruit in Britain, a sufficient number for most families may be grown in pots and tubs, placed in the other hot-houses.

The culinary hot-houses are very frequently placed in a *range*, by which it is supposed something is saved in the expence of the ends, some heat gained, and greater convenience of management obtained. Hay, as we have seen (*fig.* 307.), has adopted this plan at Dalmeny Park, Lundie, and other places; and the same mode seems to be followed by Tod, of which, as an example, we may refer to a very substantial range (*fig.* 311.), constructed for the Honorable Champion Dymoke at Scrivelsby. One of the most ornamental ranges of this sort in the neighbourhood of London, is that of the Duke of Devonshire at Chiswick; but it is also the most gloomy within, of any we have seen. If we may submit our opinion, we should, in most cases, recommend detached houses (as in *fig.* 170.), in which we may add T. A. Knight coincides.

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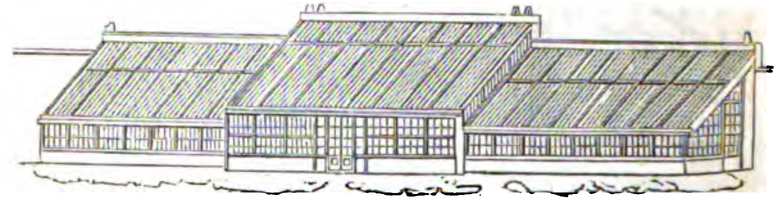

SECT. V. *Culinary Pits, Frames, and Mushroom-Houses.*

1163. These may be constructed either with or without flues; and either of such a height behind as to admit of a walk; or, so low, as to be managed like a common hot-bed frame. The intention of these pits, as far as culinary gardening is concerned, is first to force fruit-trees, as peaches, grapes, cherries, figs, apples, &c. in pots; and in this case the design which admits of a passage behind from which to water and manage the plants, will be found preferable; and secondly, to force strawberries, kidney-beans, potatoes, asparagus, sea-kale, rhubarb, &c. for which a pit sunk in the ground, and to be managed from without, will suffice, and is even preferable, because the plants may be brought close under the glass.

The *pit for fruit-shrubs* may be forty feet long, eleven feet wide, within walls; the angle of the roof from 15° to 20°; the back path two feet wide, the furnace placed at one end, and the flue passing along the front, separated by a three-inch vacuity from the tan-bed, and returning close under the back wall. These dimensions will give a bark-bed six feet wide, thirty-seven feet long, and, supposing the surface of the pit to be kept level, it may be raised to any convenient height, according to that of the trees to be forced. Whatever be the height to which the pit is raised, the back of the pit should always be, at least, three and a half feet higher than the front, which will admit of different sizes of trees. The sashes for this pit may be in two parts, one sliding over the other, as in hot-house roofs; but a better plan is, to have them to rise in the manner recommended for an early peach-house (*fig.* 308.).

The *pit for forcing herbaceous vegetables* may be in all respects of the same dimensions as above, but with the angle of the glass not more than 15°. On this plan and angle, the back of the pit will be two feet higher than the front: but the simplest plan is to omit the passage, and lessen the width of the pit two feet, retaining the slope of 15°, and the compound, or double sashes, between each rafter.

Pits without fire heat, to be worked by that arising from the bed of bark or dung, may be of any length, six or seven feet wide within, and with the glass at an angle of fifteen degrees.

Many gardeners approve highly of M'Phail's pit (*fig.* 140.), which, for growing early cucumbers and melons, may be considered as coming into general use. Abercrombie, after describing it as a "*flued pit without a furnace*," says, "some persons approve of this kind of frame, and others disapprove of it; but when the management of the air-chamber is understood, it may be applied very successfully to the forcing of early melons and choice esculents. It allows new stable-dung, even before any of the fiery particles are exhaled, to be used without any danger of burning the roots of the plants." *Pr. Gard.* p. 662.

1164. But *a pit for herbaceous vegetables*, to be heated by dung or other fermenting substances, which promises we think to surpass all others of that description, is the one adopted by J. West, of Castle Ashby, in Northamptonshire (*fig.* 312.). Nine years' experience enable its inventor to recommend it for neatness of appearance, the power of regulating the heat to the greatest nicety, and for forcing asparagus, strawberries, and the most delicate kinds of cucumbers. By raising the walls of the pit higher above the earth, it is evident it would answer equally well for growing pines, or forcing shrubs or tall-growing plants.

The dung is placed in a chamber (E) three feet and a half deep, being about eighteen inches below the surface-line; the walls (G) which surround it are nine-inch brick-work; both on the front and at the back of the chamber are two openings (A), about two feet six inches square each, with moveable doors through which the dung is introduced; the doors fit at bottom into grooves (B), and are fastened by a wooden pin and staple at top. In front of the doors, is a small area (C) sunk in the ground, surrounded by a curb of wood, by which the introduction or removal of the dung is facilitated. Along the centre of the chamber is a bar (D), which serves as a guide for packing the dung; and across the top, at intervals of twelve inches, are placed, on their edges, cast-iron bars (H), two inches wide, and three quarters of an inch thick, to support a layer of small wood, bushes and leaves (I), over which is laid the soil for the plants (K). Just below the level of the bars all round the dung-chamber, are holes (F), passing in a sloping direction through part of the wall into a cavity (G) in the upper part of the wall at the back front and both ends of the pit. In the exterior part of the back wall, are holes with plugs (L), to let out the steam and heat at discretion.

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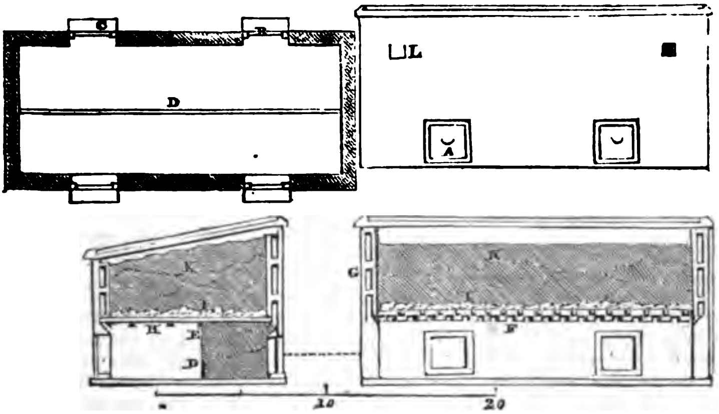


At the commencement of forcing, half the chamber is filled longitudinally with dung, and if the doors are kept shut, this will afford sufficient heat from twelve to eighteen days. As the heat declines the other half of the chamber is filled, and the temperature is kept up by additions to the top of the dung, on either or both sides, as it settles. When the united heat of the two sides ceases to be sufficient, the side first filled must be cleared out, and mixed with fresh dung and replaced, and so on, adding and turning as circumstances require. *Hort. Trans.* iv. 220.

The common *hot-bed* frame is generally from four to five feet wide within, and from nine to twelve feet long, divided into three or four lights or sashes. The back is generally double the height of the front, so that the slope of the glass is seldom more than ten degrees. Knight, with great correctness of principle, considers this as too flat to admit the sun's rays in the winter season, and recommends a basis of earth sloped to an angle of fifteen degrees, then forming on it the dung-bed, by which means its surface will be at the same angle as the base; and, lastly, he constructs the frame equally high, both in front and behind, and placing it on the dung, still retains the above angle (*fig.* 264.).

The common form of the *Mushroom-House*, and that recommended by Oldacre, have been described (704 and 705.). The latter mode, though adopted in several places, does not appear to be so generally countenanced by practical, and especially by market-gardeners, as to justify our giving it a preference in this part of our work. In the greater number of cases where mushrooms are grown for the London market, the open back sheds, or hovels, attached to the north sides of hot-house walls, are adopted. Immense quantities are raised in the open air on dung ridges; and a number of gentlemen's gardeners make use of close back sheds, and some of old cucumber-beds.

Sect. VI. *Details in the Construction of Culinary Hot-Houses.*

1165. This subject is introduced here chiefly with a view of giving the opinions of the best practical gardeners on some of what are considered recent improvements in hot-houses.

Materials of the Roof. In the construction of the roof, iron and copper, and other metals, have been lately introduced, in order to admit more light, and be more durable. This improvement, Abercrombie observes, "is at present too new to afford ground for a decisive opinion;" and Nicol says, "On account of the high price of timber, some are now constructing the framing of hot-houses of cast-iron. I would beg leave to remind such, that there is nothing so prejudicial to vegetation as the dripping of rusted iron; and would advise, that the frames be well painted, and frequently pointed, in order to prevent the bad effects of irony water falling on the foliage and fruit. I am of opinion, however, that iron-framed hot-houses will soon get out of fashion. From the quantity of water that *must* be used, in order to keep the plants in health, the frames must be often moistened, and *will* corrode."

The mode of heating by steam is becoming very general in the neighbourhood of the metropolis, and especially by such commercial gardeners as have extensive forcing departments, as Loddiges, Gunter, Grange, Andrews, Wilmot, &c. and wherever there is a range of any extent, seems far preferable to heating by smoke-flues. Nicol gives no opinion on this point; but M'Phail says, "At present, I must freely own, that I have some doubts both of the cheapness, and superiority in other respects, of this new scheme of forcing, by the influence of hot water over the generally adopted methods of the influence of fire, dung, and tan heat." Even "if found to answer better than fire alone, which I much doubt, it will only, I apprehend, be adopted in gardens where there is much forcing, and therefore, of course, the more simple methods of forcing by fire, dung, and tan heat, will be continued in moderate-sized gardens and in small ones." *Gard. Rem.* p. 122.

Furnace. That used by Nicol is simply an oven, capable of containing less or more fuel, according to the kind of hot-house to which it may be attached, and the kind of fuel to be used, with a grate in front, just large enough to kindle the mass of fuel, and keep it alive." In one of a middle size, the oven is thirty inches long and twenty inches wide; the grate eighteen inches long and ten broad; the furnace-door ten inches square; the ash-pit door ten inches wide, but fifteen inches deep, both with circular valves in their centres. *Kal.* p. 280.

Flues. Nicol gives the decided preference to flues constructed of brick and tile, thus — "The sole of two-inch thick tiles, each fifteen inches long, by twelve broad; jointed on cross bricks on edge, or pillarets, to keep them about four inches clear of the surface. The walls of well-moulded, or stock bricks, six inches clear of each other, and the height of two bricks placed on edge, covered with inch and half thick tiles, each twelve inches long and ten broad, laid the length to the run of the flue, by which means the covers will not be flush with the sides of the flue, but each edge will be champhered or bevelled, which makes the flue look very light and neat. The open or void of the flue will thus be (with the height of two bricks on edge, and two joints of lime,) ten by six inches, or thereby. It is clear, and detached on all the four sides, except the interruptions of the pillarets; and is the most effectual flue of many different sizes I have tried."—Of *air-flues*, the same author observes, "I think I have ascertained the uselessness of air-flues."

Trellising. "Roof-trellising," Nicol observes, "is now universally of wire, and often also that against back walls. It is cheaper than wood, and, on account of its lightness, fitter for the purpose, especially when placed on the roof, or against the end lights. The distance at which the wires should be placed apart for grapes, is ten or twelve inches; for cherries or peaches, four or five. The distance of the wires from the glass, for grapes, a foot; for peaches and nectarines, nine inches. But there should be a lower trellis, with the wires placed at two feet apart, and a foot under the proper trellis, on which to train the summer shoots of vines that are in a full-bearing state, in order that there may not be too great a confusion of fruit, shoots, and foliage. When vines are trained up the rafters in a stove or green-house, they should not be nailed to the beam; but three rows of wire should be extended for them, at the distance of four or five inches from each other, and three from the rafter; being set out with studs of wire, or of iron, made to screw into it, and with eyes to take in the wire."

Ventilators. "The hot-house may require to be ventilated at times, when it may be improper to open the sashes for the purpose. Ventilators are, in that case, useful. They may be contrived in different forms, and may be placed in different situations. If the hot-house have a shed behind it, they might be made to open, in the manner of a common window, near to the top of the back wall; and three in an ordinary-sized house would be enough. I lately made four ventilators in a house that had no shed behind it, in this manner: when the wall was raised to within a yard of its full height, apertures were formed in the manner of a common chimney or fire-place, eighteen inches wide, and two feet high, from which a small vent was carried through the coping. On the top was fixed a horizontal tube, three inches square, and two feet long, with a centre pipe fixed into the vent. The aperture or chimney was filled in front, with two moveable pannels or boards (painted to represent a window,) hung in the manner of common sashes, the one to move up and the other down, for the admission of air through the tube at top, thus diverting or breaking a strong current, which might be prejudicial to the grapes.

"Ventilators in front, at the distance of six or eight feet from one another, may be made thus: pierce a hole an inch diameter, through the bottom rail of the under sash, if the house have no upright glass, or through the upper rail of the upright sash, if it have. In this hole insert a tin tube to fit, having a funnel-mouth outwards, and a fine rose, like that of a watering-pot, to fit to it inside. The tube should be made in lengths of two feet each, that the air may be either diffused as it enters through the front, or be carried to the centre of the house, or farther if thought necessary. When not in use, it should be stopped with a cork or plug. When a full stream is wished, the rose need not be put on; but it should, if the air be keen. In order the better to collect the air, the funnel should be pretty large; that is, about seven or eight inches diameter. With these, and with the ventilators at or near to the top of the back wall, as mentioned above, any hot-house may safely be aired or ventilated, even in the severest weather; and also when it may be improper to open the glasses, as in rain."

Annual Repairs. The best gardeners clean the flues, white-wash the walls, and paint the wood-work of hot-houses every year, or paint every other year. In general, once in four or five years may suffice; but every thing will depend on the purpose to which the house is applied; a system of early and severe forcing being evidently much more trying for the roof than moderate sun heat, aided by occasional fires. The breakage of glass from frost amounts frequently, in the northern counties, to five per cent. on the surface of the roof, especially in flat green-houses, and others, where there is not a sufficient heat kept up to prevent the water from freezing in the unputtied interstices; but we know instances of pineries and other stoves where, for ten years, as many panes have not been broken. A roof at an angle of not less than 45°, diagonal or fragment glazing, or a closed lap, seem preventatives to breakage in cold-houses: Stewart's copper lap is still more effectual, but produces a dark, heavy effect, not at all suitable, in our opinion, to hot-houses of any sort, and with difficulty admits of repairs. Our opinion is, that by using the best crown glass, small panes, and a lap of not more than one-eighth of an inch, no breakage from frost will take place in any description of roof. If the work is performed in a masterly manner, closing this lap by putty, lead, or copper, will be unnecessary even for pineries or winter-forcing.

CHAP. VII.

Of the general Culture in Forcing and Culinary Hot-Houses.

By culture, we are here to understand the formation of the soil, the arrangement of the trees or plants, and their general treatment when planted, in regard to temperature, air, water, training, and other points of treatment.

SECT. I. *Culture of the Pinery.*

1166. The pine-apple is a native of the tropical regions of Asia, Africa, and South America; and thus, from its orignal habitation and nature, it requires a higher degree of heat than any culinary or fruit-bearing plant at present cultivated as such. It is by no means, however, so delicate as many imagine; for as it will bear a higher degree of heat continued for a length of time than either the vine or the peach, so, at any period of its growth, it will bear, without injury, a degree of cold for a space of time which, though short, would have destroyed the foliage of a vine or peach-tree in a state of vegetation. "This incomparable fruit," Weeks observes, "can be obtained even in frames without fire-heat, having only the assistance of tan and dung; and is more easily brought to maturity than an early cucumber." Though liable to the attacks of insects, it is less so than the peach, and less speedily injured by them than the common cabbage. Diseases it has almost none. The pine is generally grown in pots, and plunged in a bed of tanner's bark, or other matter in a state of fermentation; recently, however, it has been grown without bottom heat, and even with a lower atmospherical temperature than it has been accustomed to receive, at least, during winter; but as the experience of gardeners is very limited on this mode of treatment, we shall reserve whatever we have to offer on it, till we have brought into view the established practices. The fruit being reckoned the most delicious of all others, and gardeners being valued by the wealthy in proportion to their success in its cultivation, we shall here lay before the reader a copious view of the present modes of culture, from the works of the most reputable practical men who have written on the subject; noticing also occasionally, the practices of those who grow them for the London market.

and a quantity of swine's-dung. Let the above three sorts be brought to some convenient place, and laid up in three different heaps ridge-ways, for at least six months; and then mix them in the following manner, covering the dung with a little soil before it is mixed: four wheelbarrows of the above earth; one barrow of sheep's dung, and two barrows of swine's-dung. This composition," he adds, "if carefully and properly prepared, will answer every purpose for the growth of pine-plants of every age and kind. It is necessary that it should remain a year before applied to use, that it may receive the advantage of the summer's sun and winter's frost; and it need not be screened or sifted before using, but only well broken with the hands and spade, as when finely sifted it becomes too compact for the roots of the plants." *Tr. on the Pine-Apple*, p. 26.

Baldwin directs: "From old pasture or meadow ground strip off the turf, and dig to the depth of six or eight inches, according to the goodness of the soil; draw the whole together to some convenient place, and mix it with one-half of good rotten dung; frequently turn it over for twelve months, and it will be fit for use. This is the only compost dung for young and old plants." *Cult. of Ananas*, p. 8.

Weeks takes unexhausted earth and some rotten dung, and gives them a twelvemonth's preparation, by turning and mixing previously to using. *Forcer's Assistant*, p. 50.

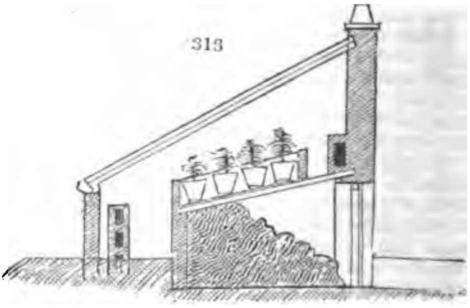
Subsect. 3. *Artificial Heat.*

1170. *Bottom Heat.* The pine, when originally introduced in England, was cultivated, without bottom heat, on stages, like other succulents. Ingenuity, however, soon suggested, and experience approved the advantage of the latter, first in preserving a moist equable heat; and secondly, in preventing the plants from feeling so much as they otherwise would any casual declension in the fire-heat, or sudden vicissitude in the temperature of the external air. "Pines," Nicol observes, "do certainly not require so strong a bottom-heat as many keep them in; yet there is something in a mild tan heat, so congenial to their natures, that they thrive much better in pots plunged in a bark-bed, if properly managed, than when planted out on a bed of earth that is heated, and often scorched, by under flues." The tan or bark-pit is therefore considered essential to the pinery.

Bark-Pits are filled with tan which has previously undergone a course of draining and sweating. The heat thus produced, will last from three to six months, when it is sifted and again put into a state of fermentation, by replacing the deficiency occasioned by decay, and separation of the dust by sifting, with new tan. In this way the bark-bed is obliged to be stirred, turned, refreshed, or even renewed several times a year, so as to produce and retain at all times a bottom heat of from 75 to 85 degrees in each of the three departments of pine culture. These operations being common, we have placed a summary of management under the head of *general directions, Bark-pit*, at the end of this section.

1171. *Fire-Heat.* The high temperature requisite for the pine in every stage of its growth, renders it necessary to have recourse to fire-heat for eight or nine months in every year; unless indeed the plants are grown in pits heated by linings of dung; in which case, these linings become necessary every month in the year in order to keep up the bottom heat. What respects the management of fires being also common to the culture of this plant in all its stages, we have placed the directions as in the case of bark-pits under such as are general. See *Subsect.* 8.

T. Jenkins, of the Portman nursery, London, grows his pine-plants in large hot-beds, and fruits them in a house (*fig.* 313.), which "though furnished with flues, yet these have been very little used. The heat imparted to the plants is produced by the fermentation of stable-dung in a pit below the plants, the top of which is covered by tiles supported by iron rafters, with the joints closely cemented, to prevent the passage of steam into the house. The pots are neither bedded in tan, nor in mould, but stand on the tiles, and the interstices between them warm the air of the house." The dung is managed as in West's pit (*fig.* 312.), but with the addition of being watered after



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it is thrown in, which is found to promote fermentation, and the intensity of the heat *Hooker in Hort. Trans.* iv. 363.

Subsect. 4. *Propagation.*

1172. *Modes of Propagation.* The pine is generally propagated by crowns and suckers, though, in common with every other plant, it may be propagated by seed. Speechly prefers suckers, because generally larger than crowns, and those produced near the middle of the stem, he considers the best. He does not, however, reject crowns; but selects the largest, which he says, when nine inches in circumference at their bottoms, equal any suckers. *Treatise on the Pine-Apple, 2d edit.* 22.

Abercrombie says, "Suckers which rise from the extremities of the roots, at a distance from the stem, though they have radical fibres, are apt to have ill-formed hearts. With Speechly, he prefers stalk-suckers and strong crowns." *Pract. Gard.* 621.

M'Phail, Nicol, Griffin, and Baldwin, do not express any preference.

Separation of Crowns and Suckers. Speechly and Abercrombie concur in the following directions: "When the fruit is served to table, the crown is to be detached by a gentle twist, and returned to the gardener, if it be wanted for a new plant. Fruit-stalk suckers are taken off at the same period. Suckers at the base of the herb are commonly fit for separation when the fruit is mature; though, if the stool be vigorous, they may be left on for a month after the fruit is cut, the stool receiving plentiful waterings on their account. The fitness of a sucker to be removed is indicated, at the lower part of the leaves, by a brownish tint there; on the appearance of which, if the lower leaf be broken off, the sucker is easily displanted by the thumb.

"If the old fruiting plant offers only small bottom-suckers, or fails to furnish any, you may bring out good suckers thus: having waited till the fruit is cut, take the old plant in its pot out of the bark-bed; strip off the under-leaves near the root, and with the knife cut away the leaves to six inches from the bottom. Take out some of the stale mould from the pot, fill up with fresh, and give a little water. Plunge the old plant into a bed with a good growing heat. Let the routine culture not be neglected, and the old plants will soon send out good suckers. Allow these to grow till they are four inches long, or more; and on the signs of fitness, detach them.

"As soon as either crowns or suckers are detached, twist off some of the leaves about the base; the vacancy thus made at the bottom of the stem is to favor the emission of roots. Pare the stump smooth; then lay the intended plants on a shelf in a shaded part of the stove, or of the green-house, or of any dry apartment. Let crowns and fruit off-sets lie till the part that adhered to the fruit is perfectly healed; and root-suckers in the same manner, till the part which was united to the old stock is become dry and firm. They will be fit to plant in five or six days. As to the prolonged period for which they may remain out of culture, pine-plants have been kept six months without mould, in a moderately warm dry state, and the only injury has been loss of time. Crowns or suckers coming off before Michaelmas should be planted, without any unnecessary delay, to get established before the winter. When late-fruiting plants do not afford offsets till after Michaelmas, it is best to keep them in a dormant state during the months least favorable to artificial culture; therefore, as you obtain these late offsets, hang them up in the house, not too near the flues, to rest till March."

Speechly says, "Suckers cannot with safety be taken from the plants, till they are grown to the length of twelve or fourteen inches, when their bottoms will be hard, woody, and full of small round knobs, which are the rudiments of the roots. It would endanger their breaking, if they were to be taken off sooner.

"When the suckers are taken off, the operation should be performed with great care, that neither plant nor sucker may be injured. To prevent which, one hand should be placed at the bottom of the plant to keep it steady; the other as near to the bottom of the sucker as conveniently can; after which, the sucker should be moved two or three times backwards and forwards in a sideway direction, and it will fall off with its bottom entire. Whereas, when a sucker is bent downwards immediately from the plant, it frequently either breaks off in the stem, or splits at the bottom."

M'Phail says, "Crowns and suckers taken from the parent plant later than October, should not be planted before the month of February or March; for, in the winter time, probably they would not strike root, but rot: they may be hung or laid in a dry part of the hot-house. Unmatured young suckers and crowns should lie unplanted, till their natural juices be so exhausted that there may be no danger of their rotting after being planted; but if they are grown to such a size as to be easily separated from the parent plant, they may be planted immediately. *Gard. Rem.* 83.

Nicol plants his suckers in summer and autumn as the fruit is gathered, sticking them into the front part of the bark-bed, "where they will strike root as freely as any where. If a large proportion of the crop come off early, the crowns and suckers may be potted at once, and plunged into the nursing-pit; or they may be twisted from off the stocks, and may be laid by, in a dry shed or loft for a few days, till the other operations in the pinery be performed, and the nursing-pit be ready to receive them and the crowns, (collected as the fruit have been gathered); which, if rooted, may be potted, and may be placed for the above time, either in a frame, or in a forcing-house of any kind, as they will sustain no injury, though out of the bark-bed for so short a time. Such crowns as have not struck root, may be laid aside with the suckers.

"With respect to the time for taking off the suckers, it is when the bottom part becomes brown; and they are then easily displaced by the thumb, after having broken down the leaf immediately under them. But, indeed, by the time the fruit is ripe, all suckers of the stem are fit for taking off, though they will sustain no injury by being left on, even for a month, but rather improve, if the stock be healthy, and if it be well watered. Suckers that rise from the root always have fibres, and may be taken off at any time; but, as formerly observed, they should not be taken into the stock, unless in a case of necessity.

"Some think it necessary to dry, or win, all crowns and suckers before potting them, and for that purpose lay them on the shelves, &c. of the stove for a week or ten days. By this treatment, they certainly may be hurt, but cannot be improved, provided they have been fully matured before being taken from off the fruit or stocks, and that these have previously had no water for about ten days. They will succeed as well, if planted the hour they are taken off, as if treated in any other way whatever; and I only advise their being laid aside as above, as being a matter of conveniency."

Griffin generally plants his crowns in the bark till they have struck root; but the suckers he puts at once, unless they are small and green at bottom, when he treats them like the crowns.

Baldwin says, "Towards the end of September, take off the suckers from the fruiting plants, and lay them in any warm place for about three days; then strip off a few of their bottom leaves, and they will be ready for planting. Plant them in the old tan, on the surface of the bed, without pots, about four or five inches apart, according to the size of the plants; observing, that the tallest be placed at the back of the frame, and the shortest in the front. In this state let them remain till the following April." *Cult. of Anan. p.* 13.

Treatment whilst Rearing. The pine, as already observed, requiring different modes of treatment at different stages of its progress to maturity, established practice has adopted three houses or pits, through each of which the plants pass in succession. They are usually named the *nursing*, *succession*, and *fruiting-house*, or pit.

Subsect. 5. *Nursing Department.*

1173. *Nursing-Pit.* This compartment is used for bringing on crowns and suckers until they are established in growth, and for this purpose they generally remain there one year.

Nursing-Pit with Fire-Heat. The nursing-pit is generally flued, but some adopt a common dung hot-bed, and others the flued pit or bed recommended by M'Phail, and which answers extremely well.

The minimum depth of the bark-bed in the nursing-house, Abercrombie states to be three feet; "the maximum three and a half. The less depth is the right, when bark alone is employed to produce the bottom-heat; and the greater, when tree-leaves are substituted on account of their weaker influence. In either case, the pit may be six inches shallower than that in the fruiting house; because the requisite altitude in the different pits partly depends on the perpendicular dimension of the pots, and on the thickness to which a layer of old bark must reach from the surface, to keep the pots from contact with the new bark, that the roots may not be burnt. In the nursery pit, the neutral layer need not be deeper than eight inches." "If the bark-bed has been in action to bring forward a previous set of plants, now removed to the succession-pit, recruit it by taking away the wasted bark, to the extent of a sixth, fourth, third, or half part, and by substituting an equal quantity of fresh. A lively bottom-heat is requisite to make pine-offsets strike freely."

"Some growers of pines," he adds, "who cannot command higher means, choose to cultivate crowns and suckers in pits without flues. As the aid of the furnace, however, allows a freer admission of air, and prevents the necessity of covering the glasses in very cold days, it is not to be deliberately rejected from the nursing-pit, when new buildings, or fundamental alterations, are in agitation — unless the vicinity of some large establishment for horses should offer a regular supply of dung, without much expense of carriage. When dung is employed, it is proper to force with that alone. The bottom-heat from tan-bark or tree-leaves is always to be preferred, in combination with flues."

Speechly adopts the flued-pit, and occasionally the frame, but generally a part of the succession-pit. Nicol the nursing-house.

Griffin adopts three houses, the two last diminutives of the first, which is the common pine-stove of Nicol and Abercrombie.

Baldwin makes use of a succession or nursing bed, without fire-heat; and of a fruiting-stove, both small. (*figs.* 300. & 301.)

1174. *Nursing-Pit, without Fire-Heat.* "Hot-beds used for growing suckers," Speechly observes, "should be well prepared, and the violence of the heat allowed to be fully over before the suckers are taken off. It is then to be levelled and covered with eight or ten inches of tan, into which to plunge the pots." *Treat. on the Pine,* 34.

M'Phail, who, when gardener to the Earl of Liverpool, was reckoned one of the best pine-growers in England, recommends the brick-bed of his invention as answering well for small succession-plants. "A pit," he says, "built on the same construction, but of larger dimensions, without cross flues, is a suitable one for growing pine-apple plants of any size; for by linings of dung the air in it can be kept to a degree of heat sufficient to grow and ripen the pine-apple in summer, as well as it can be done with fire-heat; only it will require a little more labor and plenty of dung."

Baldwin, as already observed, grows both his nursery and succession plants in a bark-bed excited by external linings of dung.

Culture of Nursing Plants. Whether pits or hot-beds be adopted, the potting, temperature, air, water, &c. are nearly the same.

Potting. For full-sized crowns and suckers, Speechly employs pots six inches diameter at top, and five and a half inches deep. Less sized suckers and crowns, he puts in less sized pots. He pots ripe or knobby-bottomed suckers immediately after taking off, letting the others lie a few days to harden. He inserts the end of the sucker no farther into the earth than what is necessary to hold the plant fast. They are to remain ten or twelve days without water, and afterwards be watered twice a week. *Treat. on the Pine,* 37.

Abercrombie says, "The pots, to receive unstruck crowns and suckers, should be three inches in diameter, inside measure, and four inches and a half deep, for the smaller plants; four inches in diameter, and six inches deep, for the larger. Lay at the bottom of each pot dry shivers, or clean gravel, to an inch in depth. Fill the pots with the compost before described, not pressing it too close. With a dibble make a hole, for the smaller plants, two inches deep; and two inches and a half, for the larger. Set the plants, and level the surface of the mould, leaving a vacancy half an inch deep from the rim. Plunge the pots in the bark-bed down to their rims, leaving between each an interval equal to the diameter of the pot. After planting, shut the house; and withhold water and admissions of air for some time."

The method which M'Phail used, he thus describes, "The fruit being partly over, and a cucumber brick-bed prepared for unstruck crowns and suckers, towards the end of August or in September, I planted them in rich earth in pots suitable to the size of the plants; I then had the pots plunged to their rims in the tan-bed in which there was a good growing heat; the lights were then shut down close, and as great a heat kept among the plants as the heat of the tan and sunshine could raise, and when the sun shone long and very bright, the plants were shaded a few hours in the middle of the day. The plants were thus managed till they had struck root and begun to grow, when a gentle watering was given to them, and a little air admitted daily. About the end of October, or beginning of November, if the state of the bed required it, a little fresh tan was added, and if the plants by growth had become crowded, some of them were removed into another place, and the remainder plunged into the tan-bed, in which they continued till February or March, when of course the bed required an addition of fresh tan, which was given it, and the plants plunged again into it at such distances one from the other as to give them room to grow."

In preparing the suckers and unstruck crowns for potting, Nicol twists off a few of the bottom leaves, and pares the end of the stump smooth with the knife. Then fill pots of about three or four inches diameter, and five or six inches deep, (the less for the least, and the large for the largest plants), with very fine, light earth, or with entire vegetable mould of tree leaves, quite to the brim; previously placing an inch of clean gravel in the bottom of each, and observing to lay in the mould loosely. Thrust the large suckers down to within two inches of the gravel, and the small ones and crowns, two inches into the mould; firming them with the thumbs, and dressing off the mould, half an inch below the margin of the pots. Then plunge them into the bark-bed, quite down to, or rather below the brim, especially of the smaller pots. If the pots be placed at the clear distance of three or four inches from each other, according to the sizes of the plants, they will have sufficient room to grow till next shifting.

Griffin plants suckers and crowns in pots five inches diameter, and four inches deep; and very strong ones in pots seven and a quarter wide by six and a half deep.

Baldwin plants his nursing plants in the bark-bed, without pots.

1175. *Temperature for Nursing Plants.* Speechly does not mention his summer temperature for nursing plants, farther than referring to a peculiar thermometer which he used, and "made for sale;" but he says, after the beginning of November, "the house should be kept in a cold state, and little or no water given the plants till the middle or latter end of January." *Treat. on the Pine*, 39.

Abercrombie is more definite: "The artificial heat in the nursing-pit is 55° for the minimum. This will keep the plants, in winter, secured from a check, and a few degrees above a dormant state. It is enough to aim at this mininum, when dung-heat is employed; for as its decline is never abrupt, there is no danger in going pretty close to the lowest extreme. When fire-heat is applied, it is better to aim at 60°, as the charge in the flues is more liable to fluctuate suddenly. The maximum artificial heat, in winter, need not go beyond 65°: but as the season for excitement advances, this becomes the minimum. When the plants are growing vigorously in autumn, or spring, the artificial maximum is 70°. In winter, the maximum, with the aid of sunshine, should not be allowed to rise higher than 70°, because the benefit of airing would be lost: in summer, the maximum, under the effect of strong sunshine, may rise to 85°; to keep it down to this, give, in July and August, the benefit of air freely."

M'Phail says, "The heat of the air in the nursing-pit, exclusive of sun-heat, is not required to be greater than from 60° to 65°." But at first planting of crowns and suckers, he gives them "a great heat and no air till they begin to grow." *Gard. Rem.* 81. 319.

Nicol directs the temperature of the nursing-pit in January with fire-heat, to be kept, as near as possible, to 65°, mornings and evenings; and in sunshine, on good days, it may be allowed to rise to about 70°. In March, from 70° to 80°, and after newly potting and plunging unstruck crowns and suckers, to 80° or 85°.

Covering at Nights. One great advantage of growing pines in pits is, that they may easily be covered with mats, or by other means, in winter. Abercrombie considers covering not positively indispensable to flued pits, in which the minimum degree of fire-heat is regularly maintained; but it will add to the security of the plants, and admit of some retrenchments in fuel, if some warmer screen, in addition to that of the glass, is applied at night, during all the season when frost prevails, or may be expected. For this purpose, provide either double mats, or a strong canvass cover. The latter is commodious, because it can be mounted on rollers, and let down at will, or drawn up under a weather-board. Remove the covering at sunrise, that the essential benefit may not be obstructed.

M'Phail covers his pits during the colder months. In January, he "covered up about three or four o'clock in the afternoon, and uncovered in the morning about eight or nine. In very cold weather, it may be necessary, sometimes, not to uncover them in the day-time, only as far as to give them a little light."

Nicol says, "The pit should be carefully covered up soon after sun-set every evening, either with double mats, or with a proper thick canvass cover, made on purpose for it, and mounted on rollers. The cover should be removed by sun-rise in the morning, and should never be kept on through the day, except occasionally, in very severe weather. For if all the light possible be not admitted to the plants, they lose color, and become sickly. By using a proper cover, however, in the night, and only in very severe weather in the day, at particular times, a considerable deal of fuel may be saved."

Griffin, Baldwin, and Weeks, offer nothing on covering any description of pine frame or pit.

1176. *Air.* When the weather is warm, Speechly admits "a great deal of air" to nurse plants.

Having potted unstruck offsets, Abercrombie admits little or no air until the plants begin to grow; but as soon as the leaves show that the root has struck, he gives plenty of air, in order to make the leaves expand, and the entire plant robust. *Pr. G.* p. 628.

Speaking of the winter treatment of pines, M'Phail says, "Admit air in fine days into every place where pine plants are." In warm summer weather, he admits some all night. *G. Rem.* p. 142.

Air, Nicol observes, should be admitted to the nursing-pit every good day "to a certain extent; dividing the quantity admitted equally, that there may be a regular circulation in all parts of the pit. Even in hard frost, when the sun shines, two or three of the lights should be slipped down, to let the rarified air escape at top." After potting unrooted offsets, he gives no air till the heat begin to rise in the bark-bed; but "as the plants take on growths, it must be given in larger portions, especially in sun-shine, so as to keep down the thermometer to 85° or 80°."

Griffin gives air at all favorable opportunities. Baldwin from the back and ends, but not from the roof, either in summer or winter.

1177. *Watering the Nursing-Pit.* Speechly waters offsets over the leaves after they have begun to strike, but gives to all pines much less water in a moist than a dry season, depending on the humidity of the air. (*Tr. on Pine*, 37.) He waters once a week or fortnight in September and October, and then leaves off till the middle or end of January, depending on the moisture of the tan, and the state of inaction of the plants. In frosty weather, he sometimes plunges the pots so deep in the tan that their rims may be covered two or three inches in order to give heat, and prevent the surface of the mould from becoming too dry. In March, he waters once in a week or ten days, and advances to twice a week in summer. *Tr. on Pine*, 47.

After planting crowns and suckers, Abercrombie gives no water till "the heat of the bark has risen, and the plants show signs of striking. Then water moderately at the root; but give none over the herb until the heart-leaves begin to grow. Meanwhile repeat watering at the root every four days. After the plant is established, water freely at the root, and give sprinklings over the leaves from a fine rose-pan."

M'Phail says, "No certain rule can be laid down for the exact quantity of water that must be given to the pine-apple plant, or how often; nor is it necessary to be particular. These and many other matters must be left to the gardener who has the care of the plants." In July, "besides watering the earth in the pots in which the roots of the plants grow, when it begins to get dry, the leaves and fruit should be watered now and then, till they are all wetted, with clean water out of a fine rosed pot; the water should be as warm as the medium heat of the air in the house. The best time to water over the leaves, is about eight o'clock in the morning, or about four in the afternoon; though it will do them no harm to water them at any time of the day, if you keep the air in the house sweet, and up to a heat strong enough for the growth of the pine-plant. The plants in this month will want water about once a week, and if the weather be hot, perhaps oftener. However, it is rare that pine-apple plants require water oftener than twice a week."

Nurse plants, Nicol observes, require very little water in winter; "perhaps a little only once in eight or ten days, or even at greater intervals, if the weather be moist and hazy. It is safer, in winter, to give too little, rather than too much water to pine-plants; nor should they be watered over head at this season. They should be watered in the forenoon of a sunny day, at this time of the year, in order that any water spilt on the bark, or in the hearts of the plants, may be exhaled by the heat of the sun, and by an extra quantity of air purposely admitted. This precaution, however, is only necessary for the sake of such crowns and suckers as have been struck late last season, and are not very well rooted; such being more apt to damp off than others that are better established." In summer he supplies water regularly and plentifully once in three days; giving the proper quantity at root, and then a dewing over the leaves. Water frequently with the draining of the dunghill.

Temperature of the Water. M'Phail says, "Eighty degrees is the medium heat of the water with which pines should be watered." He adds, "I would advise never to water them with water under seventy, unless in very warm weather, when the earth about their roots will soon regain its natural warmth." *G. Rem.* p. 128.

Steaming. M'Phail obtains this in summer by sprinkling the flues and paths now and then with clean water in the afternoon, and shuts up the houses with a strong heat in them." *G. Rem.* p. 240.

Shading. This, all the authors quoted agree, in recommending during bright sunshine, after newly potting offsets. Abercrombie says, "Shade them with thin mats in the middle of hot days; dividing the hours before and after twelve, so as to amount to a fourth of the morning, and a third of the afternoon." *Pr. G.* p. 629. — Speechly approves of shading, and effects it in an ornamental and useful manner by training vines on the rafters.

1178. *Shifting Nurse Plants.* "Offsets planted early in the season," Speechly says, "should be carefully looked over in September, and all the forward crowns and suckers that are grown large, and with an appearance of being under potted, should be removed into larger sized pots, with their roots and bulbs entire. *Tr. on Pine*, p. 38.

Abercrombie says, "when offsets have been potted in July or August, remember by October to examine the roots of the most vigorous plants. Should any have filled the pots, shift them into larger; but new roots will not often have filled the pots at that inconvenient period." *Pr. G.* p. 625.

Unstruck crowns and suckers, planted in the end of August or September, M'Phail does not shift till the following March or April, and pots with entire balls with Nicol. The offsets planted in summer, Nicol new-pots also in March. He says, "Let them be shaked out entirely; the balls be quite reduced; the roots be trimmed of all straggling and decayed fibres; and let them be replaced in the same, or in similar pots. The proper size of pots, however, in which to put crowns and suckers struck last season, is about four inches inside diameter at top, and six inches deep. A little clean gravel should be laid at the bottom of each pot, in order to drain off extra moisture; and this should be observed in the potting of pine-plants of all sorts. I have generally observed, that if the bark heat be not violent, the plants will push very strong fibres into this stratum of gravel, in which they seem to delight. I therefore generally make it two inches thick in small pots, and three or four in larger ones, less or more, according to their sizes. From the time I first adopted this mode of potting, I hardly ever had an instance of an unhealthy plant; and this very particular, together with that of keeping the plants always in a mild bottom-heat, is of greater importance in the culture of pines, than all the other rules that have been given respecting them, out of the ordinary way. The roots of pines seem to delight in gravel; and I have been careful to introduce it into the mould for plants of all ages. I generally used small sea-gravel, in which was a considerable proportion of shells, or chips of shells, with other particles of a porous nature; and I have uniformly observed the finest fibres cling to these, and often insinuate themselves through the pores, or embrace the rougher particles. Therefore, if sea gravel can be obtained, prefer it; and next, river gravel; but avoid earthy pit gravel, and rather use sharp sand, or a mixture of pounded stone, chips, and brick-bats. The plants being re-potted, plunge them in the bark-bed again, quite down to the rims of the pots, keeping them perfectly level. Eight or nine inches from centre to centre will be distance sufficient. When they are all placed, give a little aired water, to settle the earth about their roots. This need not be repeated till the heat in the bed rise to the pots, after which, as the plants will now begin to grow freely, they must be watered at the root once in four or five days; and they may have a dewing over head, from the fine rose of a watering-pot, occasionally, if the weather be fine."

In May, Nicol again shifts, but the plants are not to be shaked out at this time, but are to be shifted, balls entire, into pots of about six inches diameter, and eight inches deep. If the roots be anywise matted at bottom, or at the sides, they must be carefully singled out; and in potting, be sure that there be no cavity left between the ball and the sides of the new pot. In order the more effectually to prevent which, use a small, blunt-pointed, somewhat wedge-shaped, stick, to trindle in the mould with; observing that it be in a dry state, and be sifted fine; and also to shake the pot well, (potting on a bench or table), the better to settle the earth about the ball. Pots of this size should be filled to within half an inch of their brims, (the balls being covered about an inch with fresh earth), as the whole will settle about as much, and so leave a full inch for holding water, which is enough. In preparing the plants for potting, observe to twist off a few of the bottom leaves, as they always put out fine roots from the lower part of the stem. Also, before letting the plant out of hand, trim off the points of any leaves that may have been bruised or anywise injured in the shifting. Replunge the pots to the brim, as before, observing to keep them quite level, at the distance of fifteen inches from centre to centre of the plants on a medium; then give a little water, which need not be repeated till the heat rise to the pots."

In November, he shifts such others whose roots have filled their pots, and have become anywise matted. "Examine any you suspect to be so, and let them be shifted into pots of the next size immediately above those they are in; keeping the balls entire, and only singling out the netted fibres at bottom. The rest should be trimmed of any dead leaves at bottom of their stems, and should have a little of the old mould taken from off the surface of the pots; which replace with fresh earth; filling the pots fuller than usual, as but little water will be required till next shifting time in the spring. The whole should then be replaced in the bark-bed as before, and should be plunged quite to the rims of the pots; giving a little water to settle the earth about their roots, which need not be repeated till the heat rise in the bed."

Insects and Diseases. See this article under *General Directions. Subsect.* 8.

Subsect. 6. *Succession Department.*

The culture of succession plants necessarily coincides in many particulars with that of purslings; but less heat is generally allowed the former in order not to draw them; and they are allowed plenty of room in the bed, frequently shifted, and abundance of air admitted, in order to make them broad-bottomed and bushy: thus strengthening the heart or root part, in order that it may throw up a strong fruit the third year.

1179. *Growing Succession Plants without Fire-heat.* M'Phail says, "Succession pine plants grow exceedingly well in pits covered with glazed frames, linings of warm dung being applied to them in cold frosty weather. The north wall of a pit for this purpose had best be only about four feet above the ground; and if about two feet high of it, the whole length of the wall beginning just at the surface of the ground four feet below the height of the wall, be built in the form of the outside walls of my cucumber bed, the lining will warm the air in the pit more easily than if the wall were built solid. The linings of dung should not be lower in their foundation than the surface of the tan in the pits in which the plants grow (for it is not the tan that requires to be warmed, but the air among the plants): and as during the winter the heat of the air in the pit among the plants, exclusive of sun heat, is not required to be greater than from sixty to sixty-five degrees, strong linings are not wanted: one against the north side, kept up in cold weather nearly as high as the wall, will be sufficient, unless the weather get very cold indeed, in which case a lining on the south side may be applied. In cold, frosty weather, a covering of hay or of straw, or of fern, can be laid on the glass above mats in the night time."

Most nurserymen and growers of pines for the London market employ dung-beds of the common kind, keeping up the heat by powerful linings. The same practice is successfully adopted by Miller and Sweet, of Bristol. Baldwin combines the nursing and succession bed, growing both on tan with dung linings.

1180. *Shifting and Potting.* The middle of March, Speechly considers the most eligible time for shifting and potting such nurse plants as are to be removed to the succession-house. " If the work is done sooner," he says, " it will prevent the plants from striking freely; and if deferred longer, it will check them in their summer growth."

In this shifting, he " always shakes off the whole of the ball of earth, and cuts off all the roots that are of a black color, carefully preserving such only as are white and strong. He then puts the plants into pots eight inches and a half diameter at the top, and seven inches deep in entirely fresh mould. The bark-bed is renewed, the pots plunged to the rims, the house is kept pretty warm, till the heat of the tan arises; the plants are then sprinkled over the leaves with water, and watered first once a week and afterwards twice a week, till next shifting in the beginning of August, when they are shifted into fruiting pots with their balls entire. The size of these pots is eleven inches and a half at top by ten inches deep.

Abercrombie observes, that most of the remarks on the nursing-house will apply to the succession-pit. " Sometimes the plants, originated in the nursing-pit in August or September, will be fit to bring into the succession-house in March or April following; and sometimes not till the anniversary season. Those from late fruiterers, originated in March, will be mostly established by the end of summer.

1181. " *Introductory Shifting.* Where at the first shifting of rooted plants, they are transferred to this department, proceed as in nursing-pit, except in regard to the size of the pots, which should be twenty-four inches, or about seven inches across, and nine deep. When the plants are a year old, and the shifting for culture here is the second or third, begin as before: — make arrangements to complete the business in one day. Be prepared with a bed of lively tan, the number of pots, the compost for pines, and some clean sea-gravel or shivers. As each plant is taken from the nursing-pit, tie the leaves together. Turn them out of the old pots singly. Then proceed as follows:

" Shake off the ball of mould. Strip off a few of the lower leaves. Cut the roots off entirely: further, if the roots are scanty, or decaying, prune away a small portion of the stem, cutting into the quick. Pot the plants; plunge them in the tan, not entirely to their rims, till the new heat rising from the bark can be ascertained. Leave about five inches space between each. Keep them under a strong heat; and forbear to give water, or to admit cold air, till the plants have struck root.

1182. " *Intermediate Shifting.* When plants are to remain in the succession-house a year, shift them in the March following their introduction. Let the fresh pots be full eight inches in diameter, and ten inches deep. It is one of the most availing precautions against the premature fruiting of pines, to allow rising plants a capacious bed, and free space for the herb to expand. In turning healthy plants, new, out of the old pots, endeavour to preserve the ball of earth entire. But where plants appear to be sickly, to be infested with insects, or to have bad roots, brush away the old earth entirely: then with a sharp knife trim the longest fibres; and if any part of the main root be unsound, cut it away. Strip off some of the lower leaves. Replant in the new pots. Set the plants in the bark-bed, leaving the pots partly out, lest the first heat should be too strong. There should be a distance of seven inches from pot to pot. Water full-rooted plants gently, to settle the mould. Plants divested of roots are not at present to receive water.

1183. " *Second intermediate Shifting.* The roots of large plants which were shifted in March should be examined at the end of May, or in June. If they have filled the pots, it will be necessary to shift them into pots of an increased size, so as to admit new compost to the extent of an inch all round the old ball. The diameter of the cradle at top should be nine inches; the depth twelve, including an inch of pearly gravel at the bottom. If the roots are matted, carefully disentangle them: prune off old fibres, or not, according as the root has been spared or retrenched. In all cases, cut away unsound parts of the root, and slip off a few of the oldest leaves. After replanting, distribute the pots eight inches apart over the surface of the bed, without plunging them to their full depth, till the heat of the renewed tan is ascertained."

M'Phail says, "If in March you have any nurse pines a year old, shift and repot them at this season." "Having a bed prepared for them, strong enough to raise a good heat, take the plants and tie their leaves together carefully; then turn them out one after another, and cut all their roots off close to the stem; and if the stems of them be bare of roots, or appear rotting or black, cut a part of them off up to the quick. Rub the mould clean from the stems, divest them of a few of the lower leaves, and pot them in good rich mould, in small pots suitable to the size of the plants, and plunge them in the tan up to their rims. Let all this work be done in one day, if it be convenient. Keep a strong heat about them, and give them no air nor water till they have struck root and begin to grow; but remember, the earth should be moist in which they are potted, for no plant can make roots without moisture." "When large succession plants have been divested of their roots, and potted in the month of March, they will probably by this time have filled the pots with roots; if so, they ought to be shifted into pots a size larger, just large enough to admit of mould falling easily round their ball. If they were not shifted when the roots begin to get matted, it would check them, and probably make them fruit in August or September." "In August or September, the plants are again shifted into pots large enough to admit earth easily round their balls between their roots and the sides of the pots." In these pots, he lets the plants remain in general till the fruit is over. *Gard. Rem.* 82.

M'Phail and Speechly agree in remarking, that "some large kinds of pine-apple plants require three seasons to grow before they can bring large sized fruit, such as the black Antigua, the Jamaica, the Ripley, &c.; therefore, in the month of April or May, after they have been planted upwards of a year, it is best to take them out of the pots, and to cut off all their roots close to the stem, or leave only a few which are fresh and strong, and then plant them again in good earth in clean pots, and plunge the pots in a tan-bed with a lively heat in it. After this process, a stronger heat than usual must be kept in the house, till the plants have made fresh roots and their leaves be perceived to grow, when a little water may be given to them, which, together with a good bottom and top heat, will make them grow finely."

In August, when the fruit are all or nearly all cut, Nicol recommends a general potting of the succession plants, removing the old stocks from which the fruit had been cut to make room for them in the fruiting-pit. "The nurse plants now become the succession; the succession the fruiters for next season, and the crowns and suckers produced by the plants whose fruit have been cut, occupy the nursing-pit." *Kal.* 410.

The succession plants, before removal into the fruiting-pit, must be shifted into pots of about eleven or twelve inches diameter, and fourteen or fifteen inches deep. The plants should be plunged entirely in old tan to within an inch or two of their brims, keeping them quite level, and eighteen or twenty inches centre from centre. Great care must be taken to keep the heat of the bark-bed moderate and steady, lest the plants should start into fruit, "which, if they did, they would be next to lost. I would rather have a one-year old than a two-year old plant show now, as the loss would evidently be less; but frequently the former will bring a better fruit than the latter in the end of the season. Some of the succession plants, potted from the nurse-pit in August, may require repotting in November; but, in general, not till March, when the plants are to be shaken out of their pots, and replaced in the same or similar pots (seven or eight inches diameter, by nine or ten deep) in fresh mould, placing some gravel at bottom. The plants are then to be replunged (the bark-bed being refreshed, &c. agreeably to the general mode of management laid down in 2.) at the distance of fifteen inches from each other. In this state they remain till May, when they are re-shifted with their balls into pots a size larger, (nine or ten inches diameter, and twelve deep) and plunged till August, when they are shifted into fruiting-pots (eleven or twelve inches diameter, and fourteen or fifteen deep) and removed to the fruiting-pit as above described. *Kal.* 413.

Griffin shifts his succession plants for the second time, in March, into pots nine inches in diameter, by eight inches deep, "turning each singly out of its present pot, with the ball of earth entire around its roots, unless any appear unhealthy or any ways defective, when it is eligible to shake the earth from the roots, and trim off all the parts that appear not alive. He plunges them in the bark (refreshed as at each shifting) eighteen inches from plant to plant in the row, and twenty inches distance row from row."

It is to be observed here, that Griffin's practice, in not divesting the plants entirely of their balls of earth at this shifting, agrees with Baldwin's, but differs from that of all the other authors quoted. Griffin, it is alleged, obtains larger fruit; and Baldwin, by his practice, fruits the plants a year sooner, that is, in fifteen and eighteen months.

The crowns and suckers planted by Baldwin in the tan in September, are taken up the succeeding April, divested of all their roots, which "must not," he says, "be taken off at any future transplanting," and put into pots of five, six, or seven inches diameter, according to the size of the plant. About the middle of the following June, when the pots are beginning to be filled with roots, take out the plants with their balls entire, and put them into pots about nine inches in diameter; replunge them into your bed, and let them remain till the end of September." *Cult. of Anan.* p. 15.

The practice of shaking off the balls of earth, and cutting off the lower roots of pines in the second year's spring shifting, has at first sight an unnatural appearance, and various theorists, and some gardeners, recommend shifting the plants from first to last with their balls entire. On attentively examining the pine-plant, however, it will be found, that, in its mode of rooting, it may be classed with the strawberry, vine, and crowfoot, which throw out fresh roots every year, in part among, but chiefly above the old ones. This done, the old ones become torpid and decay, and to cut them clear away, if it could be done in all plants of this habit, would no doubt be assisting nature, and contribute to the growth of the new roots. At the same time, it is to be observed, that encouraging, in an extraordinary degree, the production-roots, though it will ultimately increase the vigor of the herb and fruit, will retard their progress to maturity.

Speechly has the following judicious observations in allusion to those who recommend always shifting with the balls entire.

"First, It is observable, that the pine plant begins to make its roots at the very bottom of the stem, and as the plant increases in size, fresh roots are produced from the stem, still higher and higher; and the bottom roots die in proportion: so that, if a plant in the greatest vigor be turned out of its pot as soon as the fruit is cut, there will be found at the bottom a part of the stem, several inches in length, naked, destitute of roots, and smooth: now, according to the above method, the whole of the roots which the plant produces being permitted to remain on the stem to the last, the old roots decay and turn mouldy, to the great detriment of those afterwards produced.

"Secondly, The first ball which remains with the plant full two years, by length of time will become hard, cloddy, and exhausted of its nourishment, and must, therefore, prevent the roots afterwards produced from growing with that freedom and vigor, which they would do in fresher and better mould.

"Thirdly, The old ball continually remaining after the frequent shiftings, it will be too large when put into the fruiting pot, to admit of a sufficient quantity of fresh mould to support the plant till its fruit becomes ripe, which is generally a whole year from the last time of shifting."

1184. *Temperature.* Speechly approves of rather a lower top and bottom heat for pines in the winter season than what some later authors recommend. "There is nothing so prejudicial to the pine-apple plant, (insects and an overheat of the tan excepted,) as forcing them to grow by making large fires, and keeping the hot-house warm at an improper season, which is injudiciously done in many hot-houses. It is inconsistent with reason, and against nature, to force a tropical plant in this climate in a cold, dark season, such as generally happens here in the months of November and December; and plants so treated, will in time show the injury done them; if large plants for fruiting, they generally show very small fruit-buds with weak stems; and, if small plants, they seldom make much progress in the beginning of the next summer."

"In the hot regions," Abercrombie observes, "to which the pine-apple is indigenous, the growth of the herb and fruit proceeds, at all times of the year, as the new plant may happen to spring, and as the advancement of the herb, and the expansion of the organs of fructification follow at *natural* intervals. Thus the rising and intermediate pines have, at home, the same heat as fruiting plants. As the force of the climate is always equal to conduct the plant to the next stage, whatever the present may be, nature's plants always show their blossoms opportunely; and the fruit is swelled to perfection, however different periods of growth in plants of one family fall together. But, under a course of artificial culture, although a similar promiscuous succession may go on, and be cherished to the end of fruiting without miscarriage; yet to let the critical periods of growth fall in winter, without any failure of the crop, or debasement of the fruit, requires so much additional expense and attendance, that our cultivators of pines endeavour to keep the *main* stock of established plants just vegetating in winter, and to bring the time of full expansion in the herb, and as much as may be of the long and trying time of fructification, to coincide with the spring and summer of this climate. The dependance of the plant on artificial excitement is then so much less. Hence, though it is contrary to the free progress of nature, the succession pines are kept under a temperature rather lower than that of the nursing-pit, in order that while the complete development of the herb is provided for, the plant may not be excited into fruit prematurely in regard to its age, nor unseasonably as to the course of the natural climate during the period which the fruit will take to ripen.

"For succession plants, the *minimum* temperature, on which the preservation of a gentle course of growth depends, cannot be safely reduced lower than that which is specified under *Temperature* in *Nursing Department*. But it is important to carry the *maximum*, as it respects both fire-heat, and the accumulation of sun-heat in the chamber, no higher in this than is fixed for that department, and rather to aim at a maximum from two to five degrees less intense. Thus the double object, of avoiding to excite the plants too strongly, and of giving air at a good opportunity, will be consulted.

Standard *for the* **Thermometer** *in the* **Succession-House.**

	MINIMUM.		MAXIMUM.	
	From the Climate and Dung-heat.	From the Climate and Tan with Fire when necessary.	From Artificial Heat.	From Sun-shine and Confined Air.
Sept.	65	65	68	75
Oct.	58	62	64	70
Nov.	55	60	62	68
Dec.	55	60	62	65
Jan.	55	60	62	66
Feb.	58	60	65	70
Mar.	60	65	68	70
April	62	65	68	70
May	64	66	68	72
June	66	66	68	75
July	68	68	68	80
Aug.	70	70	—	80

M'Phail says, "Let the succession pine-plants have about the same degree of heat to their roots in the tan-bed, and in the air of the house about them, as I have recommended for the fruiting-plants; viz. from 80 to 100 at the bottom of the pots, and from 65 to 80 in the atmosphere of the house. Some writers," he says, "recommend that a less heat be given to succession-plants than to fruiting ones. I can see no reason for making the difference, nor did I make a practice of doing it, except to young plants in winter, in pits without fire heat, which at that season could not at all times be kept to that degree of heat which might be done by the influence of fire. When succession-plants are kept in a less degree of heat than that necessary for fruiting them, they require a longer time to bring them to a proper size for producing large fruit; and of course the expence of rearing them is greater than when they are kept in a vigorous growing state. Nothing better suits a pine-apple, nor any fruit-bearing plant, than to keep it in a vigorous growing state, from the time it is planted till it ripen its fruit." *Gard. Rem.* 126.

Nicol says, "The temperature in January by fire-heat should be kept as near to 60° as possible, and even in sunshine, should not be allowed to pass 65°, lest the plants start into fruit." In May, he increases the heat to between 65° and 70° in the night. In August, he keeps down the thermometer to 75 or 80° in the day time. In September, he returns to 65° in the night, and 70° or 72° with air in the day. In October, he descends to 60° mornings and evenings, and 65° in sunshine.

Griffin differs from the above authors in recommending 60° as the heat proper for the pine in every stage, not exceeding five or six degrees over or under. The bottom-heat he considers proper, is from 90 to 100 degrees! *Tr. on the Pine*, p. 60 and 66.

Baldwin does not mention at what temperature he keeps his succession-pit.

1185. *Covering at Nights.* Where succession plants are grown in pits or frames, this is allowed on all hands to be most advantageous, by saving fuel, and preventing the risk of an injurious cooling, which in pits and houses warmed by fire, and unprotected but by the glass, will sometimes happen under the best management. Practical men recommend mats, canvass, litter, &c. laid on the frames; but a great improvement consists in keeping the covering of whatever nature, and especially if of mats or canvass at not less than six inches on the principle experimentally illustrated by Dr. Wells in his Essay on Dew; Leslie, in his experiments on concentric cases (*Essay on Heat*), and deriveable from the fact known to scientific men, (*See Young's Lect.*), that heat follows the same general laws as light.

Speechly and Nicol complain of the great breakage of glass, by covering with mats, litter, &c.

A. Seton adopts portable covers of straw, arranged in the manner of thatch, and which may be compared to the pannels of reed-fences or screens. They are formed on four laths, fixed at the same width as the pit or frame one way, and not more than four feet apart the other. The chief advantage is, that as the water runs off the thatch, the interior remains perfectly dry, so that there is no consumption of heat by the creation of vapor in those parts which are near the glass; "whereas mats, cloth, loose straw, and other similar coverings, become impregnated with moisture every night from dew, rain, or snow, and the evaporation which is thereby constantly generated, and greatly augmented by the contact of the warm glass, causes a vast and continued drain of heat." Another advantage is the facility with which they may be put on and taken off, and the little risk there is of breaking glass during these operations. *Hort. Trans.* iii. 296.

1186. *Air.* Speechly considers a due proportion of air as essential to the goodness of pine plants. The want of it will cause them to grow with long leaves and weak stems; and too great a quantity, or air given at improper seasons, will starve the plants, and cause them to grow yellow and sickly. Little air will be wanted in winter; but letting down the glasses, even for a few minutes in the middle of the day, should never be neglected in fine weather, to let out the foul air. This will cause the plants to grow with broad leaves, and stiff and strong stems, provided they have room in the bed. Air may be admitted all night in the hot season, care being taken that the glasses are left in such a manner as to prevent the rain, in case any falls, from coming on the plants. *Tr. on the Pine*, p. 75.

Abercrombie gives abundance of air in July and August, but with due caution the rest of the year.

M'Phail admits more or less air every fine day during spring and autumn, and abundance in the summer months, which is also the practice of Nicol, Griffin, and Weeks. Baldwin seems to admit air rather more sparingly than these gardeners.

1187. *Water.* Speechly disapproves of ever giving a great quantity of water at one time to the pine-apple plant, in any stage, or at any season. Too much causes the mould in the pot to run together and become hard and cloddy; and, independently of this, glutting a plant with water will rob it of its vigor, and reduce it to a weak state. Hence, though keeping of plants too dry is certainly an error, it is not attended with the same fatal consequences as the contrary practice. Watering the walks and flues, &c. in an evening, in order to raise a kind of artificial dew, is in imitation of what takes place in the West Indies, where no rain falls in the summer for many months together, and the plants are wholly supplied with moisture from the dews. Gentle summer-waterings over the top are founded on this principle. "Plants lately shifted into the pots, till their roots get matted, do not require so much water as before their shifting. Plants that are in large-sized pots, in proportion to the size of the plants, do not require so much water as plants that are under-potted. Plants that are in hard-burnt pots, made of strong clay, do not require near so much water as plants in pots less burnt, and made of clay with a good proportion of sand intermixed. The latter are greatly to be preferred. Plants in a vigorous growing state require very frequent and gentle waterings. But plants with fruit and suckers upon them, require most of all. When plants are watered over their leaves, it should be sprinkled upon them only till every part is made wet, which may easily be distinguished, as the water immediately changes the color of them to a sad green. As the leaves stand in different directions, the best method is to dash the water upon them backwards and forwards, on every side of the bed. Summer-waterings should always be given late in an evening; but in the spring and autumn, the forenoon is the proper time. Less water should be given in moist than in dry weather, for reasons already given. In winter, when water by accident falls into the centres of the fruiting plants, it should immediately be drawn out, which may easily be effected by the help of a tin pipe of about three feet in length, one end of which should be no bigger than the small end of a tobacco pipe." Pond or river water, or water collected from the roof of the hot-house, and retained within the house till it has retained its temperature, is to be preferred. *Tr. on the Pine*, 81, 82.

From March to September, Abercrombie gives most water, "keeping the mould during this season constantly a little moist." In the other months he diminishes the quantity according to the season and circumstances of the temperature, plants, &c. He uses soft water at 75°, and gives it through a tube composed of jointed pieces, so that it may be shortened at will, to prevent its falling into the hearts of the plants. He also steams the flues occasionally, and waters with drainings of the dunghill in the growing season. *Pr. G.* 627, 8.

"Of two evils," M'Phail observes, "it is better to give pine plants too little water than too much." He gives little in the winter months, but more freely in summer. He sprinkles the leaves occasionally with clean water, not less than 70 degrees warm, and shuts them down in the afternoon with a strong heat in the house. He judges of the temperature of the water by taking a mouthful of it; and if it feel neither hot nor cold, it is in a good state, being upwards of 85 degrees. *Gard. Rem.* 239.

"When you water your pines, recollect that some sorts require less water than others; the sorts called the queen and the sugar-loaf require rather more water than those called Antigua, black Jamaica, and some others of the large growing sorts." "In July succession-pines require frequent waterings. It is a good sign to see plants growing broad-leaved, and the water standing constantly in their hearts in the summer months, nor will it hurt them at any time, if there be a sufficient degree of heat kept in the house. Water them plentifully about once a-week all over their leaves with clean water, from 70 to 85 degrees warm." "The quantity of water pines require, depends somewhat on the condition of the tan in which the pots are plunged. If the tan be in a dry state, and a strong heat in it, they will require more water than when it is moist, and a less heat in it; so that, in giving water, the person who manages them must be able to conclude how often and what quantity of water the plants will need." *Gard. Remem.*

Nicol waters succession-plants once in eight or ten days in January, the quantity moderate, and the time the forenoon of good days. He gives a little more in February and March, till August, when "the waterings are to be forthwith regular and moderate, as it is not intended to force the plants into much growth, it being supposed that they are now very healthy and strong." In October he lessens and retracts the waterings, and during winter waters very moderately once in four, five, or six days; but at the root only. *Kal.* 429.

Griffin waters moderately in winter, and more liberally in the growing season, from March till October; want of water to keep the plants moist being one of the reasons of their premature fruiting.

Baldwin gives no water to the young suckers planted in the tan, from September till April; but after potting, waters two or three times a week during the summer, according as the temperature may be.

1188. *Shading.* "Succession pine-plants," Speechly observes, "do not make half the progress in violent hot weather in the middle of summer, that they do later in the season." "In order to obviate the above inconveniences, some persons cover their hot-houses in the middle of the day, when the heat of the sun is violent, with bass-mats fastened to a rope, which may be moved up and down with great ease. But a better mode, and which is frequently practised, is, to cover the glasses with a large net, which admits the air to pass freely, and at the same time breaks the rays of the sun, and retards their force, especially if the meshes of the net be not large. But if vines were judiciously trained up to the rafters of the hot-house, there would be no need of either of the last-mentioned coverings. The vines should be planted in the front of the hot-house, and not more than one shoot trained to each rafter, part of which should be cut down to the bottom of the rafters every season, by which means the roof of the hot-house may constantly be kept thinly covered with young wood, and by having only one shoot to each rafter, the vine-leaves will afford a kindly shade, and never incommode the pines; for the leaves fall, and the vines are pruned at a season when the hot-house most requires sun."

Abercrombie only shades new-potted plants till they have struck root. He uses thin mats as in the nursing pit. *Pr. Gr.* 629.

M'Phail uses no screens or covers for shades, but supposes his succession plants grown in houses in which vines are trained under the rafters. See his *Monthly Directions.*

Dressing the plants, &c. Most of the authors quoted agree in recommending decayed or casually bruised leaves to be twisted off, if they are at the bottom of the stem; or such as grow on it, carefully trimmed off with the knife. In the season of free-excited growth, Abercrombie says, "Midway between the times of shifting, take off about two inches of the upper mould, and replace it by fresh compost." Remove all *fungi* which grow out of the tan, and in general keep every part of the pinery at all times clean and sweet.

Insects and Diseases. See *General Directions, Subsect.* 8.

Subsect. 7. *Fruiting Department.*

1189. Much of the culture of the nursing and succession pits will apply to this department. But little difference, for example, is made in temperature, air, and watering, till the last stage of the maturation of the fruit.

"The pine-apple," Abercrombie observes, "can be carried even through the last stage without fire-heat: but the fruiting-house is a department in which the aid of the furnace should least of all be relinquished, unless some very great facilities for employing dung-heat, or some obstacles to the working of a stove, attend the situation." This is frequently practised by nursery-men and market-gardeners, and is quite practicable where abundance of dung for linings can be procured.

Speechly says, "Both the growth and size of the pine depend much on the construction and condition of the stove in which they are cultivated. In many places small stoves of a particular construction (in the which the pines stand very near the glass) are erected solely for the purpose of fruiting-houses. These, from their being always kept up to a high degree of heat, are by gardeners usually termed *roasters.* When there is such conveniency, it is customary, when any pine plants show fruit in the large stoves, to remove such plants (especially the most promising) directly into the fruiting-house; where, from the high degree of heat kept, they generally swell their fruit astonishingly."

Griffin's house corresponds nearly with the *roaster* or small house of Speechly; but Baldwin's seems an improvement, as being much smaller, losing less room in paths, and being comparatively easily heated.

1190. *Shifting and potting.* Speechly shifts into fruiting-pots in August (see this article under *Succession Department*), and afterwards, in the following March, divests the plants of a few of their bottom leaves, renews the mould on the tops of the pots as deep as can be done without injuring the roots, and fills up with fresh compost earth. He says, "It is very injurious to the plants, and greatly retards the swelling of the fruit to remove them after this season." *Tr. on Pine*. p. 49.

Abercrombie differs from this author, in shifting in the spring after the plants show fruit: he says, "The main set of plants from the succession-pit will usually be ready for the fruiting-house in the course of August. As to a criterion for removing full-grown pines; shift them just as the roots have filled the pot, so as to turn out whole. Late plants may not be in this state till October. The bark-bed, here, must be renewed, as on every occasion of re-potting plants: but to guard against an untimely show of fruit, the strength of the new bark must be kept considerably below the extreme limit, and there should be a layer of old bark to the full depth of the pots. For the large sorts, provide pots twelve inches in diameter and fifteen inches in depth. For forward plants also, which you are apprehensive require free space for the root and herb, to prevent them from fruiting too early, provide pots two inches wider and three inches deeper than those out of which they are to be turned; but the additional room in the pots should be no more than you may calculate the roots will fill up by the time at which you propose to have them fruit. On the other hand, if you have any reluctant fruiters, when you transfer them to the fruiting-house, postpone shifting them into new pots, in order that the impletion of the pot by the roots may accelerate their fruiting; or shift them into pots barely large enough to receive the roots, putting them into mould rendered, by an increased quantity of river-sand and fresh loam, somewhat less rich than the compost for pines in general: whichever of these courses may have been taken, as soon as they show fruit in the spring, shift them into large pots, without disturbing the ball of earth; and then fill the side of the pot with the best mould. Lay in the bottom of the fresh pots clean shivers, or sea-gravel, to the thickness of two inches, and as much compost as will keep the ball, or root, to be received level at top with the rim. At the shifting of plants that come from the succession-pit, twist off some of the bottom leaves, as far as the ripened stem is ready to send out new roots. Turn out each plant with the ball of earth entire; set it in the new pot, fill the vacancy with compost, and raise the mould to the lowest leaves by spreading compost over the ball; leaving a hollow descent to the depth of the rim to hold water. Plunge the pots in the tan-bed, distributing those in the same range eight inches apart.

1191. "*Second Shifting*. There is in general no second shifting; but the plants remain in the pots assigned at their coming from the succession-pit till the fruit is ripened. But, 1. In the case mentioned above, there is sometimes a spring shifting.

"2. When plants which were regularly shifted, come into fruit early, and it is wished to retard them, you may give them a second shifting in February, or at any time before the fruit has attained half the full diameter; putting them into pots one size larger, and proceeding, in other respects, as at the introductory shifting. Though this acts as a temporary check, the advantage of fresh mould contributes to swell the fruit. 3. To plants which are sickly, or growing out of shape, the best remedy is, to shift them as soon as this is perceived, changing the mould, and pruning away decayed parts of the root as there may be occasion." *Abercrombie*.

M'Phail, with Speechly, shifts finally in August or September; gives a dressing in March, and, in general, does not move them again till they have ripened their fruit, unless to give more bottom heat. Sometimes, however, plants intended for fruiting the following year, when shifted late in the autumn into pots which their roots do not fill well before the month of January, do not show fruit till late in the spring or summer months. For this reason, it is advisable, when they cannot be shifted early enough in the month of August or beginning of September, so as to fill the pots with roots before the winter come on, to let them remain unshifted till the fruit appear, and the stem of it be grown to its full height, and then shift the plants into larger pots, in the manner before directed, disturbing the roots of the plants as little as can be helped. After the plants are shifted, they must not get much water till the fresh growth of the roots has somewhat exhausted the moisture of the fresh earth put round them." *Gard. Rem*.

Nicol shifts finally in August, and top-dresses in February; but plants that are unhealthy, feeble, and do not stand firm in their pots, should be shaken out entirely, and be replaced in the same pots; trimming their roots according as they may need, but retaining all fresh, healthy fibres. Any plants that have already started into fruit, should also be shaken out, and be fresh potted, as above; which, by the check they receive, will keep them back to a better season of ripening, and by the force of fresh earth, make them swell their fruit larger than they otherwise would have done. I have thus new-potted plants, even in flower, with very much success, and have swelled the fruit to a size far beyond my expectations; of which fact any one may easily satisfy himself, by fresh-potting a few plants, and comparing their progress with others treated in the ordinary way. Let the plants be replunged to the brim as before, keeping the pots quite level. If the plants be full-sized, and strong, they will require to be set at about twenty inches apart from centre to centre, on a medium. But they should be sorted; the smallest placed in front, and the largest at back, as in arranging plants on a stage, that they may have an equal share of sun and light. As soon as replaced in the bark-bed, let them have a little water, to settle the earth about their roots." In May he again top-dresses, "reducing an inch or two of the earth from off the surface, and adding some fresh mould, which will invigorate the plants, cause them to push surface radicles, and so keep them the more firm and steady. This needs not be done, however, to plants whose fruit are nearly ripe; but chiefly to healthy plants new shown in flower, past the flower, or with the fruit about half grown. And with respect to any that are unhealthy, and whose fruit are less than half grown, do not hesitate to shift them, shaking them out, trimming their roots, and retaining only healthy fibres. This is a very great improvement in the culture of pines, which I formerly practised, have since advised, and have seen followed with much success." *Kal.* p. 394.

Griffin shifts, for the last time, in October, with the balls entire as before, allowing them in the bark-bed about twenty inches from plant to plant, and two feet distance from row to row; "the first row eighteen inches from the kirb, angling them in the rows as you go on." The pots he uses are twelve inches diameter and ten inches deep.

Baldwin shifts, for the last time, in September, into pots "of about fourteen inches diameter, at the top," at first half plunging the pots till the heat diminishes to a safe temperature. He afterwards fills up the interstices with tan, and lets the plants so remain until they are fruited off for the table. *Cult. of Anan.* p. 17.

1192. *Temperature.* Speechly is not definite on this subject; but observes generally, that nothing is so prejudicial to fruiting plants as making large fires to force them to grow in the winter season; the fruit-buds they send up are small, and the stems weak. *Tr. on Pine*, p. 41.

Abercrombie observes, "As long as it would be dangerous, or at least not desirable, to have the plants show fruit, the temperature should be kept reduced to that of the succession-pit. But a capital elevation, in the course of heat maintained here, must be made for about eight of the last months which the plants will remain in the house; that is, just as it becomes fit to excite them into fruit, and during the whole period of fructification. .

"In the following Table, it will be observed, that August, September, October, November, and December, are set down twice. Against the first series of these months is marked the temperature at which it is proper to aim when the plants have been transferred to the fruiting-house in the July preceding, or the current August or September, in order that they may not start into fruit at the beginning or middle of winter. Contrasted with this, the second series respects a distinct pit appropriated to late-fruiters; plants which have been removed from the succession-house some months, and in which the object of culture is nearly finished: however the decline of the natural season proceeds, a high course of heat must be continued, to ripen the fruit on these. As to the maximum of artificial heat for plants already in fruit, the degrees expressed are merely to indicate, that it would be an unnecessary expense to go higher: but, should the natural climate not supply a greater heat, to go five or ten degrees higher, so far from being attended with danger, would be beneficial to ripening pines, particularly in allowing air to be given with greater security. So the maximum in the last column is chiefly to be observed for the sake of fresh air, which will do more good than a greater heat.

Standard Temperature *for the* Fruiting-House.

	MINIMUM.		MAXIMUM.	
	From the Climate and Dung-heat.	From the Climate and Tan, with Fire, if necessary.	From Artificial Heat.	From Sun-shine and Confined Heated Air.
Aug.	66	66	—	80
Sept.	62	62	68	75
Oct.	60	62	65	70
Nov.	55	58	60	65
Dec.	55	58	60	65
Whenever the Plants show Fruit, the Minimum should be 63 deg.				
Jan.	60	63	65	70 ǀ 75
Feb.	63	66	68 ǀ	82
Mar.	65	67	70	84
April	65	67	72	86
May	65	68	72	88
June	68	68	75	90 ǀ 96
July	70	70	75	100
Aug.	70	70	—	100
Sept.	66	66	72	98
Oct.	63	66	70	94
Nov.	63	66	68	86
Dec.	63	66	68	82

He adds: "The fruit will not swell off fine, if the heat from the flues be too languid to support the prescribed minimum temperature, until the full dominion of summer supersede the aid of the furnace altogether."

M'Phail has given tables of the temperature in his hot-house, or fruiting-pinery, for every day in the year, from which we subjoin the following monthly average. In January the thermometer stood at from 63 to 66 degrees in the morning; from 68 to 85 degrees at noon; and from 64 to 74 degrees in the evening; thus,

		Morn.		Noon.		Even.
Jan.	from	63 to 66	from	68 to 85	from	64 to 74
Feb.	from	58 to 65	from	68 to 90	from	61 to 70
Mar.	from	61 to 71	from	65 to 90	from	62 to 72
April	from	60 to 78	from	66 to 96	from	65 to 73
May	from	62 to 73	from	75 to 94	from	66 to 75
June	from	65 to 75	from	83 to 100	from	68 to 82
July	from	62 to 75	from	80 to 100	from	68 to 78
Aug.	from	60 to 74	from	76 to 100	from	69 to 78
Sept.	from	62 to 78	from	75 to 100	from	67 to 79
Oct.	from	59 to 74	from	63 to 96	from	60 to 72
Nov.	from	57 to 67	from	66 to 85	from	62 to 67
Dec.	from	52 to 65	from	55 to 68	from	58 to 65

On the tables from which the above is extracted, M'Phail observes, "that the thermometer was hung in the middle of the hot-house, shaded from the direct rays of the sun." He does not offer these tables as exact rules to be followed; nor deny that the pine-apple can be ripened in a different degree of heat than that described; but he asserts, that such heat and management as he recommends will bring the pine-apple to good maturity. "Had I kept a register of the thermometer another year, and compared it with that which I kept for twelve months, and have herein given, there would have been a difference; the heat of every day, nor of every week, nor of every year, would not have been alike; nor to cultivate the pine-apple, nor any other plant, is it necessary that it should be so."

Nicol, in January, keeps the fruiting-pit at the same temperature as the succession department, (from 60° to 65°,) lest the plants should start into fruit. In February, he requires a "lively, but not violent bottom heat, in order to start the plants into fruit:" the temperature of the air he raises gradually to 75°, not allowing the thermometer to pass 80°. From 72° to 75° is his temperature for March and April. In May, June, July, and August, he requires 75° mornings and evenings, and 80° or 85° at noon. In September, after fire-heat becomes necessary, he keeps as nearly to 65° as possible, and in sunshine, by the free admission of air, to about 70 or 72°. In October, November, and December, he lowers the temperature to 60° mornings and evenings, and 65° in sunshine.

Griffin, as before observed, endeavours to keep the air of his fruiting and succession houses as near as possible to 60°.

Baldwin says, "The fruiting-house, during the winter, should be kept at about 70°; it may be left in the evening at about 75°, and it will be found in the morning at about 65°, so that no attendance during the night will be required. *Cult. of Anan.* p. 19.

1193. *Covering at Nights.* Speechly observes, that many small hot-houses are covered by large sheets of canvass, by the help of a roller and pulleys; "but where hot-houses are large, this mode of covering cannot so well be adopted; therefore the most general method is to use light covers of wood, or frames of wood, covered with painted canvass: the covering the whole of the roof of a hot-house in this manner is very troublesome, and attended with great expence; nor indeed is it absolutely necessary, as I have observed above. When either of the above methods are practised, it should be done with discretion. In many places the covers of the hot-houses are sometimes, in a snowy, dark, severe, or rainy season, permitted to remain on for many days together, which is very detrimental to the plants, as they will in time draw themselves weak by the continuance of such a practice; for it is observable, that plants grow much faster in the dark than in the light; and this is manifest from the progress of plants when first they arise from seed, in the open ground, in the spring of the year, when they do not grow half so much in the day as in the night. But here it must be observed, that the sun and light give maturity to the nightly progress of plants, and the want of them soon causes the plants to grow languid, weak, and, in time, to die. It is also a bad practice to continue to cover hot-houses late in the spring of the year, which is injudiciously done in many places, even so late as the middle of the month of May; for as the covers are seldom taken off till after six o'clock in the morning, (the hour that laborers come to their work at most places,) it makes the hot-house night too long at that season of the year, when generally there are great numbers of the fruit of the pine in blossom; for it should be remembered, that light, as well as warmth, is essentially necessary to promote the growth of plants. In large double-pitted hot-houses, the covering of the lower lights may be effected with great ease, and this is found to be of use on a double account; first, because the pine plants in the front pit, by standing very near the glass, are in the most need of covering in severe weather; and secondly, because the front pit is generally used for succession plants, which require to be shaded, after being shifted in the spring, whenever the weather is warm and clear, as I have before observed in treating upon that head."

In Russia, the pine-stoves are frequently kept covered with boarded shutters day and night for several weeks, and even as long as three months together. As the plants are then as nearly as possible in a dormant state, it does not appear to injure them so much as a native of a more genial climate would imagine.

1194. *Air.* In March, when the plants are showing fruit, Speechly "admits a great quantity of air into the hot-house, the want of a due proportion of which causes the stems to draw themselves weak, and grow tall, after which the fruit never swells kindly." *Tr. on Pine*, p. 50.

Abercrombie says, "Give plenty of air to plants in fruit, without a daily supply of which, they will not swell to a handsome full size, nor acquire the elevated flavor which belongs to the pine-apple when in perfection." *Pr. Gard.* p. 642.

M'Phail admits air whenever it can be done consistently with attention to the temperature. In June, if the nights be cold, and the days cloudy, "you will have occasion for fires, otherwise you will not be able to give air enough, and keep up the temperature." In July and August, abundance of air is given, and some often left at the houses all night.

Nicol admits air at all seasons in fine sunshine weather, and "freely as the fruit approaches to maturity, in order to enhance its flavor."

Griffin gives air to the fruiting-house "discretionally in fine, mild, sunny days, from ten till about two o'clock," and more freely in the summer season.

Baldwin gives air "when the weather will permit, winter and summer, from the back and ends, but never from the roof."

1195. *Water.* Speechly says, "As the fruit and suckers begin to advance in size, the plants will require plenty of water to support them, which may be given them at least twice, and sometimes three times a-week; but too much should not be given them at one time; it is better to give them less at a time and oftener." As soon as the fruit appears full swelled, the watering such plants as produce them should cease; but it is a general practice (in order to have the fruit as large as can be got,) to continue the watering too long, which causes the fruit to be filled with an insipid, watery, and ill-flavored juice. *Tr. on Pine*, p. 52.

Between the times of watering plants in fruit, Abercrombie says, sprinkle the flues, but "suspend watering over the herb till the blossoms are fairly set. Afterwards, while the fruit continues green, it will be beneficial to give water now and then, over the herb, from a fine rose-pan: even departing winter is some restraint upon this; but after March has commenced, wash the herb perfectly clean every eight days. Use soft water that has been warmed to the temperature of the house; and for two or three hours after, have a maximum heat from the flues to exhale superfluous moisture. Moderate humidity and the suitable degree of heat will make the young fruit swell apace. At seasons when the mid-day sun has much power, it is best to water over the leaves as soon as the morning-sun is felt on the house, or two hours before sunset. The fruit will not swell off fine, if there be any deficiency in giving water. When the fruit is well swelled, forbear to water over the fruit or leaves; but it is still necessary to keep the earth about the roots a little moist. Nor, when the fruit is pretty large, should water be poured into the crowns so copiously as to stand in them more than one day. The different degrees in which the varieties stand in need of water must not be forgotten. As the pine-apples begin to ripen, put them on short allowance of water, for excessive humidity spoils the flavor of the fruit: begin the reduction by decreasing the quantity; for, in hot weather, frequent small supplies should be given on account of the suckers on the plant, till consideration for the fruit forbid even sparing waterings, lest it should be rendered insipid."

M'Phail says, "Let it be remembered, that while the fruit is in blossom, and for some days afterwards, the plants should not be watered all over their leaves, neither should the plants be watered all over their leaves nor fruit after the fruit is fully swelled, nor should the earth, in which their roots are, be after that time kept very moist, for they do not require it, because the plant has nearly performed its office, which it never has to do a second time." To water the fruiting pine-plants in winter; in gloomy weather, when it is best not to water over the leaves, a small-sized watering-pot, with a long tin pipe and a flat nose on the end of it, should be in readiness: the water should be at 80°, and never under 70°. In January, they may require to be watered two or three times. The same in February. In March, wash them once or twice over the leaves, till every part be perfectly clean. They may require to be watered three or four times at root. In April and May, water over the leaves with water from 80° to 90°, and at bottom perhaps four or five times. In July, "when any of the fruit are full-swelled, do not water them over the fruit or leaves; but it is necessary even then to have the earth about their roots moderately moist, otherwise the fruit would flag for want of nourishment. It should also be observed, that after the fruit is swelled to a pretty good size, water should not be poured into the crowns of the fruit so plentifully as to stand in them above a day or two." In August, when the fruit are ripening, give no water.

Nicol waters seldom in January, and not oftener than once in six or eight days in February. In March, "water may be given oftener than heretofore advised, and also in larger quantities; generally a moderate watering at root once in three or four days, and a dewing over head occasionally, to refresh the leaves, and keep them clean from dust. From the time the plants are out of flower, and the fruit begins to swell, water must be applied in a very liberal manner once in two or three days, always giving the necessary quantity at root, and then a dewing over head. Watering to this extent, however, if the fruit be not in too forward a state, will seldom be necessary before the end of the month, or till April." In April, "water must be given in a plentiful manner, once in two or three days, in order the better to swell off the fruit. The roots have now much to do in sustaining it, and also the suckers, which will be fast advancing in growth. For this reason, water frequently with dunghill-drainings, or with water of dung, soaked on purpose; and after each watering at root, give a dewing over the leaves, as directed above." In May, June, and July, "from the time the fruit begin to color, however, begin also to lessen the quantity of water; and towards its being fit for cutting, withhold water entirely, else the flavor will be very much deteriorated. I shall here observe, with respect to the different kinds of pines, that the queen and the sugar-loaf sorts require considerably more water than the king or Havannah, and the Antigua. The difference in the manner of watering should be more particularly attended to as the fruit approach to maturity; as the latter-named kinds are naturally more juicy and watery than the former." In August, the plants that have done fruiting being removed, the succession stock which replace them are to be watered freely at root, and occasionally dewed over top. In October and November, the waterings are gradually lessened; and in December, once in eight, ten, or twelve days, will be sufficient. *Kal.*

Griffin never waters pines over the leaves in any stage, nor gives much at root in damp weather. In other respects his practice agrees with that of Abercrombie and Nicol.

Baldwin waters the plants in the fruiting-house cautiously till towards February; but as the spring advances, gives a larger supply. He adds, "Never water your plants in the common broad-cast method, over their heads and leaves." *Cul. of Anan.* p. 21.

1196. *Treatment of the plants.* "Sticks," Speechly says, "should be provided to support the fruit before it is grown too large; and in laying them, care should be taken to leave bandage room sufficient, making allowance for the swelling of the fruit. When the suckers are grown to about a foot in length they should be taken off, and from that time the fruit will swell very fast." *Tr. on Pine*, p. 51.

"Large fruiting-plants," he adds, "will sometimes show their fruit in the months of August and September, but these are generally thought of no value, and consequently thrown away. To prevent this, I frequently take such plants out of the hot-house as soon as their fruit begin to appear. I then set them in a shed or out-house for five or six weeks; at the expiration of which time I pot them as in the month of March, after shaking off their balls. After this I plunge them into the tan; and in the month of March following put them into larger-sized pots, with their balls and roots entire. By this means I have sometimes cut tolerably good fruit from such plants in the months of May and June following. Such forward plants generally produce very fine suckers. Whenever the pine plants are removed after they are grown large, it will be of service, before they are taken out of the tan-bed, to mark the side of the pots which stands next the sun; for it is observable, that the centres of the plants generally tend that way: so that the plants, when replaced, may stand as they did before they were removed. I do not mean that it is at all necessary for the plants to be put into the very identical places in which they stood before, but, in point of position, it will be proper, and the plants will be benefited by being so placed. This may as easily be done as placing them in a random manner, which is the common method."

Abercrombie directs, "to keep the plants growing gently, and to have the pots, in general, completely filled with the roots by the time at which you intend to excite them into blossom. From the middle of February to the 1st of March is a good time to have the main crop in flower; as the prospective season is the finest. About a month before you expect to see fruit, dress the plants by taking away two inches in depth from the top of the mould. Twist off some of the lower leaves. Fill up with fresh compost, round the stem, to the remaining leaves. The bark-bed should be revived at the same time, so as to make it lively; but no new tan should be added, till the time for the fullest heat arrives." He agrees with Speechly in the following directions as to suckers, "If you desire to ripen eminently large fruit, destroy the suckers as they spring, by twisting out their hearts with an iron sharp-pointed instrument formed for the purpose. Apply this to the heart of the sucker; and turning it round, bring the heart away. On the other hand, this method is unfavorable to an increase of the stock, as there would be nothing but crowns to originate plants from: when the multiplication of the stock is a principal object, the suckers must not be extirpated." Speechly, in addition to this practice, says, "A yet further advantage may be given to the swelling of the fruit, by having a few of the lower leaves of the plant taken off, and by putting a rim of tin, or any thing else in the form of a hoop, round the top of the pot, sufficient to raise the mould three or four inches. The mould should be of the best quality, and constantly kept in a moderate moist state: this may be done by having the surface kept covered with moistened moss. The roots of the pine-plant, especially those produced from the part of the stem just under the leaves, will then make a surprising progress, and the fruit will be greatly benefited by this expedient."

M'Phail says, "It frequently happens that pine-apple plants designed to bear fruit, do not show their fruit early enough in the spring or fore-part of summer, to ripen their fruit before winter, when there is not sunshine enough to give the fruit any flavor. This may happen because the plants have not come to a proper growth, or their roots may have been injured by too violent a bottom-heat, or by being over-watered, or they may have been shifted too late, or been put into pots too large for their roots to have filled them before the end of the growing season. To make pine-plants show their fruit at an early time in the spring, some authors have recommended the cutting off some of the roots at the autumn shifting; but long experience has convinced me, that cutting off the roots, or destroying them by any means, instead of making them show fruit, is an effectual mean to prevent them from showing fruit till they have again made long roots. The fruit of the pine-apple is formed probably not less than seven or eight weeks before it appears among the leaves; and if a plant be divested partially or totally of its roots, its growth is stopped till it has made roots of considerable length, when it will grow quickly. And, if before the roots were destroyed, the fruit had been formed in the hidden secret centre of the plant, the fruit will grow and show itself when the leaves of the plant, excepting those on the stem of the fruit, will make no appearance of growing. This, perhaps, may be the reason which induces some persons to think that cutting off the roots of the plant causeth it to fruit sooner than it would do were the roots suffered to remain. If pine-apple plants, intended for fruiting the following year, be shifted late in the autumn into pots, which their roots do not fill well before the month of January, they probably will not show fruit till late in the spring or summer months." He top-dresses the pots, and trims plants in February, and uses every means to heat water, &c. to keep them in a growing state during that month and March. "In March, to make some of your fruit swell very large, prevent all suckers from growing on the plants. You may destroy them by twisting out their hearts with a sharp-pointed stick, or a piece of iron about eighteen inches long. This, however, should not be made a general practice. It is contrary to nature; and I never knew it to make the fruit swell much larger than if the suckers had been left to grow. If pine-apple plants be in a good growing state, as soon as the fruit shows itself, one or two suckers may be observed coming up beside its stem. If more than two or three suckers begin to grow out of the stem, they should be destroyed, unless they are so near the earth as to make roots into it, which will strengthen them without robbing the fruit." "In June, the fruit, when it gets large, should be supported with sticks to prevent it from falling, and to make the crowns grow upright on the fruit. Were the fruit permitted to lean to one side, the crown in growing would force itself upright, and when the fruit was ripe, the crown would stand crooked on it. If any of the fruit that showed early are ripe, set the plants out of the fruiting-house, and replace them by any that may have shown fruit among the succession plants." If in August you have any plants among your succession pines which have showed fruit, as your fruiting plants are now ripe, set out the pots, and take those in fruit from among your succession plants, to replace them. In November it may be well to have a few plants start into fruit, which may come in at an early and very acceptable season. Some may yet be green or not fully ripe, and should get no more water than what is necessary to keep them from flagging. *G. Rem.*

Nicol in February top-dresses and trims such of the plants as have not then shown fruit. "Some kinds of pine apples put out suckers on the fruit-stalk, at the base of the fruit, which should be rubbed off with the thumb as they appear, because they rob it of nourishment to a certain extent. If the object be to have large fruit, all suckers of the root, and all but two or three of the best of those rising from between the leaves, should be destroyed. Those of the root may easily be twisted off, and the others may be destroyed, or be prevented from growing farther, by breaking out their heart-leaves, which is no difficult matter while they are young, being then brittle. But if the increase of the stock be the object, all suckers of the stem should be encouraged, and even some of the best of those from the root." *Kal.*

1197. *Time required to Fruit the Pine.* All the authors quoted, excepting Baldwin, and almost all cultivators of the pine-plant, require from two and a half to four years from the planting of the crown or sucker to perfecting its fruit. The general period is from two and a half to three years; a fruit of the queen pine being gathered in August, 1819, and its crown planted a few days afterwards, will, in the July, August, or September, 1822, produce fruit. A strong sucker from the same plant taken off, as is frequently the case, a month before the fruit ripens, and planted, will, in the end of 1821, or early in the spring of 1822, ripen its fruit. Baldwin, however, accomplishes this by both crowns and suckers in a shorter period, and appears to have great merit, not only in that, but in growing his succession plants without the aid of fire-heat. The following are his observations on both subjects. "The New Providence, black Antigua, Jamaica, Enville, and the other large sorts of ananas, will require the cultivation of three years to bring them to perfection; but the old queen and Ripley's new queen may be brought to perfection in fifteen months. To effect this it must be observed, that some of the plants will fruit in February or the beginning of March, and consequently that the suckers may be taken off in June, or the beginning of July. Make then a good bed of tan with lining of litter round the outside, to keep in the tan; make the bed to fit a large melon frame; put the suckers into pots of about nine inches diameter, filled with the compost; plunge them in the bed, prepared in regular order, and throw a mat over them in hot weather, for shade, till they have taken root; let them remain till the end of September, and then shift them into pots of about twelve inches diameter, and plunge them in the fruiting-house. I have had fine crops of pines raised from these suckers, many of them four pounds each, from plants only fifteen months old. This method, in point both of time and expense, has greatly the advantage of the common plan of raising pines, in three years, by fires; when the fruit at last is frequently small and ill-flavored.

It is a peculiar recommendation of this plan, that the plants reared in frames, without fires, the first year seldom or never run to fruit; whereas, on the contrary, where stoves are used, first for the nursery, next for the succession, and lastly for the fruiting-house, it is seldom that one-third of the plants come to the fruiting-house, because so many of them have run to fruit; and even those that stand are necessarily dried and stinted, being subject to the attacks of various insects; not to mention the enormous care and expense attendant upon a three years' cultivation. By this plan, "one-third of the coals are sufficient, and less than one-half of the usual labour and buildings." *Cult. of Anan.* p. 28.

1198. *Cutting ripe Pines.* "It is easy to know," Speechly observes, "when the pine becomes ripe by its yellow color, yet they do not all change in the same manner, but most generally begin at the lower part of the fruit; such fruit should not be cut till the upper part also begins to change, which sometimes will be many days after, especially in the sugar-loaf kinds. Sometimes the fruit will first begin to change in the middle, which is a certain indication of its being ripe; such fruit should be cut immediately."

Abercrombie says, "The indications of maturity are, a diffusive fragrance, accompanied by a change in the color of the fruit; most sorts becoming yellow, or straw-color; others, dark-green, or yellowish tinged with green. Cut pine-apples before they are dead-ripe, or the spirit of the flavor will be dissipated. Bring away, with the fruit, above five inches of stalk; and leave the crown adhering to the top."

Nicol says, "If pine apples be not cut soon after they begin to color, that is, just when the fruit is of a greenish-yellow, or straw color, they fall greatly off in flavor and richness; and that sharp, luscious taste, so much admired, becomes insipid."

1199. *Retarding and keeping Fruit.* "It sometimes happens," Speechly observes, "that great part of a stove of plants will show their fruit at or near the same time, and with the same treatment, would consequently become ripe too nearly together. To prevent this, and bring them into a regular succession, when the fruit is nearly ripe, part of the plants may be taken out of the stove, and set in a dry shady place; as, for instance, the stove-shed, where the pots should be covered with moistened moss, but no water given them; it must be observed, that every one of the plants must be taken into the hot-house again, and set in the tan-bed for a week or ten days before the fruit is cut, to give it a good flavor. When there is a variety of hot-houses, this caution is not necessary."

Contrivances for retarding fruit, Abercrombie states, are sometimes resorted to, that plants which have started too soon into fruit, may have a better season to ripen in; and sometimes in order that a whole crop may not come in at once. The former may be provided for by shifting early in spring, or at any time before the fruit has attained half the full diameter; and the latter inconvenience may be thus obviated: "If you perceive the fruit ripening too fast, or advancing too nearly together, set as many plants as you intend to retard into a dry airy place, affording both shade and shelter. Give no water as long as you wish to suspend their progress. For the same purpose, others may be set out green; while the excitement of these is lowered, they must be kept in a growing state."

"If pines," M'Phail observes, "ripen too fast after one another, set the pots out of the house with the fruit on them, into an airy, cool, dry shade, and the fruit will keep a fortnight or longer, if it be set out before it is full ripe. The plants, while in this situation, should have no water given them: and it may be necessary sometimes, in order to have a succession, or constant supply of fruit for a long time, to set some of them out green, into a cooler place, to keep them back; and when you wish to ripen them, take them into the house, and plunge them in the tan again."

1200. *Size of the Fruit.* Three pounds may be considered the average size of the queen pine apples brought to market or sent to table, but occasionally they grow much larger, attaining four and five pounds; and the Providence, with Speechly and Griffin, has weighed seven and nine pounds. Griffin appears to have been particularly successful in growing large fruit. At Kelham, near Nottingham, while gardener to J. C. Girardot, Esq. he cut, in the year 1802, twenty queen pines, which weighed together eighty-seven pounds seven ounces. In 1803, one weighing five pounds three ounces. In July, 1804, one of the New Providence kind, weighing seven pounds two ounces. In August, 1804, one of the same kind, weighing nine pounds three ounces. And in 1805, he cut twenty-two queen pines, which weighed together one hundred and eighteen pounds three ounces.

At a meeting of the Horticultural Society of London, held in October, 1817, T. Baldwin, gardener to the Marquis of Hertford, at Ragley, presented a queen pine of great beauty and superior flavor. It measured sixteen inches in circumference, seven inches in length, and weighed four pounds. The plant on which it was produced was little more than fifteen months old. *Hort. Tr.* vol. iii. p. 118.

Subsect. 8. *General Directions common to the Three Departments of Pine-Apple Culture.*

1201. With a view to render the reader master of this most important part of horticulture, we shall here bring together a variety of general observations which could not well have been introduced in the foregoing instructions without frequent repetition.

Management of the Bark-Pit. The first point deserving attention here is the *Preparation of the Tan*, after it is brought from the tan-vats; this has been already described. (See 867).

Formation of the Bed. M'Phail says, " Pits for tan need not be made deeper than three feet six inches; if they be very wide, three feet will do; and to admit large fruiting pine-plants, the surface of the tan-bed will require to be five or six feet from the glass above it. When a pine-pit is to be filled wholly with new tan, if it be late in the autumn or winter, the tan had best lie in a state of fermentation for some time before the pots be plunged in it. If pine plants in pots be plunged in wet tan, it is apt to affect their roots, and if the roots be hurt, the plant must suffer."

It is desirable on the first formation of a bed, to mix new and old tan together; in which case the quantity of new bark to be brought into the pit will depend upon the goodness of the bark and the bottom-heat required. As much new tan as will fill two third-parts of the bark-pit, with a mixture of old, rotten almost to earth, will produce a bottom-heat of about 85°. When old tan with higher remains of strength is used to modify the new, the same heat may be produced, if the quantity of new be not more than half the capacity of the pit. This is said of a new pit. After a bark-bed has been in action, partial renewals of bark, to keep up the heat, are frequently sufficient in the reduced proportion of one-third, one-sixth, one-twelfth, or less. At intermediate stages between the partial renewals, the bed requires only to be excited into a brisker fermentation by forking up. About five-sevenths of the pit from the bottom should be occupied by the new and old tan as a fermenting body of bark: and about two-sevenths from the top, or a little more than the depth of the pots, whatever that may be, should consist of old tan incapable of heating so as to burn the roots of the plants; at least such should be the ordinary distribution of the tan; but where peculiar circumstances require a speedy augmentation of heat, without displacing the pots, as when fruit is to be swelled off in the last stage, the earthy tan at top may be taken away, and new tan substituted. *Abercrombie.*

" I have found," says M'Phail, " that when a tan-pit is about six feet wide, and three feet deep, filled with good new and old tan in nearly equal quantities, it is enough to raise and retain a sufficient heat for the growth of the pine-apple for about half a year, with the addition of as much new tan as will keep it up to its original height; at the expiration of which time, the exhausted part of the tan is to be taken out, and the bed recruited with new bark." " When tan gets too dry, pour water into it now and then between the pots; this will cause a fine moist heat to arise among the plants to help to nourish them, and it will likewise enable the tan to retain its heat longer than if it were suffered to become dry, for no body of vegetables will continue to ferment and generate heat after the moisture in them is evaporated." *Gard. Remem.*

1202. *Temperature of the Bed.* The general practice is to keep this from five to ten degrees higher than that of the air of the house in the winter months; somewhat higher in spring and autumn; and about the same temperature in summer. M'Phail and Griffin prefer rather a higher degree of bottom-heat. One hundred degrees, these authors recommend, or " about milk-warm, at the bottom of the pots, is heat enough for the roots of the pine-apple plant to grow in; therefore the depth, whether of tan, leaves of trees, or dung put into the pit, should be proportioned according to the qualities of the materials in regard to raising heat. If the air in the house be kept up to a proper degree of heat, the roots of the plants will grow in a heat of eighty degrees, so that it is safer to have the pots stand for a time in such a gentle heat than in a heat of upwards of a hundred; but let it be remembered, that the heat of the bed, especially from its surface to eight or nine inches downward, is liable to increase and decrease in an uniformity, though not so quickly, with the variations of the heat kept up in the atmosphere of the house. But be this as it may, the heat of the tan at the bottom of the pots when the roots are there, had best not be warmer than about milk warm, especially in winter, when, if the roots at the bottom of the pots be destroyed, there is not at that season of the year a kindly natural warmth in the house to cause young roots to spring from the stems of the plants to draw into them sufficient nourishment to sustain them; and farther, if the roots of fruiting plants be destroyed in winter, it will probably hinder them from showing fruit in time to ripen, or make them show weak." *Gard. Rem.*

Abercrombie and Nicol agree in the following standard for the different classes of pines, allowing a latitude of from five to eight degrees, below or above. Nursing bark-bed 75°. Succession bark-bed 72°. Fruiting bark-bed 82°. The standard for the succession-pit is fixed lower than that for the nursing-pit, to guard against the chance of starting the plants into untimely fruit. Abercrombie observes, that when the bottom-heat of a bark-pit is as high as 80°, with a layer composed of old and new tan at top, that layer will scarcely exceed 65°.

"Many persons," he adds, "work pine-stoves with a bottom-heat five or ten degrees higher than the maximum standard set down for each house above. These, on the one hand, and the theorists, on the other, who censure the application of any bottom-heat to exotics as unnatural, both seem to be in extremes. In tropical climates, the earth itself about the roots of plants is frequently so penetrated with the violent heat of the atmosphere, as to maintain a temperature of 80 degrees, or more, in the shade; consequently, for the roots of exotics from such climates to be plunged into a bed heated to that degree is not unnatural: still it should be recollected, that the heat of the air there has a proportionate elevation above that of the earth. During our winter, therefore, instead of keeping the roots of pine-plants in a factitious heat of 80°, while the artificial temperature of the air is, in some cases, let down to 55° and 60°, perhaps a better relation of the bed with the atmosphere would be supported by having the bark-bed at 60° or 65°, and the air of the pit at 70°, at least never less than the heat at the roots."

The Measurement of Bottom-Heat is effected by keeping trial-sticks in the bed, which M'Phail considers sufficient for any experienced person; but the most accurate mode is, to plunge the bulb of the thermometer about a foot into the bed, till it reach that depth where the layer of old bark into which the pots are plunged, and the fermenting mass may be supposed to join. This will give the heat at the bottom of the pots.

1203. "*Renewal of the Bark-Bed.* When the decline of the bed below a given temperature requires it to be renewed, take out the pots, tie the leaves carefully with bass, to protect them from being broken, and set them in a place where the plants will receive no check. If the top layer be earthy and decayed, so as to run through the screen, take it entirely off. Let the rest of the old bark be screened, and that which passes through be carried out of the house. Bring in new bark equal to the quantity taken away; but, before mixing it with the retained portion of the old, separate the least efficient of the old to serve as a top-layer. Proceed then to mix the new bark equally with the soundest part of the old, turning over the bed from the bottom with a fork. Tread this part equally. To receive the pots, spread on lightly at top a layer composed three-fourths of old bark, extending at least to the depth of the pots. Dress the surface of the bed full up to the sides of the pit, making it rather higher in the middle. After renewing a bark-bed, if there has been a great proportion of new tan introduced, or if there is any probability that the heat may rise excessively, plunge the pots but one-third of their depth into the bark, or set them merely on the surface, till the full heat has risen and been found not in excess; then plunge them to their rims.

"*Reviving Tan with the Fork.* If it be not requisite to take off the top, begin at one end of the bed, and dig out as much bark as will allow the remainder to be loosened, and completely forked over, without spilling any into the house. Fork it accordingly; return the bark taken out, level the top, and replunge the pots to their rims.

1204. "*Times of renewing and reviving the Bark-Bed.* After the bark-bed has been renewed by the substitution of new bark for that which is quite wasted, it may be expected to last in good action, with the help of an intermediate forking up, for ten or eleven weeks; consequently, it will require renewal about five times in the year. As a gradual decline must take place between one renewal and another, the heat can scarcely be kept by any management from fluctuating less than ten degrees; and, therefore, in planning the business of the year, it is a desirable thing to distribute the times of renewal so that they may just precede those periods when something critical depends on having the bark-bed at a maximum heat. The principal occasions seem to be these:—

"1. The time of the principal annual potting and repotting, when established plants are advanced to the last and intermediate stages, and new plants are brought into the nursing-pit. This will commonly fall in the first week in August; but let it fall when it will, one of the fundamental reparations of the bed must be adapted to it; because the plants want a good growing heat to strike them, and the successive clearance of one pit after another affords the easiest opportunity for shifting the bark.

" 2. That crisis of autumn when the weather is declining, yet not cold enough to light fires. This happens about the beginning of October, and may commonly follow too close after the entire restitution of the bed to admit of timing the second renewal exactly to it; the bed may be, however, well forked up, when the season is on the turn. The second renewal will scarcely be demanded by the state of the bed till eleven weeks after the first. As it respects the fruiting-house, it should be particularly sound and complete, to allow of timing the third to a critical period in the culture of the pine. Rather protract the interval between the second and third renewal to three months or more, than precipitate the third, which might start the plants too soon into blossom.

" 3. In the fruiting-house, accordingly as you calculate that the plants will shew fruit at the end of January or later, renew the bed just before, in the proportion of one-third, if necessary, so as to have the bed steadily up to 80° when the plants come into flower.

" 4. A shifting of the roots into larger pots is frequently requisite for plants in the nursery and succession pits about the middle or end of March. Whenever repotted plants are to be struck, the bed should be prepared for yielding the approved degree of heat.

" 5. The same principle prescribes a renewal at the partial repotting, which is commonly made at the end of May. This may be combined with another object: — contrive to have the pit in lively action just before you discontinue fire-heat.

" As to forking up merely: if this be done at the end of six weeks after renewal, there will be four or five weeks to run, while the heat is to be sustained on the old materials, which will be generally found a convenient distribution of this business.

" In the continued hot weather of full summer, the fermentation in the bed may decline faster than the strength of the tan is given out, from the mass of tan getting excessively dry. In this case, pour as much water on the surface, between the pots, as, in addition to that passing through the pots in common waterings, will restore sufficient moisture to the bed.

" With a small fork, keep the surface of the bark free from fungi, or crusty spawn, which are apt to generate there."

1205. *Substitutes for Tan.* Tan is in many places scarce and dear, and in others not to be got; in either case it becomes an object to know the best substitutes, and their management. Horse-dung alone, as already observed, is used by some; and, by others, mixed with bark — with ashes, with leaves, saw-dust, shavings, clippings of leather, chopped spray, and such other durable substances as can be brought to ferment along with it, and prolong its duration as a fermenting mass.

" Nicol, when tanner's bark is difficult to be procured, recommends a mixture of leaves with stable-litter, using only a little bark (fifteen or eighteen inches,) in which to plunge the pots. But in using leaves, or leaves mixed with litter, they must always be well fermented, and the rank heat extracted out of them before they are made up into a bed for the plants."

Niel observes, that flax-dressers' refuse ferments very slowly and regularly, and that, used instead of stable-dung, it will keep up a steady heat longer than almost any other substance.

Speechly used oak-leaves with great success, and gives the following directions for their preparation:

" After being raked into heaps, they should immediately be carried to some place near the hot-house, where they must lie to couch. I generally fence them round with charcoal-hurdles, or any thing else to keep them from being blown about the garden in windy weather. In this place we tread them well, and water them in case they happen to have been brought in dry. We make the heap six or seven feet in thickness, covering it over with old mats, or any thing else, to prevent the upper leaves from being blown away. In a few days the heap will come to a strong heat. For the first year or two that I used these leaves, I did not continue them in the heap longer than ten days or a fortnight; but in this I discovered a considerable inconvenience, as they settled so much when got into the hot-house, as soon to require a supply. Taught by experience, I now let them remain in the heap for five or six weeks, by which time they are properly prepared for the hot-house. In getting them into the pine-pits, if they appear dry, we water them again, treading them in layers exceedingly well, till the pits are quite full. We then cover the whole with tan to the thickness of two inches, and tread it well, till the surface become smooth and even. On this we place the pine-pots in the manner they are to stand, beginning with the middle row first, and filling up the spaces between the pots with tan. In like manner we proceed to the next row, till the whole be finished; and this operation is performed in the same manner as when tan only is used.

"After this the leaves require no farther trouble the whole season through, as they will retain a constant and regular heat for twelve months without either stirring or turning; and if I may form a judgment from their appearance when taken out, (being always entire and perfect,) it is probable they would continue their heat through a second year; but, as an annual supply of leaves here is easily obtained, such a trial with us is hardly worth the trouble of making. However, as a saving in leaves may be an agreeable object in places where they are less plentiful, I was induced to make the following experiments. In 1777, one of the pine-pits was filled with one part of old, and two parts new leaves well mixed together. And the next year, 1778, one pit was filled with old and new leaves in equal quantities. In both these experiments, I had the satisfaction to find the pits so filled to retain a heat through each season, equal to the other pits that were filled entirely with new leaves; and since that time we have always used the whole of the undecayed leaves mixed along with the new ones. I also have constantly used the leaves after they were taken out of the hot-house in the early-made hot-beds, and always found them to answer quite as well as fresh leaves. I must beg leave to observe, that when the leaves are intended to be used a second time, it will be proper at the taking them out of the pits to remove some few at the top, as also on each side; because the leaves at the top and outside of the pit approach most to a state of decay. After this the pines will have no occasion to be moved but at the stated times of their management; viz. at the shifting them in their pots, &c. when at each time, a little fresh tan should be added to make up the deficiency arising from the settling of the beds; but this will be inconsiderable, as the leaves do not settle much after their long couching. During the two first years of my practice, I did not use any tan, but plunged the pine-pots in the leaves, and just covered the surface of the beds when finished, with a little saw-dust, to give it a neatness. This method was attended with one inconvenience; for, by the caking of the leaves, they shrunk from the sides of the pots, whereby they became exposed to the air, and at the same time the heat of the beds was permitted to escape. Many powerful reasons may be given why oak-leaves are preferable tanners' to bark. I believe that oak-leaves are preferable to those of any other sort; but I have found, by repeated trials, that the leaves of beech, Spanish chesnut, and hornbeam, will answer the purpose very well. It seems, that all leaves of a hard and firm texture are very proper; but soft leaves that soon decay, such as lime, sycamore, ash, and of fruit-trees in general, are very unfit for this mode of practice.

"First, They always heat regularly; for, during the whole time that I have used them, which is near twenty-five years, I never once knew of their heating with violence; and this is so frequently the case with tan, that I affirm, and indeed it is well-known to every person conversant in the management of the hot-house, that pines suffer more from this one circumstance than from all other accidents put together, insects excepted. When this accident happens near the time of their fruiting, the effect is soon seen in the fruit, which always comes ill-shaped and exceedingly small. Sometimes there will be little or no fruit at all; therefore, gardeners who make use of tan only for their pines, should be most particularly careful to avoid an over-heat at that critical season — the time of showing fruit.

"Secondly, The heat of oak-leaves is constant; whereas tanners' bark generally turns cold in a very short time after its furious heat is gone off. This obliges the gardener to give the tan frequent turnings, in order to promote its heating. These frequent turnings, not to mention the expence, are attended with the worst consequences; for, by the continual moving of the pots backwards and forwards, the pines are exposed to the extremes of heat and cold, whereby their growth is considerably retarded; whereas, when leaves are used, the pines will have no occasion to be moved but at the times of potting, &c. The pines have one particular advantage in this undisturbed situation; their roots grow through the bottoms of the pots and mat amongst the leaves in a surprising manner. From the vigor of the plants, when in this situation, it is highly probable that the leaves, even in this state, afford them an uncommon and agreeable nourishment.

"Thirdly, There is a saving in point of expence, which is no inconsiderable object in places where tan cannot be had but from a great distance, as is the case here, the article of carriage amounting to ten shillings for each waggon-load. Indeed, this was the principal reason that first induced me to make trial of leaves.

"My last ground of preference is the consideration that decayed leaves make good manure; whereas, rotten tan is experimentally found to be of no value. I have often tried it both on sand and clay, also on wet and dry lands, and never could discover, in any of my experiments, that it deserved the name of a manure; whereas, decayed leaves are the richest, and of all others, the most suitable for a garden. But this must only be understood of leaves after they have undergone their fermentation, which reduces them to a true vegetable mould, in which we experimentally know that the food of plants is contained. This black mould is, of all others, the most proper to mix with compost earth, and I use it in general for pines, and almost for all plants that grow in pots; for flowers it is most excellent. The remainder of this vegetable mould may be employed in manuring the quarters of the kitchen-garden, for which purpose it is highly useful.

"Leaves mixed with dung make excellent hot-beds; and I find, that beds compounded in this manner, preserve their heat much longer than when made entirely with dung. In both cases, the application of leaves will be a considerable saving of dung, a circumstance very agreeable, as it will be the means of preventing the contests frequently observed in large families, between the superintendant of the garden, and the directors of the husbandry."

Steam has been substituted for bottom-heat, and, as Speechly observes, "seems to stand forward among the modern improvements of gardening." Speechly knew, in 1796, only two instances in which steam was applied as bottom-heat; and, with M'Phail, does not think it will finally answer as a substitute for tan. Instances in which it is adopted, are now much more numerous; but time sufficient has not elapsed, and the opinions of gardeners are yet too unsettled on its merits to enable us to recommend it for adoption in general practice. For heating the atmosphere of hot-houses, there seems little (or at least much less) doubt of its being preferable to fire-heat.

Count Zubow, at St. Petersburg, employed steam to heat a pit or cistern of water, over which, at about three inches distance, a frame, covered with faggots, was placed, and on this was laid the earth, in which his pines and other exotics were planted without being in pots. The plan is said to have succeeded, and a wholesome temperature to have been obtained and communicated to the mould above the faggots. *Fischer in Hort. Trans.* iii. 430.

"R. Gunter, of Earl's Court, tried the application of steam as a bottom-heat, by introducing the vapor into a chamber in the bottom of the pit, over which were laid cross bars covered with brush-wood, and, in some places, oak-planks, pierced with holes. On these the mould was placed in which the pines were planted. The quantity of heat imparted to the earth was very great, but, contrary to his expectation, no vapor ascended into the mould, which became excessively dry and husky; nor was he able, by frequent waterings, to keep it in a state fit for vegetation; the roots of the plants in it, in spite of every precaution, becoming shrivelled and dry." *Hort. Trans.* iv. 408.

1206. "*Fire-Heat.* Recourse must be had to the furnace whenever the temperature of the house, from the natural heat of the season, aided by the bark-pit, falls below 60°. At 55° the decline of atmospheric heat will not be got so far as to hurt pines and stove-plants in general; but, if you light no fires till the thermometer fall to 55°, it may happen that, before the flues can be brought into full action to affect the house, a sudden retrocession in the natural season may sink the air at once five or six degrees lower — then, the tenderest exotics will be in a hazardous situation. It is not advisable to expose a plant that has been lately potted even to the extreme, 55°, lest it should be checked in making new roots. To refuse the aid of the furnace till the latest moment will also restrain the gardener from admitting fresh air, in the meantime, so as to have always pure air in the house. The maximum heat to be caused by fire alone in absolute winter, is 68°. This should be thrown to the middle of days not enlivened by sunshine; also, to periods when the heat of the bark-bed is from any cause deficient. The medium, 64°, for mere fire-heat, should be interposed on preparing to air the house in the forenoon; and in the evening, between three and eight.

"The best kind of fuel is pit-coal, mixed with cinders of the same, on account of the duration of the fire and regularity of the heat: cinders are lasting in the next degree: peat may be resorted to under a deficiency of either of the others; it will require more attendance: wood blazes off so rapidly, that to maintain and regulate a furnace fed by it is very troublesome." *Pr. G.*

T. A. Knight has tried coal-dust formed into bricks, with one-third of its bulk of clay or pond-mud. With these he found he could sustain a high and regular temperature in his pinery with little expense or trouble, and that the burnt clay and ashes were valuable as manure. *Hort. Trans.* iv. 156.

"As soon as fires become necessary," Abercrombie says, "the attendant on the furnace should set it at work every afternoon, at five, four, or three o'clock, according to the time of year, beginning an hour before sun-set. His last examination of the furnace for the evening should not be earlier than ten o'clock, when as much fuel should be added as will support the proper heat till the morning, while the front of the fire is smothered with ashes to prevent too consuming a draught. He ought to be again at the fire, to refresh it with fuel in the morning, within seven hours after leaving it: when the nights are longest, the decline of the fire will thus be repaired three hours before sun-rise. The season for fire-heat falls mostly within the limits of eight months, specified below. Fire-heat is first resorted to in evenings; and is extended to mornings when the weather is cloudy and damp, or frosty. The lateness or forwardness of the seasons will require occasional deviations from any outline drawn from the practice of a single year: the following outline is given to assist, and not to fetter, the director of the stove.

1207. "*Calendar for the Stoves.—October.* As soon as cold nights or foggy days occur, fires will be wanted in houses where the standard temperature marks a high minimum. The pinery first demands the aid of the furnace, on account of all the plants having been recently potted. Gentle fires made in the evening, to last only for the night, will supply the few degrees of heat in which the natural climate is defective. Artificial heat is not applied to excite the pines to grow in the herb at this time; but merely to prevent any check to the new roots from cold and damp. If the tan-bed send up a good heat, the use of the stove in the pinery may be deferred till the middle or end of the month.

"One object is, to keep the temperature up to a given minimum; another, to interfere with fire-heat when the declension in the natural climate is unseasonably abrupt. Thus 62° at the end of September is more severe than 58 at the end of October.

"*November.* Work regular fires every evening, and occasional fires on cold mornings, and throughout severe days. A violent heat would be pernicious. The maximum to aim at for the day-time in rigorous frosts is 65°, independent of any rise in the thermometer from occasional sunshine.

"*December.* Attend punctually to the furnace in the afternoon, late at night, and timely in the morning. Between five and nine in the forenoon, never let the course of fire-heat relax: but, if between nine and three, the sun should shine sufficiently to raise the thermometer to 70°, the furnace may be stopped, and need not work again till three in the afternoon.

"*January.* Recruit and regulate the stove evening and morning. To have the heat defective, or in excess, would be alike prejudicial.

"*February.* The furnace must be carefully attended, as the three principal hours of daily regulation come round. Maintain fires all day in rigorous weather.

"*March.* From the returning influence of the sun, and the gentle impulse of the stove, the plants will be excited strongly into growth. To conduct them by an equal progression, the fire-heat should be regularly sustained morning and evening, and raised, as noon approaches, to 70, 72, and 75 degrees, in case the power of the sun alone has not elevated the thermometer, by ten in the morning, at least to 70°. To make the continuation of fire in a hot-house during the day depend merely upon the presence or absence of frost, is to treat a stove like a green-house. According to the climate to be imitated, the tenor of artificial heat ought to bear some analogy to the revolutions of temperature caused by the sun, as it respects both the history of a day, and the rise and acmé of a growing season.

"*April.* Continue fires regularly while the sun is down; and when the weather is chilly and gloomy, work the furnace all day.

"*May.* Go on with the evening fires: have a gentle heat in the early part of the morning, at least till appearances promise a fine warm day. Some managers, to spare fuel, dispense with the stove as soon as the thermometer can be kept, by the shelter of the house and the influence of the bark-bed, from sinking below 60° at the coldest time between sun-set and sun-rise. But, on the principle laid down in March, the heat ought to be progressive where pines are grown, and, indeed, where any fruit is forced that will repay the cost: in the pinery, then, the minimum for May is 64° at the beginning, and 68° at the close.

"*June.* If the weather be seasonable, no fire-heat will be wanted. But, if it be midsummer, according to the calendar, resume fires in unseasonably cold intervals, in order to give sufficient air, without checking plants that have been excited by a higher temperature than that at which the natural climate may happen to be during an anomalous day or two."

Griffin, adopting a low atmospheric temperature, generally lights fires to his fruiting-house in October, and succession department in the month of November.

1208. *Air.* The following monthly directions on this subject by Abercrombie correspond with the practice of the other authors quoted.

July and *August.* "You can scarcely give air without restraint, even in the day-time, at any other season than the last weeks of July and the course of August. When the nights are warm, leave openings for a gentle interchange with the unconfined atmosphere, so as not to expose the pines to casual rain. A constant circulation of pure air will always invigorate growing plants, and heighten the flavor of ripening fruit.

In the middle of sultry days, keep down the heat to the maximum under *Temperature*, by a very free circulation of air.

" In *September* commences the necessity for caution in admitting air, so as not to lower the temperature beyond the minimum for the house. When air is given in reduced quantities, divide it equally to all parts of the pit. The atmosphere at the autumnal is not equally cool as the vernal equinox, because the heat from the past summer is not at once dissipated. The 23d of September will more often correspond with the middle of May than with the 21st of March, as to the influence on the glass of the withdrawing and returning heat in the natural climate. Proceed in September as in June and May below.

" *October.* To give air without hazard, see *Temperature* for the house, and the directions in April and March.

" *November.* In calm fine days, give moderate admissions of air from about ten till two. Be careful to shut the sashes, if the atmosphere turn cloudy or excessively cold.

" *December.* In the middle of a clear sunny day, when such occurs, though the air be frosty with it, slide down a light alternately a little way. Meanwhile keep up a maximum heat by the flues; and shut the glasses by two o'clock, or sooner, if the weather, or the thermometer, requires.

" *January.* As in December.

" *February.* As in November; rather freer: in order to which keep good fires.

" *March.* Watch for favorable opportunities to give air. In warm cheerful days, with a little wind, draw open some of the glasses about three hours before twelve; and close again by four in the afternoon; or reduce the interval, as the suitable hours may be few.

" *April.* Every fair warm forenoon, as soon as the sun's influence will prevent the house from being chilled, admit fresh air by opening the sashes a little. From nine till noon, gradually widen the aperture for the air. Close again two hours before sun-set, or before the thermometer is below 60 degrees, or the higher minimum is prescribed by the forced advancement of the plants in particular houses. Whenever the weather is gloomy, raise the fire-heat preparatory to giving air.

" *May.* Fresh air may be admitted, in bright warm mornings, an hour sooner than in April; and, on fine afternoons, the sashes may be kept open proportionally later, so as the thermometer be watched, and the exceptions after shifting plants, or renewing the bark-bed, be attended to.

" *June.* Give air liberally from seven to six, if the weather has attained a seasonable settled warmth. When the thermometer is down to 66 degrees, shut the glasses for the evening."

1209. *Water.* The same agreement is observable in Abercrombie's general instructions for watering. " Use soft water. In winter, let water that is to be given to plants stand in the house to acquire the same temperature, or warm the water to 75 degrees before applying it. From November to February; or, as long as the deficiency of a strong exhaling heat in the natural climate makes it unsafe to let water fall into the hearts of the plants, give the water through a tube, composed of jointed pieces, so that it may be shortened at will, and having a funnel into which you may pour the water.

" When it is proper to water over the leaves, which is from March to October, excepting in the last stage of fruiting-plants, let the water be warmed to 80 degrees before it is applied, which will contribute to kill several tribes of insects.

" From the middle of October to the end of February, the plants will require to be moderately watered only once in eight or ten days. When they have been recently potted, they require less than at other times. Under a continuance of moist and hazy weather, the plants may be kept without water for a lengthened interval without any privation. In the beginning of October and March, once a week may be sufficient. During the course of September and April, they may require watering every five days; August, May, June, and July, every three or four. If, by accident, water fall into the heart of a plant in winter, the best remedy is, to shut the house close; and raise the heat something above the customary standard, that the water may go off in vapour before it can injure the plant.

" The season of free-excited growth is usually from the first of March to September: though this must commence sooner, or be continued later, according to the forwardness or delay of the plant, and the desired time of fruiting. During this season, the mould in the pots should be kept constantly a little moist. Maintain the bark-bed in good action, when you begin to water at the root in an increased degree; heat the air of the chamber nearly to the maximum, before you at any time dew the herb, and raise it fully afterwards; for moderate humidity, corrected and exhaled by heat, will make the plants thrive.

"From May to August, the time of day for watering must recede more and more from the hour of noon to ten, nine, and eight in the morning; or to three, four, or five in the afternoon, according to the power of the sun. When July and August happen to be sultry, the pine, as a plant, will flourish the better for a little water once in two or three days: but from pines in fruit withhold water, as the signs of ripeness appear. In the height of summer, pour the water over the leaves, and into the centre of the plant. It promotes the health of the herb, to have water standing continually in the heart of the plant, under a well-sustained heat, never fluctuating more than ten degrees below 80°. Shut the house close after watering, which will cause a dewy exhalation.

"*Watering with Drainings of the Dunghill.* In the growing season, about mid-day, between the times of shifting the plants, pour every six or eight days a quantity of dunghill drainings on the mould, which is a compendious way of applying manure. Plants making new stalks and leaves may thus be invigorated; but after fruit is shown, only pure water should be given even at the root."

"*Steaming the Flues.* Having the flues at a maximum heat, sprinkle them occasionally with water from a rose-pan. The steam thus raised is congenial to vegetation, and destructive to insects. It is a fine resource when you cannot water over the leaves.

1210. *Insects.* The white scaly coccus, or mealy pine-bug, is the most injurious insect to pine-apples. It adheres closely to the leaves; and, if not removed, will in time consume them, though in appearance it seems almost inanimate. It infests the vine, the orange, and many plants besides the pine; and lurking in the pots of earth plunged in the bark-bed, insinuating itself into every crevice of the walls and woodwork, is not to be extricated without extreme difficulty.

The brown turtle insect, or brown scaly coccus, or bug, also infests the pine. It is nearly allied in form to the white scale, but is much less injurious in its effects.

The white mealy crimson-tinged insect is also enumerated by Speechly; and by some is thought to be the same as the white scale, with which it is equally injurious, "wedging itself in between the protuberances of the fruit in the most surprising manner," so as not to be got out without great difficulty, rendering the fruit unsightly, robbing it of its juices, and rendering it deficient in flavor, and ill tasted. *Tr. on Pine*, p. 133.

So many different processes have been recommended for destroying these insects, that Abercrombie justly observes, "To devise any remedy new in principle would be difficult and altogether superfluous. Of the recipes and specified methods which have fallen into disuse, or were at once rejected by men of business, we shall avoid quoting any merely to say, that this is too simple to be effective, that too elaborate to be of practical use, and a third as fatal to the plants as to the insects. It will be enough to select one or two remedies, which are safe, with a little qualification, and certainly efficacious.

"1. The ingredients of the first prescription are met with in many recipes: to Nicol belongs the credit of mixing them in the proportion recommended below. We shall give the substance of his introduction to this remedy; because many experienced growers of pines concur in the opinion, that a chemical preparation is not to be resorted to till the effects of a sound, cleanly course of culture have been tried.

"'If the plants, by proper culture, be kept healthy and vigorous, insects will not annoy, but leave them. The coccus hesperides seems to delight in disease and decay, as flies do in carrion. I have, without the smallest hesitation, received into my stock plants covered with the pine-bug; made no effort to get rid of them; and, by next shifting time, in two or three months, have seen no more of them. In short, I never but once in my life tried any remedy for the pine-bug; and as I was completely successful, I shall here give the recipe, which may safely be applied to pine-plants in any state; but, certainly, best to crowns and suckers at striking them in August; to others it may, at any rate, be used in the March shifting, when they are shaken out of their pots.

"'Take soft soap, one pound; flowers of sulphur, one pound; tobacco, half a pound; nux vomica, an ounce; soft water, four gallons; boil all these together till the liquor is reduced to three gallons, and set it aside to cool. In this liquor immerse the whole plant, after the roots and leaves are trimmed for potting. Plants in any other state, and which are placed in the bark-bed, may safely be watered over-head with the liquor reduced in strength by the addition of a third part water. As the bug harbours most in the angles of the leaves, there is the better chance that the medicated water will be effectual, because it will there remain the longest, and there its sediment will settle. The above is a remedy for every species of the coccus; and for most insects, on account of its strength and glutinous nature.' Its application will make the plants look dirty; therefore, as soon as the intended effect may be supposed to have followed, whatever remains of the liquor on the leaves should be washed off with clean water. It would be improper to pour a decoction charged with such offensive materials over fruiting-plants. Further, this peculiar dose for a tenacious insect is not to be applied indiscriminately to exotics in a general stove, as it might make the more delicate leaves of shrubs drop off.

"2. There is another method which proceeds on different principles, and is particularly adapted for destroying insects on fruiting-plants, without hurting the flavor of the fruit. The basis of this course is the combination of moisture with a high heat." Of this method we have already given an account, and shall only here observe, that it proceeds on the fact experimentally proved, that a degree of heat and moisture, which is speedily fatal to animals, will not immediately destroy or injure vegetable life, and this the more especially of plants of such a robust nature as the pine.

Griffin, after many trials and experiments, found the following the most effectual wash for destroying insects on pines:

"To one gallon of soft rain-water, add eight ounces of soft green soap, one ounce of tobacco, and three table-spoonfuls of turpentine; stir and mix them well together in a watering-pot, and let them stand for a day or two. When you are going to use this mixture, stir and mix it well again, then strain it through a thin cloth. If the fruit only is infested, dash the mixture over the crown and fruit, with a squirt, until all is fairly wet; and what runs down the stem of the fruit will kill all the insects that are amongst the bottom of the leaves. When young plants are infested, take them out of their pots, and shaking all the earth from the roots, (tying the leaves of the largest plants together,) and plunge them into the above mixture, keeping every part covered for the space of five minutes; then take them out, and set them on a clean place, with their tops declining downwards, for the mixture to drain out of their centre. When the plants are dry, put them into smaller pots than before, and plunge them into the bark-bed." *Tr. on the Pine*, p. 84.

Baldwin, after many fruitless attempts, discovered the following mode about eighteen years ago: "Take horse-dung from the stable, the fresher the better, sufficient to make up a hot-bed three feet high to receive a melon-frame three feet deep at the back; put on the frame and lights immediately, and cover the whole with mats, to bring up the heat. When the bed is at the strongest heat, take some faggots, open them, and spread the sticks over the surface of the bed on the dung, so as to keep the plants from being scorched; set the plants or suckers, bottom uppermost, on the sticks; shut down your lights quite close, and cover them over well with double mats, to keep in the steam; let the plants remain in this state one hour, then take out the plants, and wash them in a tub of cold water, previously brought to the side of your bed; then set them in a dry place, with their tops downwards, to drain, and afterwards plant them. This treatment is sure to kill every insect. You will observe likewise, that the crowns and suckers in the beds heated by linings of dung without fire-heat, will have all their insects killed, or be kept free of them, if they were clean when planted, by the effluvia of the dung. *Cult. of Anan.* 33.

Miller recommends turning the plants out of the pots, and cleaning the roots; then keeping them immersed for four-and-twenty hours in water in which tobacco stalks have been infused: the bugs are then to be rubbed off with a sponge, and plants, after being washed in clean water and dripped, are to be repotted. Muirhead, a gardener in the north of Scotland, has described a similar mode, (*Caled. Hort. Soc. Mem.* i. p. 209.) only in the place of tobacco-juice, he directs flowers of sulphur to be mixed with the water. With a bit of bass-mat fixed on a small stick, and dipt in water, he displaces as many of the insects as he can see. He then immerses the plants in a tub of water, containing about 1 lb. of flowers of sulphur to each garden-potful. They remain covered with the water for twenty-four hours, as desired by Miller. They are then laid with their tops downward to dry, and are repotted in the usual manner. What share of the cure in either of these ways may be due to the sulphur or to the tobacco liquor does not clearly appear; the rubbing off or loosening the insects is evidently important; and it is not unlikely that immersion in simple water, so long continued, may alone be sufficient to destroy them. Indeed, the experience of one of the best practical gardeners in Scotland (Hay), leads him to conclude, that even moderate moisture is destructive to these insects. During many years, he regularly watered his pine-plants over head with the squirt, during the summer-months: this was done only in the evening; it never injured the plants; and the bug never appeared upon them. *Ed. Encyc.* art. *Horticulture*.

Summer is the best season to destroy insects on the pine, but where circumstances require it, any of the above remedies, not even excepting M'Phail's, which appears the best, may be put in execution during the winter or spring months, raising the heat of the house accordingly.

T. A. Knight observes that "Baldwin recommends the steam of hot fermenting horse-dung: I conclude the destructive agent, in this case, is ammoniacal gas; which Sir Humphry Davy informed me he had found to be instantly fatal to every species of insect; and if so, this might be obtained at a small expense, by pouring a solution of crude muriate of ammonia upon quick-lime; the stable, or cow-house, would afford an equally efficient, though less delicate, fluid. The ammoniacal gas might, I conceive, be impelled, by means of a pair of bellows, amongst the leaves of the infected plants, in sufficient quantity to destroy animal, without injuring vegetable life: and it is a very interesting question to the gardener, whether his hardy enemy, the red spider, will bear it with impunity."

Cleansing and refitting the House. Every department of the pinery must be kept at all times sweet and clean. At the period of removing sets of plants (or oftener, if necessary) that have completed specific stages, purify the house thoroughly, and have the flues swept, the plaister white-washed, the wood-work and glass washed at all events, and the latter painted, if necessary, all broken glass mended, and every other substantial, or casual reparation effected. If insects are supposed to be harboured in the building, the following wash is to be introduced with a brush into the cracks and joints of the wood-work, and the crevices of the walls: "Of sulphur vivum, take 2 oz.; soft soap, 4 oz. Make these into a lather, mixed with a gallon of water that has been poured in a boiling state upon a pound of mercury. The mercury will last to medicate fresh quantities of water almost perpetually."

Subsect. 9. *Compendium of a Course of Culture.*

1211. In addition to the above copious mass of information, we subjoin from Abercrombie the following judicious summary of practice, from the planting of the crown to the cutting of the fruit. The dates are arbitrary; but specific days or months must be assumed to mark anniversary and other periods.

" *Nursing-Pit.* — Aug. 15. 1813. Crowns and suckers planted.

" Oct. 30. 1813. If the plants, from forward growth, require more room, some are removed to another pit, and the remainder set at increased distances.

" March 30. 1814. Such plants as want it are shifted. Plants of the same standing are now sometimes distributed to houses where the treatment differs, as the plant is expected to fruit at the end of two or three years. 1. The large black varieties require three years' culture. 2. Crowns and fruit-suckers are seldom so forward as suckers from the stem. The last, indeed, commonly grow too vigorously, and do best under a moderate excitement during the first two stages.

" *Three-year Fruiting-plants. Nursing-Pit.* — May, 1814. Plants intended to complete a year in this pit, are repotted; having the ball of earth shaken away, and all the old root-fibres pruned off.

" *Succession-Pit.* — Aug. 15. 1814. Plants that have been in the nursing-pit the previous year, are shifted and transferred to this house.

" *Fruiting-House.* — Aug. 1815. Plants which have consumed one year in the nursing-pit, and a second year in the succession-house, are removed to this department.

" Aug. 1. 1816. Fruit ripe.

" *Two-year Fruiting-Plants. Succesion-Pit.* — March 30. 1814. Plants from the nursing-pit are put into larger pots; and brought for culture here, as directed under this division.

" May or June, 1814. Succession pines are sometimes intermediately shifted, without disturbing the balls of earth.

" *Fruiting-House.* — Aug. 15. 1814. Plants from the succession-pit, having consumed one year in the first and second stages, are shifted into the largest-sized pots, to be treated as under this head.

" Aug. 1. 1815. Having been cultivated as under fruiting-house, the ripe fruit is fit to cut."

Subsect. 10. *Recent Improvements in the Culture of the Pine-Apple.*

1212. These have been chiefly or almost entirely attempted by T. A. Knight, and consist in the disuse of bottom-heat, and in employing a much higher degree of solar heat during summer, and much less fire-heat during winter, than is generally done by practical gardeners. Some lesser improvements, such as nourishing the suckers on the parent stem after the fruit is cut, are less recent, and though not mentioned in the popular manuals of gardening, are yet frequently practised by the best cultivators. With respect to growing pine-plants by the heat of dung or tan without fire-heat, there is nothing new or extraordinary in the practice, as may be seen in the foregoing subsections, by the quotations from M'Phail and others.

In 1819, T. A. Knight tried the effect of a very high temperature during the day, in bright weather, and of comparatively low temperature during the night, and in cloudy weather. "A fire of sufficient power, only to preserve in the house a temperature of about 70°, during summer, was employed; but no air was given, nor its escape facilitated till the thermometer, perfectly shaded, indicated a temperature of

95°; and then only two of the upper lights, one at each end, were let down about four inches. The heat of the house was consequently sometimes raised to 110°, during the middle of warm and bright days, and it generally varied, in such days, from 90° to 105°, declining during the evening to about 80°, and to 70° in the night. Late in the evening of every bright and hot day, the plants were copiously sprinkled with water, nearly of the temperature of the external air. The melon, water-melon, Guernsey lily, fig-tree, nectarine, orange and lemon, mango, Avvoado-pear, Mammee-tree, and several other plants, part of them natives of temperate climates, grew in this hot-house so managed "through the whole summer, without any one of them being drawn, or any way injured, by the very high temperature to which they were occasionally subjected; and from these and other facts," T. A. Knight continues, "which have come within my observation, I think myself justified in inferring, that in almost all cases in which the object of the cultivator is to promote the rapid and vigorous growth of his plants, very high temperature, provided it be accompanied by bright sunshine, may be employed with great advantage; but it is necessary that the glass of his house should be of good quality, and that his plants be placed near it, and be abundantly supplied with sand and water." In the above case liquid-manure was employed.

It is added, "My house contains a few pine-apple plants; in the treatment of which I have deviated somewhat widely from the common practice; and I think with the best effects, for their growth has been exceedingly rapid, and a great many gardeners, who have come to see them, have unanimously pronounced them more perfect than any which they had previously seen. But many of the gardeners think that my mode of management will not succeed in winter, and that my plants will become unhealthy, if they do not perish in that season; and as some of them have had much experience, and I very little, I wish, at present, to decline saying more relative to the culture of that plant." *Hort. Trans.* iii. 465.

The above information, the result of T. A. Knight's experiments in 1819, was communicated to the Horticultural Society in the autumn of that year. On the 7th of March following, a paper was read to the Society on the same plants, of which the following is a transcript:

Of those gardeners who doubted whether the plants would stand the winter, it is stated, "The same gardeners have since frequently visited my hot-house, and they have unanimously pronounced my plants more healthy and vigorous than any they had previously seen: and they are all, I have good reason to believe, zealous converts to my mode of culture.

"I had long been much dissatisfied with the manner in which the pine-apple plant is usually treated, and very much disposed to believe the bark-bed, as Kent has stated, (*Hort. Trans.* iii. 288.) 'worse than useless,' subsequent to the emission of roots by the crowns or suckers. I therefore resolved to make a few experiments upon the culture of that plant; but as I had not at that period, the beginning of October, any hot-house, I deferred obtaining plants till the following spring. My hot-house was not completed till the second week in June, (1819) at which period I began my experiment upon *nine* plants, which had been but very ill preserved through the preceding winter by the gardener of one of my friends, with very inadequate means, and in a very inhospitable climate. These, at this period, were not larger plants than some which I have subsequently raised from small crowns, (three having been afforded by one fruit,) planted in the middle of August, were in the end of December last; but they are now beginning to blossom, and in the opinion of every gardener who has seen them, promise fruit of great size and perfection. They are all of the variety known by the name of Ripley's queen pine.

"Upon the introduction of my plants into the hot-house, the mode of management, which it is the object of the present communication to describe, commenced. They were put into pots of somewhat more than a foot in diameter, in a compost made of thin, green turf, recently taken from a river-side, chopped very small, and pressed closely, whilst wet, into the pots; a circular piece of the same material, of about an inch in thickness, having been inverted, unbroken, to occupy the bottom of each pot. This substance, so applied, I have always found to afford the most efficient means for draining off superfluous water, and subsequently of facilitating the removal of a plant from one pot to another, without loss of roots. The surface of the reduced turf was covered with a layer of vegetable mould obtained from decayed leaves, and of sandy-loam, to prevent the growth of the grass-roots. The pots were then placed to stand upon brick-piers, near the glass; and the piers being formed of loose bricks (without mortar), were capable of being reduced as the height of the plants increased. The temperature of the house was generally raised in hot and bright days, chiefly by confined solar heat, from 95 to 105 degrees, and sometimes to 110 degrees, no air being ever given till the temperature of the house exceeded 95 degrees; and the escape of heated air was then, only in a slight degree permitted. In the night, the temperature of the house generally sunk to 70 degrees, or somewhat lower. At this period, and through the months of July and August, a sufficient quantity of pigeons' dung was steeped in the water, which was given to the pine-plants, to raise its color nearly to that of porter, and with this they were usually supplied twice a day in very hot weather; the mould in the pots being kept constantly very damp, or what gardeners would generally call wet. In the evenings, after very hot days, the plants were often sprinkled with clear water, of the temperature of the external air; but this was never repeated till all the remains of the last sprinkling had disappeared from the axillæ of the leaves.

"It is, I believe, almost a general custom with gardeners, to give their pine-plants larger pots in autumn, and this mode of practice is approved by Baldwin. (*Cult. of Anan.* 16.) I nevertheless cannot avoid thinking it wrong; for the plants, at this period, and subsequently, owing to want of light, can generate a small quantity only of new sap; and consequently, the matter which composes the new-roots, that the plant will be excited to emit into the fresh mould, must be drawn chiefly from the same reservoir, which is to supply the blossom and fruit: and I have found, that transplanting fruit-trees, in autumn, into larger pots, has rendered their next year's produce of fruit smaller in size, and later in maturity. I therefore would not remove my pine-plants into larger pots, although those in which they grow are considerably too small.

"As the length of the days diminished, and the plants received less light, their ability to digest food diminished. Less food was in consequence dissolved in the water, which was also given with a more sparing hand; and as winter approached water only was given, and in small quantities.

"During the months of November and December, the temperature of the house was generally little above 50 degrees, and sometimes as low as 48 degrees, and once so low as 40 degrees. Most gardeners would, I believe, have been alarmed for the safety of their plants at this temperature; but the pine is a much hardier plant than it is usually supposed to be; and I exposed one young plant in December to a temperature of 32 degrees, by which it did not appear to sustain any injury. I have also been subsequently informed by one of my friends, Sir Harford Jones, who has had most ample opportunities of observing, that he has frequently seen, in the east, the pine-apple growing in the open air, where the surface of the ground, early in the mornings, showed unequivocal marks of a slight degree of frost.

"My plants remained nearly torpid, and without growth, during the latter part of November, and in the whole of December; but they began to grow early in January, although the temperature of the house rarely reached 60 degrees; and about the 20th of that month, the blossom, or rather the future fruit, of the earliest plant, became visible; and subsequently to that period their growth has appeared very extraordinary to gardeners who had never seen pine-plants growing, except in a bark-bed or other hot-bed. I believe this rapidity of growth, in rather low temperature, may be traced to the more excitable state of their roots, owing to their having passed the winter in a very low temperature comparatively with that of a bark-bed. The plants are now supplied with water in moderate quantities, and holding in solution a less quantity of food than was given them in summer.

"In planting suckers, I have, in several instances, left the stems and roots of the old plant remaining attached to them; and these have made a much more rapid progress than others. One strong sucker was thus planted in a large pot upon the 20th of July, (1819;) and that is (March 1820) beginning to show fruit. Its stem is thick enough to produce a very large fruit; but its leaves are short, though broad and numerous; and the gardeners who have seen it, all appear wholly at a loss to conjecture what will be the value of its produce. In other cases, in which I retained the old stems and roots, I selected small and late suckers, and these have afforded me the most perfect plants I have ever seen; and they do not exhibit any symptoms of disposition to fruit prematurely. I am, however, still ignorant whether any advantage will be ultimately obtained by this mode of treating the queen-pine: but I believe it will be found applicable with much advantage in the culture of those varieties of the pine, which do not usually bear fruit till the plants are three or four years old.

"I shall now offer a few remarks upon the facility of managing pines in the manner recommended, and upon the necessary amount of the expense. My gardener is an extremely simple laborer, he does not know a letter or a figure; and he never saw a pine-plant growing, till he saw those of which he has the care. If I were absent, he would not know at what period of maturity to cut the fruit; but in every other respect he knows how to manage the plants as well as I do; and I could teach any other moderately intelligent and attentive laborer, in one month, to manage them just as well as he can: in short, I do not think the skill necessary to raise a pine-apple, according to the mode of culture I recommend, is as great as that requisite to raise a forced crop of potatoes. The expense of fuel for my hot-house, which is forty feet long, by twelve wide, is rather less than sevenpence a day here, where I am twelve miles distant from coal-pits: and if I possessed the advantages of a curved iron-roof, such as those erected by Loudon, at Bayswater, which would prevent the too rapid escape of heated-air in cold weather, I entertain no doubt, that the expense of heating a house forty-five feet long, and ten wide, and capable of holding eighty fruiting pine-plants, exclusive of grapes or other fruits upon the back wall, would not exceed fourpence a day. A roof of properly curved iron bars, appears to me also to present many other advantages: it may be erected at much less cost, it is much more durable, it requires much less expense to paint it, and it admits greatly more light." *Hort. Trans.* iv. 72.

The president has since (in June, 1820.) had such a house as he has hinted at erected, and roofed with our bar. (1158.) The plants of every description succeeded in it admirably, and some pines were intended to have been sent to the anniversary dinner of the Horticultural Society (June 7. 1821.); but unfortunately this intention was deranged through the neglect of the gardener.

1213. From the above *experiment* with nine plants for little more than as many months, it would, as it appears to us, be premature to draw any general conclusion. That the pine may be grown to great perfection without bottom-heat, there can be no doubt whatever, from general analogy; but, in our opinion, it never can be grown with such ease and security, when the pots containing the plants are surrounded by air, as when they are surrounded by earth, sand, saw-dust, or any matter capable of preserving a more steady degree of both heat and moisture, than air. A plant in a pot is in a very unnatural habitation in any case; but when the pot is isolated in the atmosphere, it is doubly so; for no care of the gardener can prevent a continual succession of changes from taking place in the temperature and humidity of the sides of the pot, and, of course, of the fibres of the roots which form a web round it within. Wherever, therefore, the pine-plant is to be grown without bottom-heat, we would recommend plunging the pots in sand, gravel, saw-dust, lime-rubbish, or some substance not liable to encourage insects; but we are clearly of opinion, that wherever a moderate bottom heat, from fermenting vegetable substances, can be commanded, it will always deserve the preference to every other mode. By it gardeners are more certain of avoiding the dangers resulting from any unforeseen deficiency of fire or steam-heat in the atmosphere of the house; and they can also calculate on a more equal distribution of the periods of the ripening of the fruit, the great object being to have pines fit to cut every week in the year. At the same time, we have no hesitation in stating it as our opinion, that in nine-tenths of the cases in which the culture of the pine has not been found to succeed, it has been owing to excess of bottom-heat, and the withholding of water, the results of which are, a yellow color, insects, and small, premature fruit. Bark-pits are, in general, too deep, and the bark remains too long without being turned and renovated, by which means too large a proportion of new bark is added at one time, and a violent heat is the consequence. The pots are too often, in opposition to the directions of Speechly and Nicol, indiscriminately plunged to the brim; whereas, in some cases, they should previously be merely set on the surface, or half plunged, till the heat subsides. Holding these opinions, however, we trust we are open to every improvement, and consider that the experiments of T. A. Knight will effect much good, by exciting the attention of ingenious practical men to the subject, and of extending the culture of the most exquisite of all fruits.

The treatment, as to solar heat, we have already highly approved of. As to the mode of filling the pots with soil, pines, like many other plants, will grow in almost any thing. We have seen them do well in lime-rubbish, in peat-earth, half plunged in a cistern of water, as recommended in the *Museum Rusticum*, and set on the back shelves, close under the glass. Oldacre grows them in powdered bones; Boursault, of Paris, in *poudrette*, or desiccated night-soil, — and so on. There is more danger, in our opinion, in using a rich soil, like Oldacre's and Boursault's, than in one like Knight's, only moderately so; for the great object is to give plants food at many mouths, rather than gorge a few, and prevent the formation of more, which, over rich soils, infallibly effect.

1214. The mode of employing the vigor remaining in the old stock or plant after the fruit is cut, to nourish, for a certain time, the sucker or suckers which may be growing on it, was practised by Speechly; but scarcely to the extent which it has been carried lately. This, we think, a considerable improvement, if kept within certain limits; but, if carried too far, what might be gained by the sucker coming earlier into fruit, would be lost by the retardation of its own suckers.

On Nov. 3. 1818. " A queen-pine, grown by Peter Marsland, esq. of Woodbank, near Stockport, was exhibited to the Horticultural Society. It weighed three pounds fourteen ounces, measured seventeen inches in circumference, and was peculiarly well-flavored. The singularity of this pine was its being the produce of a sucker which had been removed from the parent-root only six months previous to the time the fruit was cut. The plant on which the sucker grew had produced a fruit, which was cut in

October, 1817; the old stem, with the sucker attached, was allowed to remain in the pine-pit till May, 1818; at that time the sucker was broken off, potted, and plunged into a fresh pit; it soon after showed fruit, which, in the course of four months, attained to the weight and size above stated. P. Marsland is in the practice of producing pines in this way with equal success and expedition. His houses are all heated by steam." *Hort. Trans.* iv. 52.

On the 17th of Oct. 1819, specimens of the New Providence, globe, black Antigua, and Enville, were exhibited, all which were produced in a similar manner to the above. P. Marsland considers, that "though not of the largest description, yet as far as beauty of form and richness of flavor are concerned, they would not yield to fruit of more protracted growth." The success which has attended this gentleman's mode of "treating the pine, so as to insure the production of fruit within twelve months from the cutting of their previous produce, has been perfectly satisfactory;" and the following is his account of it. "In November, 1819, as soon as the fruit had been cut from the pine-plants, which were then two years old, all the leaves were stripped off the old stocks, nothing being left but a single sucker on each, and that the strongest on the plant; they were then placed in a house where the heat was about sixty degrees, and they remained till March, 1820. At this period the suckers were broken off from the old stocks, and planted in pots from eight to twelve inches in diameter, varying according to the size of the sucker. It may be proper, however, to observe, that the length of time which the young sucker is allowed to remain attached to the mother-plant, depends in some degree upon the kind of pine: the tardy fruiters, such as the black Antigua, and others, require to be left longer than the queen, and those which fruit readily.

"After the suckers had been planted, they were removed from the house, where they had remained while on the old stock, to one in which the temperature was raised to seventy-five degrees. Immediately upon their striking root, the largest of the suckers showed fruit, which swelled well, and ripened between August and November, being, on the average, ten months from the time the fruit was cut from the old plant, and seven months from the time the sucker was planted. The fruit so produced, though, as may be expected, not of the largest description, I have invariably found to be richer and higher flavored than that grown on older plants. The suckers of inferior strength will not show fruit in the same season, but in the following they will yield good fruit, and strong suckers for a succeeding year's supply. Those suckers are to be preferred which are produced on plants that have ripened their fruit in November, for those taken from plants whose fruit is cut in August, or earlier, are apt to show fruit in January or February, while yet remaining on the mother-plant. But whenever this happens, the sucker should be broken off immediately upon being perceived, and planted in a pot so as to form a root of its own, to maintain its fruit." *Hort. Trans.* iv. 392.

This experiment shows what can be done; though it must be obvious that a considerable part of the saving in time is lost by the small size of the fruit. Baldwin, in our opinion, has hit on the proper use of this mode, the principle of which, as already observed, consists in the employment of the otherwise lost vigor of the old stock. He contrives to produce tolerably sized fruit, and to have such a degree of vigor in his suckers, as that they are able, in their turn, to throw out other vigorous suckers to succeed them. In aid of this, he often earths up the old stock, so as to cover the lower end of the sucker; and partially wrenching it off, he, by these means, obtains for it a good stock of roots before he renders it an independent plant.

Sect. II. *Of the Culture of the Vinery.*

On the culture of so important a fruit as the vine, it is not surprising that there should be a great variety of opinions. Without quoting those of the earlier, and of foreign authors, we shall give those of the best modern British gardeners.

1215. *Soil.* The kind of compost Speechly made use of for the vine border of the hothouse at Welbeck, was as follows, viz. "One-fourth part of garden mould, (a strong loam); one-fourth of the swarth or turf, from a pasture where the soil is a sandy loam; one-fourth of the sweepings and scrapings of pavements, and hard roads; one-eighth of rotten cow and stable yard dung, mixed; and one-eighth of vegetable mould from reduced and decayed oak leaves. The swarth or sward, should be laid on a heap, till the grass roots are in a state of decay, and then turned over and broken with a spade; then put it to the other materials, and work the whole well together." *Tr. on Vine.* p. 25.

Speechly covers his vine border with a coat of gravel two inches thick.

The following are "the materials and proportions of a good compost" recommended by Abercrombie. "Of top-spit sandy loam from an upland pasture, one-third part; unexhausted brown loam from a garden, one-fourth part; scrapings of roads, free from clay, and repaired with gravel or slate, one-sixth part; vegetable mould, or old tan reduced to earth, or rotten stable-dung, one-eighth part; shell marl or mild lime, one-twelfth part." The borders he recommends to be from three to five feet in depth, and, where practicable, not less than four feet wide in surface within the house, communicating with a border outside the building, of not less than ten feet wide.

M'Phail directs as follows: "To make a suitable border where it is required for the grape vine, provide a large quantity of earth of a loamy nature; that from arable land, or from a ridge in which a hedge-row of hazel, maple, elm, &c. have grown many years, and have been grubbed, is good; or a spit deep from the surface of a common, long pastured; or from the head or end lands of a corn-field; either of these will do very well." For forcing early, he adds, "vines do best in a strong deep loam, not destitute of a mixture of sand, and well manured with rotten dung, on a dry bottom of hard clay."

Nicol, after premising that the bottom of the border is to be made perfectly dry by draining and paving, says, "the average depth of the border should not be less than a yard. If four feet, so much the better. It is not easy to say how broad it should be; but it should not be narrower, outside and inside of the house taken together, than thirty feet. The soil should be thus composed: one-half strong hazelly loam, one-fourth light sandy earth, an eighth part vegetable mould of decayed tree-leaves, and an eighth part rotten dung; to which may very properly be added, a moderate quantity of lime, or of shell-marl. These articles should be perfectly decomposed, and intimately mixed, before planting."

Wm. Griffin, who has received the medal of the Horticultural Society for his skill in cultivating grapes at Woodhall, in Hertfordshire, forms his vine borders as follows. After being completely drained, the whole bottom is covered with brick, stone, or lime rubbish, about six inches thick, and on this is laid a compost of "half good loamy soil with its turf, one quarter of rich solid old dung, and one quarter of brick and lime rubbish; the turf well rotted, and the whole well incorporated." *Hort. Trans.* vol. iv. p. 100.

The compost used by D. Judd, of Edmonton, is as follows; half of rich gritty loam from a common; a quarter of rich old dung; and a quarter of lime rubbish, tan, and leaf mould, mixed together. These materials were kept separate, and frequently turned during winter, and when afterwards well mixed were not sifted, but laid on a prepared bottom to the depth of three feet. He says he does not use so much dung as is usually done, because, though the vine will bear an extraordinary quantity of manure, yet its growth is thereby retarded, especially when young. He recommends the addition of old tan, from having experienced (with Speechly, Mitchell, and others), that the vine will root in that more freely than in any other substance. *Hort. Trans.* vol. iv. p. 4.

1216. *Choice of Sorts.* In the *horticultural catalogue* will be found a description of the best sorts of grapes for forcing, or the open wall, from which a selection may be made, according to the taste of the party. For a mere glass case, in which the fruit is to be ripened by the heat of the sun, the following, which are the hardiest sorts, will succeed best, viz. white muscadine, white sweetwater, black sweetwater, black Hamburgh, large black cluster, small black cluster, miller grape, and black St. Peter's.

For a small house, to be forced, or to which fire-heat is to be applied in spring and autumn, the following sorts are what experienced gardeners recommend, as sure bearers and high-flavored grapes: black and red Hamburgh, black and grizzly Frontignac, black prince, white muscat of Alexandria, Sitwel's white sweetwater, and early white Teneriff.

Speechly, Forsyth, and Abercrombie, give long descriptive lists, and leave the reader to choose from their descriptions.

M'Phail recommends, as "the best sorts of grape-vines for forcing, the black Hamburgh, red Frontignac, black prince, black muscadel, red Lombardy, royal muscadine, white muscadine, white Frontignac, white muscat, white sweetwater, white muscadel, and white Syrian." *Gard. Rem.* p. 77.

Nicol names twenty-four sorts, as under, marking those he esteems the best with an asterisk (*).

White Grapes.	*Black Grapes.*	*Red Grapes.*
* Sweetwater, muscadine, * royal muscadine, * Frontignac, Hamburgh, raisin, * tokay, * passe musqué, * muscat of Alexandria, * Constantia.	Muscadine, * Frontignac, * Hamburgh, * muscat of Alexandria, cluster, * Constantia, St. Peter's.	* Frontignac, * grizzly Frontignac, raisin, * flame tokay, * Lombardy.

1217. *Choice of Plants.* Vines are to be had in the nurseries, propagated either from layers, cuttings, or eyes; and provided the plants be well rooted, and the wood ripe, many are of opinion that it is a matter of indifference from which class the choice is made. Justice prefers plants raised from cuttings, as likely to have ripened roots; but where they have to be sent from a distance, he prefers to plants, cuttings, containing an inch or two of the old wood, and twelve or fourteen inches of the new. These he plants at once where they are to remain, as practised in France. Speechly prefers plants which have been raised from the eye, for the following reasons: "They have more abundant roots, grow shorter jointed, are more prolific, and will, if permitted, come into bearing the second year." Abercrombie takes indifferently plants raised from cuttings or eyes; and M'Phail does not direct any preference. Nicol approves of "plants raised from cuttings that have been two seasons in pots, and have been properly treated and trained to a single shoot." The shoot of the first year should have been headed down to within six or eight inches of the pot; and that of last season to four, or, at most, five eyes. "The plants should have been fresh potted into good earth last season; and should be now in pots of nine or ten inches diameter, well rooted, and healthy. Such plants are much to be preferred to those raised from layers that are seldom well rooted, and never grow so freely as plants raised from cuttings.

It may be remarked, that the most general mode of propagating the vine at present, in the best nurseries, is from buds or eyes; and that, both as the cause and effect, such plants are made choice of by most gardeners. The great objection to layers is, that being propagated in the open air, they grow till checked by frost, and then do not ripen their roots, which generally die off, so that the plants make very weak shoots the first year after planting. Layers kept in the nursery one year after being separated from the mother plant, are, of course, not so liable to this objection. Plants raised from cuttings or eyes, having no adventitious support, produce no more roots than what the shoot and leaves enable them to ripen, and at two years' growth, may be justly considered as the best description of plants for stocking a house.

Niel, (*Edin. Encyc.* art. *Hort.*) describes "an incomparably more speedy mode of storing a new grape-house," than that of employing any description of plants to be procured from a nursery. This mode is only to be adopted "where a vinery previously exists in the garden, or where there is a friend's vinery in the neighbourhood. It is practised frequently at the gardens of Dalkeith House, by James Macdonald, head-gardener there, and a distinguished member of the Caledonian Horticultural Society; and Niel has been an ocular witness of "its complete success."

"In the end of June or beginning of July, when the vines have made new shoots from ten to twelve feet long, and about the time of the fruit setting, he selects any supernumerary shoots, and, loosening them from the trellis, bends them down so as to make them form a double or flexure in a pot filled with earth, generally a mixture of loam and vegetable mould; taking care to make a portion of last year's wood, containing a joint, pass into the soil in the pot. The earth is kept in a wet state; and at the same time a moist warm air is maintained in the house. In about a week or ten days, roots are found to have proceeded plentifully from the joint of last year's wood, and these may be seen by merely stirring the surface of the earth; or sometimes they may be observed penetrating to its surface. The layer may now be safely detached. Very frequently it contains one or two bunches of grapes, which continue to grow and come to perfection. A layer cut off in the beginning of July generally attains, by the end of October, the length of fifteen or twenty feet. A new grape-house, therefore, might in this way be as completely furnished with plants in three months, as by the usual method, above described, in three years. Supposing the layers to be made on the 1st of July, they might be cut, and removed to the new house on the 9th: by the 9th of October, the roof would be completely covered with shoots, and next season the house would yield a full crop of grapes. It is not meant that they should be allowed to do so, if permanently-bearing plants be wished for; on the contrary, they should be suffered to carry only a very moderate crop, as it is pretty evident that the roots could not sustain the demand of a full one, or at any rate, that the plants would necessarily show their exhausted state, by barrenness in the following season. By this means the more delicate kinds, as the Frontignac, may be quickly propagated: we have seen layers of the Gibraltar or red Hamburgh made in the beginning of July, reach the length of thirteen feet before the end of the month, yielding at the same time two or three bunches of grapes. The more hardy, such as the white muscadine, form still stronger plants in that space of time. Little difficulty is experienced in removing the plants from the pots into the holes prepared for them: if there be fears of preserving a ball of earth to the new roots, the pots may be sunk with them, and then broken and removed; or the plants may be kept in the pots till autumn, when they may very easily be taken out of them without detriment. Macdonald's experience does not lead him to think that plants propagated in this way are less durable than those procured by slower means, and where the roots and branches bear a relative proportion to each other. But supposing they were found to be less durable, it is evident that one may thus very easily keep grape-houses constantly stored with healthy fruit-bearing plants, and that the kinds may be changed almost at pleasure. When it happens that too much bearing-wood has been trained in, the plants are relieved, and sufficient sun and air admitted, by thus removing two or three shoots; and supposing these to contain each several bunches of some fine sort of grape, they are not lost, but may be ripened, by setting the pots on the side shelves, or flue trellis, of the pinery, or any hot-house."

A mode of more general utility than that described, is to select the plants in the nursery a year before wanted, and to order them to be potted into very large pots, baskets, or tubs, filled with the richest earth, and plunged in a tan-bed. They will thus make shoots, which, the first year after removal to their final destination, will, under ordinary circumstances, produce fruit.

1218. *Planting.* Vines are commonly either trained against the back wall, or on a trellis under the glass roof. In the former case, the plants are always placed inside the house; but in the latter, there are two opinions among practical men, one in favor of planting them outside, and the other inside the parapet wall. Where the vines are to be drawn out when in a dormant state, as is generally the case with those trained under the rafters of pineries, there can be no question that outside planting must be adopted; but for vineries, where this practice is not requisite, it seems preferable to plant them inside. This is Nicol's practice, who places one plant "behind the parapet, and between it and the front flue, in the centre of each light."

Abercrombie says, "Let them be carefully turned out of the pots, reducing the balls a little, and singling out the matted roots. Then place them in the pits, just as deep in the earth as they were before, carefully spreading out the fibres, and filling in with fine sifted earth, or with vegetable mould. Settle all with a little water; and let them have plenty of free air every day, defending them from very severe frost or much wet; which is all the care they will require, till they begin to push young shoots."

D. Judd has adopted a mode of planting which seems to be excellent in its kind; it is founded on the principle of increasing the number of mouths or feeders of the roots of plants (564.), to enable them to search for, and take up food, rather than gorging such as they may have with too much food, or with food of too rich a quality. The vines being raised from single eyes in March, were in the March of the following year cut down to one eye, and put in bottom-heat till they produced shoots of sufficient length to draw through the holes in the parapet of his vinery, or about two feet; afterwards they were hardened in the green-house, where a temperature was kept of about 60°, and there they grew two feet more. Holes were opened in the vine border in the beginning of May, and in about a fortnight after, a wheelbarrow full of old tan, or earth of tan, was put in each hole, in the middle of which the roots of the vine-plants remained after being treated as follows. "The leaves were cut off from the lower part of the plant, about two feet and a half of its length; the end of the shoot was then drawn very carefully through the hole, so that the pot being removed, the ball was placed two feet distant from the front of the house, upon its side, so that the stem lay in a horizontal position, about six inches below the level of the surface of the border. When thus placed, the whole of the stem which was to be covered was slit, or tongued, at each eye, like a carnation layer, by passing a sharp penknife at three quarters of an inch below each eye, and on the side of the eye, about one-third of the thickness into the wood, and then upwards to the centre of the joint. This being done, the stem was covered with about four inches of old tan, and the other two inches were filled up with the mould of the border." It is essential to the safety of the shoot, that the slitting be done the last thing, and whilst it is laid in its position, lest the stem should be broken. By slitting the stem," he adds, "abundance of roots are produced from every eye: the progress of the shoot is not very great until the roots begin to push out;" after which, however, it is so surprising that those under Judd's management were from twenty-five to thirty feet in length, and of proportionate strength. *Hort. Trans.* iv. 4.

Season of planting. As the plants are generally in pots, and may be turned out with balls, they may be planted in almost any month in the year; but the autumn or spring months are of course to be preferred. Nicol says, "I have planted grape-houses in May, and in June, that have succeeded so well, as that the plants have reached the top of the house before November in the same years. They were kept in pots, and so carefully turned out of them in transplanting, as that the plants experienced no check, although sprung many inches. I have also done the like with peaches."

Distance. Speechly disapproves of the common practice of planting all the different sorts of grapes at the same distances, and advises a larger or less space to be allowed, in proportion to the natural character and qualities of the plant. Vines planted at three or four feet apart he considers as crowded; for though by this mode a house will soon get furnished, and tolerable crops of grapes be produced in a few years; yet after remaining many years so close together they will be cramped in their growth for want of room, and thereby rendered less productive. On a wall or trellis twelve feet high, he recommends six feet between plant and plant for the weak and delicate kinds, and twelve feet for those that grow robust and strong. But in order to obtain a crop of grapes as soon as possible, he proposes to introduce temporary plants between the principals; such temporary plants to have been grown two or three years in large pots, so as to come immediately into bearing, and to be trained so as to occupy the upper parts of the wall, while the principals are furnishing it below. *Treat. on Vine*, 102.

"At first planting a house," Abercrombie observes, "some of the vines may be introduced as temporary plants. After the wood from a good stool is able to cover the space between two or more lights, plants less vigorous, or which bear fruit not so well approved, may be taken quite away. A vinery is better adapted for cultivating a single plant to a considerable extent than a hot-house."

1219. *Pruning and Training.* The opinions of authors and practical men on this subject are very various; and each, as M‘Phail observes, lays "much stress on his own mode;" he adds, "but I am of opinion, that to have good crops of grapes much more depends on the soil they are planted in, and the climate in which they are kept, than on any methods of pruning or training that have been, or ever can be, adopted." In this sentiment, every person of observation who has seen a number of the vineries in this country, or vineyards on the continent, must entirely concur: but as every operation of art, is, or ought to be, conducted in a manner suitable to the end in view, it is highly necessary that system should enter into this as into every other subject. We shall, therefore, give the various opinions of practical men as to training vines in vineries, in chronological series, beginning with Speechly, the Moses, as he may be called, of modern British vine-dressers.

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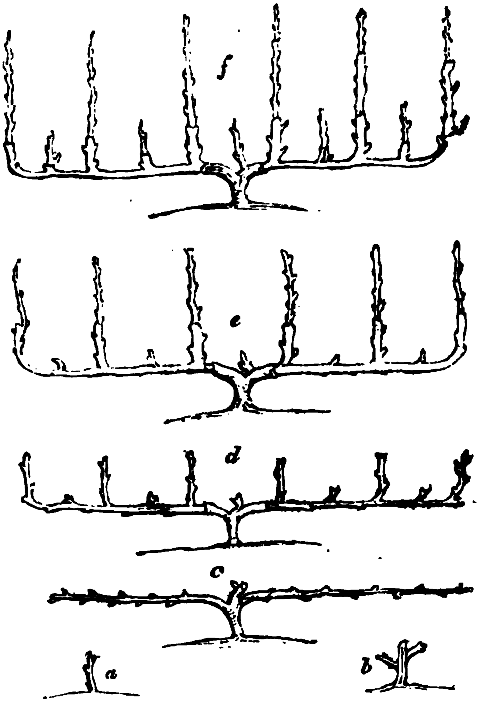

Speechly, having planted a vine against a wall or roof-trellis, cuts it down to two eyes or buds (*fig.* 314. *a*); the next winter the shoots of the preceding summer are shortened each to one eye (*b*); two leading shoots are produced, trained upright during summer, and in the following winter headed down to from three to five feet each, and laid in horizontally parallel to the ground, and about a foot above it (*c*); these main stems produce shoots from every eye, but only a few are selected, which stand from a foot to fifteen inches apart, and these are trained upwards during summer, and in winter every other one is cut out to within two or three eyes of the main stem, and the rest shortened to one-third of the length of the trellis (*d*). The following summer, the third, a moderate crop will be produced from the side shoots of the wood of the preceding year, and from the spurs on the main stem. In the winter following, the shoots which have produced the fruit are shortened down to two eyes, excepting the leaders to the long shoots, which are left with four or five eyes (*e*). Next summer, the fourth, the top of the roof, or wall, will be reached by the leading shoots, and the spurs are now allowed to produce each one leader. In winter, both of these leaders are headed down to four or five eyes, and the side shoots, from the old wood, to one or two eyes (*f*). In the following summer, the fifth, a full crop of grapes is produced in every part of the house. This constitutes one course or rotation; and the next, and all the future courses, extend only to four years, in which the object is to renew the upright bearers every fourth year, the intervening spurs furnishing shoots to succeed them. This method is called perpendicular, spur, or Dutch training: but few who adopt it pursue it so regularly as to renew the old upright shoots every fourth year, by which, and for other causes, and chiefly the small quantity of fruit produced during the first four years, it has fallen into disrepute.

"The methods of pruning established vines," Abercrombie remarks, "admits of much diversity of method, as the plants are in different situations. Without reckoning the cutting down of young or weak plants, alternately, to the lowermost summer-shoot, which is but a temporary course, three different systems of pruning have their advocates.

" The *first* plan is applicable only to vines out of doors; but it may be transferred to plants in a vinery without any capital alteration. In this method, one perpendicular leader is trained from the stem, at the side of which, to the right and left, the ramifications spring. When the plant is established, the immediate bearers, or shoots of the growing season, and the mother-bearers or shoots of the last year's growth, are thus managed. Soon after the growing season has commenced, such rising shoots as either are in fruit and fit to be retained, or are eligibly placed for mother-bearers next season, are laid in, either horizontally or with a slight diagonal rise, at something less than a foot distance, measuring from one bearing shoot to the next: the rising shoots, intended to form young wood, should be taken as near the origin of the branch as a good one offers, to allow of cutting away, beyond the adopted lateral, a greater quantity of the branch, as it becomes old wood; the new-sprung laterals, not wanted for one of these two objects, are pinched off. The treatment of those retained, during the rest of the summer, thus differs. As the shoots in bearing extend in growth, they are kept stopped about two eyes beyond the fruit: — the connate shoots, cultivated merely to enlarge the provision of wood, are divested of embryo bunches, if they show any; but are trained at full length as they advance during the summer, until they reach the allotted bounds: were they stopped in the middle of their growth, it would cause them to throw out troublesome laterals. In the winter-pruning, there will thus be a great choice of mother-bearers. That nearest the origin of the former mother-bearer, or most commodiously placed, is retained, and the other or others on the same branch are cut away; the rest of the branch is also taken off, so that the old wood may terminate with the adopted lateral: the adopted shoot is then shortened to two, three, four, or a greater number of eyes, according to its place on the vine, its own strength, or the strength of the vine. The lower shoots are pruned-in the shortest, in order to keep the means of always supplying young wood at the bottom of the tree.

" The *second* method is to head down the natural leader, so as to cause it to throw out two, three, or more principal shoots; these are trained as leading branches; and in the winter-pruning are not reduced, unless to shape them to the limits of the house, or unless the plant appears too weak to sustain them at length. Laterals from these are cultivated about twelve inches apart, as mother-bearers; those in fruit are stopped in summer, and after the fall of the leaf are cut-in to one or two eyes. From the appearance of the mother-bearers, thus shortened, this has been called spur-pruning.

" The *third* plan seems to flow — from taking the second plan as a foundation, in having more than one aspiring leader; and from joining the superstructure of the first system immediately to this, in reserving well-placed shoots to come in as bearing-wood. Thus, supposing a stem, which has been headed, to send up four vigorous competing leaders, two are suffered to bear fruit; and two are divested of such buds as break into clusters, and trained to the length of ten, twelve, fifteen feet, or more, for mother-bearers next season. In the winter-pruning, the leaders which have borne a crop are cut down to within two eyes of the stool, or less, according to the strength of the plant; while the reserved shoots lose no more of their tops than is necessary to adjust them to the trellis.

M'Phail also describes three modes of pruning; the first, or fruit-tree manner, he calls the *old method*, the general shape of the plant when pruned and trained being like that of a trained peach (*fig.* 315.); the second he agrees with Abercrombie in calling *spur-pruning* (*fig.* 314.); and the third he calls the *long* or *new method* (*fig.* 318.); " though," he adds, " I understand by books, (*Switzer* and *The Retired Gardener*), that it was in practice nearly one hundred years ago, and I saw it in practice forty years since." It is singular that this *old method* of M'Phail should have been recently described and figured by a German horticulturist, as a new and " experimentally proved superior mothod of vine culture." *Versuch einer durch Erfahrung erprobten methode den Weinbau zu verbessern, von J. C. Kecht, Berlin*, 8vo. 1813.

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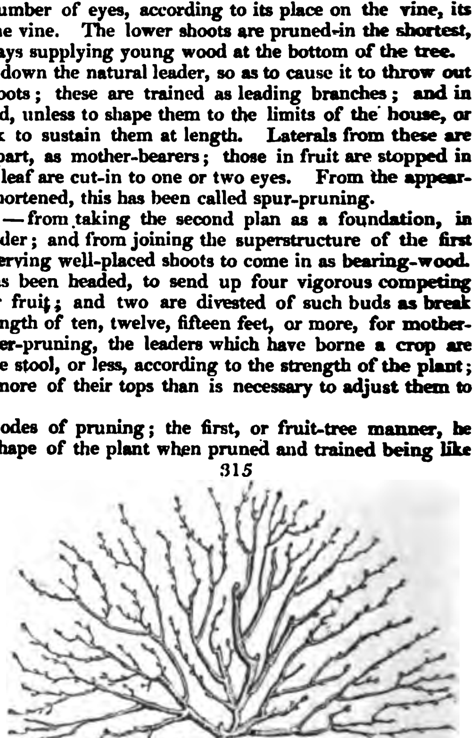

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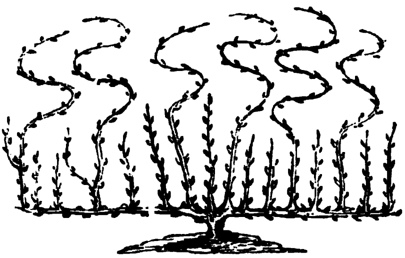

Forsyth adopts a method nearly resembling that of Speechly; but instead of laying-in the shoots in a straight direction, either upright or horizontal, he bends and attaches them in a serpentine form (*fig.* 316.), which has some effect in the open air, or under gentle forcing, of making them break more regularly: though even this is denied by some, who contend that, so treated, they break only at the angles or bends.

Nicol's opinion, as to the different modes of training, is in unison with M'Phail's. He says, "With respect to the manner in which vines should be trained, opinions are at variance. Some advise training the shoots in a straight and direct manner; others in a horizontal manner; and others in a serpentine form. If grapes be otherwise well managed, they will do well in any of the above ways; and I have just to observe, with respect to the last-mentioned method, that it necessarily leads to more confusion, particularly with regard to the training-in of the summer-wood, than either of the preceding methods. On dwarf-walls or trellises, the horizontal or zig-zag manner of Hitt (*fig.* 274. *g.*), or Forsyth (*fig.* 316.), may be very proper; but in a properly constructed, and properly planted grape-house, the most sensible manner of training, in my opinion, is directly up the roof."

The first year after planting, "after the buds have sprung an inch or two, it will be proper to single out those to be trained, and displace the others with the thumb. Three shoots only should be trained on each plant; that is, the two lowermost, and the uppermost, if it be vigorous; but otherwise displace it, and train the next below it. As the shoots advance, they should be trained at the distance of ten or twelve inches from each other; allowing them sufficient room in the ties to swell without being bound. Pinch off all laterals as they appear, except one or two nearest to the point of the shoot, lest by any accident it be broken, and in that case, that a substitute may readily be found; which, however, is never equal to the main shoot; so that great care should be taken in the training of principal leaders. One side-shoot of each plant may be stopped when it is five or six feet in length, and the other when nine or ten, (as they are to be cut well down in the winter-pruning,) which will throw in the more strength to the middle shoots, that are only to be headed down to about six or eight feet, and which, if well ripened, may yield a few fruit next season. These should be encouraged, therefore, and be carefully trained, as long as they will grow."

In the end of the season, say in the month of November, "these shoots," Nicol observes, "are to be pruned thus: the side shoot, stopped first, to three eyes; the other to five or six feet; and the middle shoot, to seven, eight, or ten feet, according to its strength: from which may be expected a good deal of fruit next season, and a shoot from its extremity, to be stopped at the top of the house, this time twelvemonth. From the side shoot, pruned to five or six feet, may be expected a few fruit; and from its extremity, a shoot to be headed at this time next year, at nine or ten feet in length, which will, the season following thereafter produce a full crop. From the side shoot, shortened to three eyes, are to be expected two shoots; the one to be trained to the height of about nine or ten feet, (to be pruned to five or six at this time next year); and the other to four or five only, as it is again to be pruned back to two or three buds this time twelvemonth; thus providing for wood to fill the under part of the trellis."

In a properly constructed grape-house, the plants trained up the roof, and the house filled with wood, "there should be," Nicol observes, "three ranges of bearing shoots; viz. one range, at bottom of the trellis, from end to end of the house, reaching from within two feet of the ground, five or six more feet upwards; a second, reaching from a foot, or perhaps two feet under the tops of these, that is, from within seven or eight feet of the ground, to the distance of fourteen or fifteen feet upwards from it; and a third range, reaching from a foot or two under the tops of these last, to the uppermost row of wires on the trellis: the shoots of the first, or lower range, being headed at about five or six feet; those of the second, or middle range, at about seven or eight; and those of the third, or uppermost, at about nine or ten feet in length; all a foot or two, more or less, according to circumstances, according to their strengths, how low or how high upon the plants they have issued, and how far they have sprung, and are fully matured. The distance at which these shoots should be placed from each other, in their respective ranges, is about thirty inches; which distance is necessary to give room to the stubs of next year, on which the clusters are to hang, as in this season;

and which distance may be varied a few inches, according to the kinds of grapes, some growing stronger than others.

" The undermost shoots on the trellis, or those placed nearest to the ground, and which were only trained to the height of a few feet, must be shortened back to two or three joints; it being a principal point in the training of vines, always to provide for a supply of bottom wood, and to keep young wood as near to the ground, or lower parts of the plants, as possible.

" In pruning, cut generally at two inches above the bud. Some cut nearer, even as near as half an inch, which is apt to weaken the shoot of next season, and sometimes to prevent its vegetating at all; the buds being very susceptible of injury, on account of the soft and spongy nature of the wood. In the cutting out of old wood, be careful to cut in a sloping direction, and to smooth the edges of the wound, in order to prevent its being injured by moisture. The pruning being finished, let the loose, shreddy, outward rind on the old wood be carefully peeled off, observing not to injure the sound bark, and clear the trellis and branches of leaves, tendrils, &c. Let the shoots and branches be afterwards regularly laid in, at the distances above specified, particularly the young shoots that are expected to bear next season. As to the others, it is not so material; nor is it material how near the young shoots be placed to the old, or even though they sometimes cross them. Choose strands of fresh matting, or pack-thread, to tie with; and observe to leave sufficient room for the swelling of the shoots and branches next season, as often already cautioned.

" The house should be shut up at nights, for ten days or a fortnight, after being pruned, particularly if there be any appearance of frost; admitting air freely through the day. It is proper to keep the plants from the extremes of heat or cold for some time, in order that their pores may contract, and the wounds may heal gradually; as otherwise they are apt to bleed now, and to break out afresh on the application of fire-heat in the spring. When they are judged to be safe, expose the house night and day."

Hayward is of opinion, " that the greater length the sap has to pass through the body of the vine, the more abundant, fine, and high-flavored will the fruit be;" and in consequence of this opinion and successful trials, he recommends introducing only one plant in a vinery, and training it over the whole trellis, either in horizontal shoots from two main leaders (*fig.* 817. A); or in his wavy manner (B); and he can, as the tree advances in growth, gradually convert the latter into the former mode.

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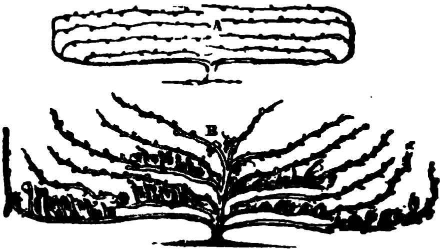


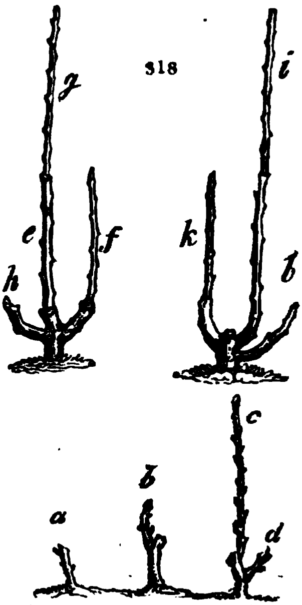
A very scientific mode of training vines under a glass roof, has been adopted by J. Seton, Esq. at Stamford Hill, one of our most enlightened horticulturists, and practised by him for several years with considerable success. It is thus described: —

" The vine having, like other trees, a tendency to produce its most vigorous shoots at the extremities of the branches, and particularly so at those which are situated highest, it generally happens, when it is trained, as is most frequently done, across and upwards, from the front to the back of the house, that the greater portion of the fruit is borne near the top, while the lower parts are comparatively barren. This takes place, whether the branches be made to consist chiefly of vigorous terminal shoots, preserved at considerable length, or the leading shoots be kept short, and lateral spurs be left for the production of the fruit; but in the latter case, the evil exists in a smaller degree: for the spurs, or short lateral branches, divert the sap in its ascent, producing, by means of its flowing to their extremities, an approximation to the effect of long branches. The same inconvenience would occur, to a certain extent, if the vines were trained in a like manner in the open air, but it is greatly augmented in a house, in consequence of the air being much hotter, as every one knows, at the top than beneath. Having observed that the fruit produced on the vigorous shoots, which usually grow at the extremities of the long branches, is, generally, more abundant, and of a finer quality, than that produced on the short lateral ones, I was desirous to promote the growth and preservation of the former; but the usual mode of training the branches across the house and upwards, being subject to the objection before-mentioned, and little scope being afforded for it in a house of small dimensions, I thought I should obviate these inconveniences, in great part, and attain another object, presently to be mentioned, by training the branches in a horizontal direction, and keeping the whole of the fruit-bearing part of each tree nearly on the same level. With this view, five vines were planted at the front and ends of a house, twenty-five feet in length, provided with rods placed horizontally under the glass of the roof, twenty inches asunder, and extending from end to end. The first vine, placed at one end, being trained up to the two lower rods, a shoot of it was laid along each of them, and continued successively from year to year, till it reached the other end: then the shoot on the lower rod was turned upwards to the next, and led back upon it towards the stem of the tree; while that on the upper rod was turned down, and led back, in like manner, on the lower one. During this process, a sufficient number of spurs, or short branches, was left annually on the old wood, to produce fruit. When the leading shoots, which had been thus trained in a retrograde direction, approached towards the end, whence the original branches proceeded, preparation was made for a succession of young wood, by bringing forward two fresh shoots from the stem of the tree, and leading them along, close to the preceding ones. As these, and the leading shoots of the first branches, which were then on their return, advanced, the spurs on that part of the old wood, to which they had reached, were cut out, to make room for them, the naked stem only being left. When the second series of branches had returned nearly to the end, at which the trunk was situated, the first series, on which there was then but little of the herbage remaining, was cut out at the trunk. Fresh shoots were then brought forward to succeed the second series; and so on without end. It would be superfluous to dwell on the mode of managing the other trees; as it will be perceived that, following the same principle, they must be laid along the higher rods in succession, two rods being allowed to each tree; and when the stem is not at the end of the house, two branches are to be trained eastward, and two westward, along the rod. Thus, in a house of twenty-five feet in length, instead of having only fifteen or sixteen feet, to admit of the length of a branch, as would be the case under the usual mode of training across the house, we have a range of thirty feet, which affords ample scope for the long shoots at the extremities; and these, I find, when laid on in the horizontal position, and left from three to five feet long, according to their strength, usually bear fruit at all their buds, while the spurs on the old wood are also very productive. By these means, the tree possesses the double advantage of no part of it being robbed of its nourishment, by means of any other vegetation, which is supplied from the same root, being situated either in a higher position or warmer atmosphere. To what extent the former of these circumstances alone may operate, I cannot determine from any actual experiment; but, from the general observations I have made, that the growth of the vine, as well as of other trees, is most luxuriant in the parts that are situated highest, I am inclined to think, that its effects are very considerable. Others, who have made the same observation, have recommended the training of the shoots in a zig-zag manner, advancing upwards, with the view of retarding the ascent of the sap through the inclined parts: this, however, I have found to have little or no effect, the general direction of the shoot being upwards, through all the bendings. But whatever may be the effect produced by the horizontality of the position, in equalizing the luxuriance of the growth, I conceive that no doubt will be entertained, in regard to that of a uniformity of temperature; and this is fully obtained by the method in question.

" I now come to the other object to be attained by the mode of treatment, which will be stated in a few words, as the effects produced in regard to it will be very evident. In the usual mode of management, each tree is under the influence, in its different parts, of all the degrees of temperature in the house; but under the mode now proposed, each tree has its own peculiar climate, to which alone all its parts are exposed. This affords us the command of a most convenient variety, in regard to earliness in the ripening of fruit. For example, if there be a wish to save fuel, and yet to have grapes of several varieties, which ripen at different seasons, of the late sorts there will, under the common method, be only a few brought to perfection at the tops of the trees, whilst those that are near the bottom will not ripen, and that part of those trees will accordingly be useless. But in the arrangement above described, the early and late sorts may be procured at the same time, in equal abundance and perfection, by training the early sorts, let us suppose the sweetwater, at the bottom; the middling ones, such as the black Hambro', next; and the late, such as the muscat of Alexandria, at the top. Again, if it be wished to have some very early, and others very late, the order may be reversed, by placing the early varieties at the top, and the late at the bottom; in which case, more fuel will be required. This method, it will be perceived, may be varied in many ways, and will operate under all the degrees of forcing." *Hort. Trans.* vol. iii. p. 9. to 13.

W. Griffin, already mentioned, does not employ a trellis in his vinery, but trains only a single shoot under each rafter. The vine is planted outside, close to the parapet, and introduced through a hole immediately under the rafter up which it is trained. On planting, it is cut down to one eye; about Christmas, the shoot formed during the preceding summer is cut down to two or three feet; the second year one shoot only is trained from the extremity, and it is again headed down in winter, so that the joint length of the two years' wood, is from ten to fifteen feet; and at the Christmas of the third year, the shoot is cut off at the end of the rafter. The fruit, it is obvious, is to be obtained from the side shoots, or spurs, proceeding from this main shoot. The spurs are cut down to single eyes every winter, till the main shoots get coarse and rugged, which will happen in about ten years; it is then cut away entirely, a young stem having been previously trained up the two preceding years from the bottom to substitute in its place. As soon as the plants become sufficiently strong, to furnish wood from the point where they enter the house, for a second and third branch, then a proper number must be fixed on as permanent plants, and their side branches brought successively forward and trained to the contiguous rafters, " one bearing branch being applied to each rafter, and the plants which originally belonged to these rafters taken away entirely." The weight of grapes produced by the vine under each rafter by this mode of pruning is generally about forty pounds, two bunches to each spur, or from fifty to a hundred bunches, averaging half a pound each. When the house is in forcing, the branches are suspended from the rafter by strings from two to three feet long, fastened to nails or hooks on each side the rafter; by this means they are let down from the glass when danger from frost is apprehended, in the manner effected by the hinged rafter-trellis. (*fig.* 304). " I also contrive," adds this very successful cultivator, " to spread the branches, when in bearing, on either side of the rafters, under the glass, but so as not to occupy the whole space under the glass with the foliage, for I consider that very great advantage arises to the fruit from giving free admission to the sun from the centre of each light." It will be asked by some gardeners, what is done with the leading shoot at the end of every main stem? This Griffin " stops during its growth in the summer, leaving three or four joints at the utmost; and these must be cut away, at the time of pruning, down to the old wood, or nearly so: sometimes, to prevent the top of the house being crowded, a little of the old wood at top may be cut off also, and replaced by the next year's shoot." *Hort. Trans.* iv. 104.

Griffin's mode of pruning may be considered as analagous to what M'Phail calls *spur-pruning;* the long or new method has been adopted and reduced to a regular system by J. Mearns, of Shobden-court, Herefordshire. The vinery there, as at Woodhall, is of the common form, with wooden sashes and rafters; the vines are planted inside the house, at two feet and a half apart, nearly close to the front wall, and are headed down to within a foot of the soil (*fig.* 318. *a*). One shoot only is allowed to proceed from each plant, which at the end of the first season is cut down to the second or third eye (*b*). Next year, two leading shoots are encouraged, the strongest of which is stopped when it has grown three or four joints beyond the middle of the roof, and the weaker, after having grown three or four feet, for the purpose of strengthening the eyes. At the fall of the leaf, the leading shoots are reduced, the main one to the length of the middle of the roof (*c*), and the lower one to the third eye (*d*). In the third season, one leading shoot is trained in from each shoot (*c* and *d*,) and from the bearing shoot (*c*), fruit-bearing side shoots, are produced, one bunch is left on each, and the shoot stopped at one or two joints above it: no side shoots are allowed to proceed from the spur (*d*), the leading shoot from which is to become the bearing wood for the next year. Thus in the autumn of the third season the lower part of the house is furnished with a crop of grapes from shoots proceeding from wood of the preceding year (*e*), and parallel to this bearing shoot on each vine is the young shoot for next year's crop. In winter, the shoot from the extremity of the bearing branch (*e*) is cut off at the top of the roof, or within twelve or fifteen inches of it (*g*), and the shoot (*f*) from the spur (*d*) is cut down to the middle of the roof, and all the spurs (on *e*) which had borne the grapes are now cut out. Each vine is now furnished with two shoots of bearing wood (*g*, *f*), a part of old barren wood (*e*), and a spur for producing a young shoot the following year (*h*). In the fourth summer a full crop is produced both in the upper and lower half of the house; the longer shoot bearing on the upper half of its length, and the shorter on its whole length; a leading shoot is produced from the short shoot, and another from the spur. In the pruning season of the fourth year, the centre shoot is entirely removed, and replaced by the side shoot (*i*), now the whole length of the roof, and this side shoot is in its turn supplanted by the shoot (*k*) from the spur,



while a spur (*l*) is prepared to succeed it. This constitutes one rotation or period of the system of J. Mearns, which he has followed since 1806, attended by abundant crops of large-sized bunches; and he considers it may be continued for any length of time. *Hort. Trans.* iv. 246.

1220. *Summer Pruning.* This depends generally on the necessity of admitting light and air to the fruit and young wood; and particularly on the sort of winter pruning to be adopted. "The gardener, therefore," as Nicol observes, "must have a predestinating eye to the following season."

"Whatever methods of pruning are used," M'Phail remarks, "the grape-vine, through the whole course of the growing season, requires constant attendance, so as not to suffer the plant to be crowded in any part with superfluous shoots or leaves, and no more fruit ought to be suffered to swell on the plant than it is well able to bring to perfection. The berries also on each bunch should be thinned, so that they may have room to swell, without pressing too hard upon each other."

Abercrombie and this author agree in directing, that "as the shoots advance of newly planted vines, they must be kept regularly fastened to the rafters. Divest them of their wires, and also take off their laterals as they appear. The vines in general may be permitted to run twenty feet, and the most vigorous thirty-five feet, before they are stopped, if the rafters extend so far. Sometimes a vigorous shoot, having extended the width of the house, is conducted either in a returning direction down a contiguous rafter, or laterally along the top of the stove, as may be most convenient.

"Stop the shoots by pinching off their tops. After they have been stopped, they usually send out laterals from three or four of the upper eyes. If these laterals are at once taken off, the sap will be merely diverted to the lower part of the shoot: permit them, therefore, to proceed about twelve inches, and then pinch off their top. These shortened laterals will, in their turn, send out others, which should be stopped at the second joint."

In the second season, "as soon as the shoots are half a span long, the rudiments of the bunches will be perceptible. The bunch is produced on the naked side of the shoot, opposite the leaf-bud. Having ascertained the most promising shoots, divest the vines of supernumerary branches as they rise. Fruitful laterals will sometimes show two or three bunches at each eye; and this is apt to tempt the pruner to retain too many. On the leading shoot, retain of the best laterals, to the right and left, a number proportioned to the vigor and age of the plant: one on each side, as near the bottom as it offers, with a second, third, fourth, up to seven, at the distance of three feet, if the plant is in its fourth summer, but only five, at the distance of four feet, if this be the third summer since the plant was struck. Train the shoots reserved on each side the rafter, tying them to the trellis with strands of matting. Leave on each branch two bunches, or a single bunch; according as the plant is in the fourth or third season from its origin: pinch off the others. Afterwards stop the bearing laterals at the second joint above the fruit. Rub off water-shoots from the older wood. Pinch off inferior laterals and tendrils.

Most of the summer pruning of grapes, Nicol observes, may be performed with the fingers, without a knife, "the shoots to be displaced being easily rubbed off, and those to be shortened, being brittle, are readily pinched asunder."

"After selecting the shoots to be trained for the production of a crop next season, and others necessary for filling the trellis from the bottom, which shoots should generally be laid in at the distance of a foot or fifteen inches from each other, rub off all the others that have no clusters, and shorten those that have at one joint above the uppermost cluster. For this purpose, go over the plants every three or four days, till all the shoots in fruit have shown their clusters; at the same time rubbing off any water-shoots that may rise from the old wood.

"Train in the shoots to be retained, as they advance; using strands of fresh matting, and allowing sufficient room in the ties for the swelling of the shoots. Likewise pinch off all laterals and tendrils, every time you go over the plants, as these only tend to confusion, and take greatly from the strength of the clusters."

"If there be an under trellis, on which to train the summer-shoots, they may, when six or eight feet in length, or when the grapes are swelling, be let down to it, that the fruit may enjoy the full air and light, as it advances towards maturity. Such of these shoots as issue from the bottom, and are to be shortened in the winter-pruning to a few eyes, merely for the production of wood to fill the trellis, may be stopped when they have grown to the length of four or five feet. Others that are intended to be cut down to about two yards, and which issue at different heights, may be stopped when they have run three yards or ten feet, less or more, according to their strength. And those intended to be cut at, or near to, the top of the house, should be trained a yard or two down the back wall, (a trellis being placed against it purposely); or they may be run right or left a few feet on the uppermost wire.

"I would here observe, that in order to be a good trainer of vines, and be able to provide for a crop the following season, a man must have some forethought, and be capable of making his selections, as the plants shoot, even at this distance of time. He must predetermine how he shall prune, and where he shall cut, at the end of the season; and so, as it were, fashion the plants to his mind. He has this more effectually in his power, with respect to the vine, than any other fruit-tree, on account of its rapid growth and docility.

"The stubs, or short shoots, on which the clusters are placed, will probably push again after being stopped, if the plants be vigorous. If so, stop them again and again; but after the fruit are half grown, they will seldom spring. Observe to divest the shoots, in training, of all laterals as they appear, except the uppermost on each; in order to provide against accidents, as hinted at above, in training the new planted vines. When these shoots are stopped, as directed above, they will push again. Allow the lateral that pushes to run a few joints, and then shorten it back to one; and so on, as it pushes, until it stop entirely. When the proper shoot gets ripened nearly to the top, the whole may be cut back to the originally shortened part, or to one joint above it, if there be reason to fear that the uppermost bud of the proper shoot will start.

"Be careful to divest the plants of all damped or decayed leaves, as they appear, as such will sometimes occur in continued hazy weather; and some may be bruised by the glass, in moving the sashes for the admission of air, or by other accidents."

Hayward, in the summer prunings, takes off all collaterals as they arise, and any shoots which, though laid in for fruit, turn out unproductive, that the whole strength of the tree may be properly applied. *Hort. Trans.* vol. i. 172.

J. Mearns stops the bearing branches at the bunch, instead of the next joint above it, which is the usual practice; "for I found that the fruit did equally well, and it divested the branch of an incumbrance, while it allowed a much larger portion of light to come into the house, together with a more free circulation of air among the fruit and young wood. I blind all the eyes on each fruit-spur as soon as they push, except the uppermost, which I retain, to draw up the sap to nourish the fruit: I never suffer them to push above a joint or two before I pinch them back, always cautiously retaining an eye, and am particularly cautious that nothing should happen to injure the leaf that accompanies the bunch, for if that is lost, the fruit of course will come to nothing." *Hort. Trans.* iv. 255.

Thinning the Leaves and Fruit. "Every one of penetration and discernment," Nicol observes, "will admit the utility of thinning the berries on bunches of grapes, in order that they may have room to swell fully; and further, that of supporting the shoulders of such clusters of the large growing kinds as hang loosely, and require to be suspended to the trellis or branches, in order to prevent the bad effects of damp or mouldiness in over-moist seasons. "Of these, the Hamburgh, Lombardy, royal muscadine, raisin, St. Peter's, Syrian, Tokay, and others, should have their shoulders suspended to the trellis, or to the branches, by strands of fresh matting, when the berries are about the size of garden-peas. At the same time, the clusters should be regularly thinned out, with narrow-pointed scissars, to the extent of from a fourth to a third-part of the berries. The other close-growing kinds, as the Frontignacs, muscats, &c. should likewise be moderately thinned; observing to thin out the small seedless berries only of the muscadine, sweetwater, and flame-colored Tokay. In this manner, handsome bunches, and full-swelled berries, may be obtained; but more so, if the clusters on over-burdened plants be also moderately thinned away. Indeed, cutting off the clusters, to a certain extent, of plants over-loaded and pushing weak wood, is the only means by which to cause them to produce shoots fit to bear fruit next year; and this should be duly attended to, so long as the future welfare of the plants is a matter of importance."

1221. *Remedies for Bleeding.* "If the pruning has been timely, the vine is not liable to bleed. When the sap rises before the wound is healed, bleeding ensues, and is not easily stopped. This retards the plant; and, out of doors, the loss of a few days is, in some seasons, irreparable: but in other respects, the consequences of bleeding are not so disastrous as many seem to apprehend; and a gardener is sometimes surprised by a subsequent crop of uncommon goodness. Innumerable remedies for bleeding have been proposed: the following rank among the best. Sear the place, and cover it with melted wax, or with warm pitch spread upon a piece of bladder. Or peel off the outside bark to some distance from the place; and then press into the pores of the wood a composition of pounded chalk and tar, mixed to the consistence of putty." *Abercrombie.*

"Vines," Nicol remarks, "will bleed in autumn, as well as in spring, though not so copiously at the former season. The best preventative is timeous or early pruning in spring; and not pruning till the wood is thoroughly ripe in autumn. Plants that have been pruned too late in spring, and forced too soon afterwards (a great mistake), will bleed, and the best remedy I know of is searing the end of the shoots by a hot poker, or rod of iron, in order to dry it, and then to apply hot wax."

Switzer recommends opening a hole at the roots with a spade, and pouring in a few pailfuls of cold water, which he says will have a sure and immediate effect. As this must be by chilling the roots and weakening the vital functions, it seems questionable whether the remedy may not be worse than the disease.

Speechly's remedy for bleeding, is to peell off or divest that part of the branch adjoining the wound of all the outside bark; then with a sponge dry up the moisture, and immediately wrap round the wounded part a piece of an ox's bladder, spread over with tar, or pitch made warm, in the manner of a plaister. Then tie the whole securely with a strong thread, well rubbed with bees' wax. These must remain for three weeks or a month. *Tr. on the Vine*, 145.

T. A. Knight recommends "four parts of scraped cheese to be added to one part of calcined oyster-shells, or other pure calcareous earth, and this composition pressed strongly into the pores of the wood." "This done," he says, "the sap will instantly cease to flow." *Hort. Trans.* vol. i. When the vine is in full leaf, it is not liable to bleed when cut; therefore the largest branches may be cut off during the growing season with perfect safety.

1222. *Stirring the Soil and Culture of the Borders.* "The borders," Abercrombie observes, "should be kept at all times clear from weeds. In winter and spring, the surface of an open border should be turned with a three-pronged fork, not digging deep so as to injure the roots. The design is merely to revive the surface. When it is necessary to recruit the soil, dig the exhausted part carefully up, and work in such a compost as has been described under *Soil*, or similar. The dung out of a cow-house, perfectly rotted, is a fine manure for the vine." He adds, "From the time the buds rise, till the fruit is set, manure the border once in ten days, with the drainings of the dunghill, poured over the roots of the plants."

M'Phail recommends digging in rotten dung, and watering with dung-water from the melon-beds, or with that which has run from a dunghill in a state of fermentation. Forking over, and working a little short dung or compost, if thought necessary, is Nicol's preparation for the winter. A week or two previously to commencing to force, say about the middle of January (forcing to begin the first of February,) he directs the border to be pointed or forked over carefully; and let it be watered all over with the drainings of the dunghill; which repeat at the end of four or five days, and also again at a like interval; giving as much as will sink down to the deepest-placed roots and fibres. The border on the outside should also be covered, or rather should already have been covered, to a good thickness, with stable-yard dung; not, however, mere litter, but good fresh dung, the juices of which may be washed down to the benefit of the roots. The intention of this covering is to answer as a manure; and also to keep severe frost from the roots, from the time the sap is put in motion, till the spring be so far advanced as that the plants shall sustain no injury. Previous to laying on the dung, the border should be pointed or forked over, that the juices may descend the more readily to the roots, and not be washed off."

Speechly covered the vine-border in front of his hot-house with gravel; the best gardeners do not crop them at all, or only with the most temporary crops of vegetables.

1223. *Time of beginning to Force.* "The growing season of our climate," Abercrombie remarks, "does not last long enough to bring out, swell to full size, and perfectly ripen, the fruit and summer-shoots of the vine. Hence, when the artificial excitement, applied to this plant, begins just before the natural spring, and is continued till the leaves fall, the plant is beneficially assisted under a deficient climate rather than forced. The best time to begin to force is the first of March, if the object be simply to obtain grapes in perfection moderately early. In proportion as the start is accelerated before this, the habits of a deciduous plant, and the adverse state of the weather, leave a greater number of obstacles and discouraging contingencies to intercept final success. Managers, however, who work a number of houses, and who have to provide, as well as they can, against demands for grapes in early succession, begin to force about the 21st of December, and, successively, in other houses, the 1st of January, 1st of February, and so on. Attempts are even made, by bold speculators, to lay forward for a crop in March, by beginning to force in August, and getting the fruit set before November: but such labor and expense is often lost. The period of ripening is not early in proportion to the time of beginning: when the course of forcing coincides nearly with the natural growing season, ripe grapes may be cut in five months, or less; when short days compose a third part of the course, in about six months; when the course includes full half the winter, it will last nearly seven months."

In case grapes be not wanted very early, M'Phail considers the month of February the best time to begin to force. On the subject of very early forcing, this author remarks: "On the supposition that the earliest crop of grapes was over by the end of

June, and the glasses laid aside, or left open on the house day and night, you may, if it is desired to try to have grapes early in the spring, prune your vines in August, and put your house in order; and if it is necessary to dig in manure about the roots and stems of the vines, let it be done. If your border be dry, give it a good watering; and if with dung-water, at this time, it will help to enrich it. When this is done, draw on your glasses, and keep the air in the house to a moderate degree of heat, and your vines will afterwards shoot out, and if they are in a fit state for bearing, they will show fruit. If you have not plenty of vines in other houses to succeed these, it would not be advisable to begin to force at this season of the year, for there are several things that might reasonably be urged against the probability of the success of this attempt to ripen grapes early in the spring; but it may succeed, and therefore it is worth giving it a trial. By custom, the vines can be brought, as it were naturally, to shoot forth in the autumn, and their fruit may be set before the shortest days; the greatest art will then, after that, be to preserve them through the dead of winter in a lively growing state. This can be done only by much attention, in making gentle fires, and admitting an easy circulation of fresh air in the house every favorable opportunity."

Nicol says, "Those who have two or three grape-houses, generally begin to force the earliest by the first of the year, and sometimes even in November or December."

"In Holland," Speechly observes, "they begin to force the vine in November, in order to have ripe grapes in April, and sometimes they succeed in producing them by the end of March, in pretty good perfection."

W. Griffin puts on the sashes and commences forcing early in January; no fire is used the first week; in the second week a little fire is made every other night; the third week the heat is kept from 50° to 52°, but not allowed to exceed 55° till the vines begin to break; from that time, until they blow, the heat is kept between 52° and 57°; and whilst they are in bloom the heat is raised to between 57° and 65°. "Air is regularly given plentifully through all these stages, until the bloom appears, when the house is kept close, except the sun be very powerful. When the bloom is past, attention is paid to thining the grapes; a regular heat is then kept up, and air in due quantity, as the weather permits, is admitted, observing to give a larger proportion when the heat of the sun is strong, and always shutting up the house early in the afternoon." The crop so treated generally ripens in July. *Hort. Trans.* iii. 106.

Care of outside Stems. "At whatever season forcing commences, the stems of vines planted outside the house should be guarded from the stagnating effects of cold, by a bandage of hay, or moss and bass matting, round the bole, and a mulching of dry litter over the root. The excluded stems must be protected in the same way at the commencement of the forcing-season. While the vines are young, it will also be advisable to cover the outside border, in winter, with strawy dung taken from the outside of old hot-beds." *Abercrombie.*

J. Griffin keeps the stems of his vines inside the house moist, from the time of beginning to force till the bunches show themselves, by daily watering them with a syringe. This, he says, contributes materially to the production of vigorous shoots. Some gardeners wrap the stems round with moss, which they keep moist for two or three months, for the same purpose. In hard forcing, practices of this sort are particularly necessary.

Temperature. "Begin," Abercrombie says, "at 50° min. 55° max. In a week, raise the minimum to 55° and the maximum to 60°. Till the time of budding, the temperature should not exceed 60° from artificial heat, and 64° from collected sun-heat. After the buds are in full motion, it may be raised to 60° min. 64° max. from fire, and 68° from sun-heat. By the time the bloom expands, the lowest effect from the flues should be 66°: the highest may be 72°; and when the sun's influence is strong, let it be accumulated, by confining the interchange of air to the ventilators, till the heat rise to 80°. After the fruit is set, the minimum should be 75°, and fresh air copiously admitted."

"In beginning and continuing to force the vine," M'Phail observes, "nature should be imitated, by increasing the heat as the days lengthen; but it should be remembered, that to ripen the best sorts of grapes, they require as great a heat as the pine-apple does to ripen it in the summer; for the vine has no artificial heat to its roots."

Supposing the forcing to commence on the first of February, Nicol's directions are as follow: "Make the fires so moderate as that the thermometer may not pass 50°, or at most 55°, mornings and evenings, until every bud in the house have begun to spring. This is a point of very great importance in the forcing of grapes. If the forcing be commenced with a dash, as some fast-going gardeners term it, and if a high temperature be kept up from the beginning, the chance is, that a third or fourth part of the buds will not push, and of course there will be a great falling off in the expected crop. After the whole of the shoots and buds are in an evident state of vegetation, the temperature may be gradually raised to 60°, 65°, and 70°, at which it may continue till the bloom begin to open. This rise from 50° to 70° must not be sudden: it should not be effected in less time than a fortnight; or, if the plants be not in a very strong state, three weeks, otherwise the shoots will push weakly."

After the plants come into bloom, he directs the heat to be raised to 75°. M'Phail and Abercrombie allow it to be a little higher "with the sun heat, and if there be air at the house." "When the fruits are ripening, the air of the house ought to rise from 75° to 85°, with sun-heat and plenty of air." *Pr. Gr.*

J. Mearns considers it of the utmost importance to the bold breaking of the buds, and to the strength of the wood, not to force vines hard until the first leaves arrive nearly at their full size. "After that period," he says, "I give them a much less portion of air, suffering the sun to raise the thermometer to 90° or 100° before I give any. There is no danger of drawing the wood after that stage of growth, and if the thermometer sinks at night to 60°, the vines will do better in a higher temperature in the day." *Hort. Trans.* iv. 254.

Air. Abercrombie directs this to be given pretty freely by the sashes till the leaves unfold. Before the foliage is fully made out, begin to keep the house close, admitting air only by the ventilators; and particularly observe to have a sultry, moist climate while the blossom is coming out, and until it is off and the fruit set. While the fruit is swelling and ripening, the plants will want abundance of heat and air." *Pr. Gr. 651.*

M'Phail recommends a little air to be given during a part of the day while the thermometer is above 65°, and the sun shines in the winter months, and abundance in the summer season when the heat exceeds 75° or 80°.

In beginning to force, Nicol observes, "air should be admitted freely every day, by opening the sashes in the ordinary way, until the foliage begin to expand; and to an extent that the thermometer may not rise to more than five degrees above the fire-heat medium in sunshine; thus bringing away the buds strong and vigorous. But after the foliage begins to expand, except in fine weather, the house should be chiefly aired by means of the ventilators, until the blossom is over, and the fruit begin to set; or at least until the season become mild."

When grapes are setting, air need not be admitted so freely as before, grapes being found to set best in a high moist heat. "A moderate circulation by the ventilators will be sufficient for the purpose, except perhaps in clear sunshine; when it may be necessary to open a few of the sashes at top, in order to let the rarified air escape, and keep the temperature within due bounds. Air is to be increased as the season and growth of the plants and fruit advance. When the fruit is ripening, it should be admitted more freely than heretofore, in order to give the fruit flavor; for on this, and on the withholding of water, as advised above, that matter entire depends." *Kal.*

Williams, (*Hort. Trans.* i.) strongly recommends a dry atmosphere for vines, in which he says the wood, though of slower growth, is more compact, and the fruit more saccharine. Hence vines growing on the sides of mountains in the south of Europe, and in the dry warm province of *La Mancha* in Spain, yield richer grapes, and make stronger wine, than when cultivated in the neighbouring valleys, where, however, they experience greater warmth, and the fruit arrives sooner at maturity. Impressed with the importance of ventilation, from the beginning of July till the middle of October, he generally leaves several of the upper lights of his vinery open about two or three inches all night.

1224. *Watering and Steaming.* Abercrombie says vines require a plentiful supply of water from the time the fruit is well set till it begins to color, particularly when the berries become transparent at the last swelling. Withhold water entirely when the grapes approach maturity.

"If the vines be planted in the inside of the house," M'Phail observes, "care should be taken to keep them sufficiently watered, and in dry weather, in the spring and summer, the border in the outside of the house in which the roots of the vines run, should get plentiful waterings. In order to keep the leaves and fruit clean, let the plants be washed occasionally with clean water, thrown on them by a tin squirt or engine, but take care that the decaying paint on the rafters be not washed down on the leaves and fruit, which would stain and hurt them. Should there be any danger of that, it will answer the purpose fully as well by filling the house full of steam now and then, by sprinkling water on the flues when they are warm." Alluding to the first stage of early forcing, the same author observes: "In some houses, the border, or part of the border in which the vine is planted, is in the inside of the house; where that is the case, let it be watered and sprinkled now and then to keep it in a moist state. Water the flues sometimes when they are hot, which will produce a fine steam, very beneficial to the plants in promoting their growth, and in preventing them from being infested by the red spider. Steam, however, should not be used too copiously. If the border for the vines be in the house, or if there be plenty of plants in pots of earth in it, the evaporation arising from the moist earth is generally sufficient to moisten the air properly; and besides, there is a continual draught of external air coming into the house among the plants; and it is known that the common atmosphere contains moisture at all times, especially in cold weather, when the ground is full of rain from the clouds."

In March, the fruit being set and swelling, he says, "Water the borders in the house, and sprinkle them and the flues now and then with sweet clean water. If this be attended to, and air given in fine days, the house will be kept in a sweet state. The vines may sometimes be watered all over; but if this kind of watering is practised, it should be done carefully; for I have seen grapes much hurt with the decaying paint having been driven from the rafters and other parts of the house on them, by the force of the water. If the paths, flues, and borders in the house be sprinkled and watered occasionally as I have directed, grape-vines will do without giving them water over their leaves and fruit, at this season of the year; though I by no means disapprove of washing them well, now and then, all over, leaves and fruit, provided it be done with clean water, and no filth driven on them from any part of the house."

From the time that grapes are swelled to a size that you can hardly perceive them to grow larger, till the black sorts begin to change color, and the white ones to appear of a more bright color than at an earlier period of their swelling, let the borders be watered plentifully, and the flues sprinkled now and then with clean water. The border outside the house may, probably, in the summer months, require a good watering now and then. *G. Rem.*

After the commencement of forcing, Nicol observes, "the border must be duly and freely refreshed with water, generally once in two or three days; and if occasionally watered with the drainings of the dunghill, it would add much to the vigor of the plants. The branches should be watered once in two days by the engine, with a considerable degree of force, in order to keep the plants clean, and prevent the breeding of the red-spider and thrips, which are often very troublesome in the grape-house."

As vines advance in growth, "they must be liberally supplied with water. The vine, when in a free growing state, requires more water than is generally imagined; and many, very many gardeners, half ruin their plants, and very much injure their crops of fruit by withholding this element. I know some who do not give as much water to a vinery in a whole season as it ought to have in a month. But what is the consequence? Wood as large as wheat-straw, and berries the size of garden-peas!"

Increase the supplies of water with the advances of the season and growth of the plants. "As the fruit begin to color and swell off for ripening, the quantity of water, hitherto liberally given, must be lessened by degrees; and, towards its coming to full maturity, must be entirely withheld, that it be not rendered insipid. The operations of the engine on the foliage must also cease; but previously, be particularly severe, and be careful to scourge it well, that no vestige of the red spider be left. This is a matter of very great importance, and but too little attended to: and for want of taking this care, I have more than once seen a whole crop of grapes very much spoiled, and the berries rendered dirty, nauseous, and bitter."

Ripening the Wood. Abercrombie directs, "If the fruit be not off by the middle of August, the continuation of fine dry weather, or of heat dependent on the natural climate, will hardly be sufficient to ripen the wood; and therefore, as soon as the external air declines to 68°, resume gentle fires, morning and evening, so as to keep the minimum temperature of the house to 70°. The maximum need not exceed 75° in sunshine; for fresh air should circulate at every proper opportunity. Proceed thus until the shoots of the season have ceased to grow, and turn brownish at bottom, and the leaves begin to fall, indications that the wood is ripe, when the first and last are not caused by a deficiency of heat." He adds, "If the weather continues warm after the fruit is cut, take off the glass frames; as the shoots will ripen the better under full exposure to it. In October, however, it will be advisable again to put on the frames, as well by shelter to assist the ripening of the wood, if that is not complete, as to protect the house from injury, when rough wintry weather may be expected."

Nicol says, "If the lower part of the shoots be not, by the beginning of August, turning brownish, then it is advisable to apply a little fire-heat, in order to further the growth of the plants, and the perfection of the wood. Some would put this matter off, perhaps another month; but if the application of fire-heat be at all necessary, less trouble and expense for fuel will attend the process of ripening the shoots in September than in October. Another consideration is, that, as it were, you take up vegetation on the way, and hand her forward to the end of her journey, instead of allowing her to lag behind, and then forcibly push her on against her inclinations; a matter of the very first consideration and importance in every species of horticulture. Let very moderate fires be made at first, increasing their strength as the season advances, and so as to keep the temperature, mornings and evenings, at about 70°. This should be continued till the growth of the plants begin to stop, and till the part of the leading shoots whereat you would cut, that is, about six or eight feet upwards, become brownish. The portions of air, hitherto freely admitted, must be lessened by degrees, as the weather turns colder; and so as that, in sunshine, the mercury may not fall below 75°. When the growth of the plants is over, expose the house day and night, except in rain. Water must also be withheld, as the growth of the plants abate, and somewhat in the proportion in which you would have vegetation stop; not all at once, but gradually. Continue the operations of the engine to the latest; not merely to subdue the enemy at present, but as far as possible, to prevent his appearance next campaign."

Exposure and resting of the Wood. "Some managers," Abercrombie observes, "leave the house quite exposed when the vines have done growing; and whether it be covered or not, there should be constantly a circulation of air through it. Vines which have been exposed to the weather, or freely to the dry air, in a state of rest, when forced after a proper interval, generally break at almost every eye."

The rest proper to a deciduous plant, cannot be given to vines where the branches are kept subject to the influence of a permanent heat after the leaves are fallen, as in the case of vines grown in pine or other stoves. The top of its stem, with its branches, must therefore be withdrawn from the house immediately after the fall of the leaf, to remain on the outside till it be proper again to force the plant. Abercrombie says, "the branches will require no covering in this climate;" but many gardeners lay them down, or tie them to stakes, and cover them with litter or mats.

M'Phail says, "Some modern writers on gardening recommend that the glass frames of the grape-house be taken off the vines as soon as the vines are all cut; and also to take the vine-plants out of hot-houses appropriated to the culture of the pine-apple when the grapes are over. This they tell us is to ripen the wood, and give the plants rest, &c. I do advise that the glass frames of grape-houses be suffered to remain over the vines all the year, excepting in July and August, and that grape-vines in hot-houses for the pine-apple should not be taken out to remain for any length of time at any season of the year. If fruit-trees ripen their fruit well, the wood for bearing the following year will be sufficiently matured; but the plants, whether they be the grape-vine, peach, &c. had best remain in that climate made for them artificial, all the year, for though the fruit be over, the wood of the plant requires protection. As well," he adds, "might they expect the cherry-tree to blossom in September and October; which months are some years warmer than the month of April, when the cherry-tree is in full blow, or that the Christmas-rose may be excited by summer heat to blossom in July or August." "It is natural for the grape-vine to produce only one crop in the year, and when it is accustomed to grow in a hot-house appropriated for the pine-apple, its nature is not changed; nor will it offer to put forth its buds before January in hot-houses kept to a heat sufficient for growing the pine-apple, when the pine pots are plunged in a bed of warm tan."

We have already quoted T. A. Knight's opinion (1000.) as highly favorable to putting the vine into a state of repose, as early as possible in the autumn preceding the season in which it is to be forced.

After the growing season, and when the wood is ripened, Nicol "exposes the house day and night, except in rain." After an autumn pruning, he shuts up the house for ten days or a fortnight, particularly if there be any appearance of frost; admitting air freely through the day. The object in thus keeping the plants from the extremes of heat and cold, is, in order that their pores may contract, and their wounds heal gradually; as otherwise they are apt to bleed now, and to break out afresh on the application of fire-heat in the spring. When they are judged to be safe, expose the house night and day, as before." *Kal.* 428.

1225. *Forcing the Vine in a Pine or other Stove.* Abercrombie, in a comparison between the hot-house or general stove and vinery, justly observes, that the former "has many circumstances of inferiority to the vinery; and, although its shades of inconvenience or imperfect accommodation are not weighty enough to forbid the dedication of any spare room to the vine, yet they are sufficient to confer very great credit on the manager who obtains a good crop of fine-flavored grapes under them." *Pr. G.* 657.

Speechly considers, that the vine and pine may be advantageously grown together; but subsequent experience having led to the culture of pines in pits, most gardeners, and among these Nicol, prefer growing them separately.

M'Phail, without giving a decided approbation of their union, gives the following directions on the subject, which are to be taken in connection with his opinion as given above, on the impropriety of withdrawing the wood to rest it in the open air.

"To manage the grape in a hot-house appropriated for growing the pine-apple, and for ripening its fruit, treat them in the following manner: in the month of November or December, cut down all the old wood to about the height of the pit, leaving only two young shoots, the strongest that can be got, the strongest one to shoot from the buds and bear the fruit, the other to be cut short and to grow long shoots to bear the fruit the succeeding year. This is to be done successively year after year, leaving the old stem of the vine to grow, as the older the plant is the better. After the vines are pruned, tie them up nearly close to the glass, with matting, to iron rods or laths fixed to the rafters of the house. As soon as they begin to swell in their buds and show themselves ready to break, let them down about a foot from the glass, so that they may receive the benefit of the warm air round about them, and not be liable to be affected by the frosts. If the buds burst strong and bushy, it is a good sign that they will show fruit; but if weak, on the contrary; and, if they miss showing fruit on the fourth or fifth joint, they will show none at all; and in that case the young shoot that does not show fruit should be cut off, as it would only take the nourishment from the others which have shown fruit. Do not let more than one or two bunches grow on one bud, for if too many are left on the plant, they will not swell well. If the vines be planted in the inside of the house, care should be taken to keep them sufficiently watered; and in dry weather, in the spring and summer, the border in the outside of the house in which the roots of the vines run, should get plentiful waterings. In order to keep the leaves and fruit clean, let the plants be washed occasionally with clean water, thrown on them by a tin squirt or engine, but take care that the decaying paint on the rafters be not washed down on the leaves and fruit, which would stain and hurt them. Should there be any danger of that, it will answer the purpose fully as well by filling the house full of steam now and then, by sprinkling water on the flues when they are warm."

1226. *Forcing Vines by Dung Heat.* Justice, Lawrence, and Switzer, state instances of this being done on wooden walls in their time. Fletcher, a market-gardener near Edinburgh, has practised it with great success in a glass case, keeping constantly, till the fruit is about to ripen, a heap of dung, or dung and weeds, in a state of fermentation in the area of the house. But the most systematic and extensive forcing of this kind is that which has for fifteen years been practised by J. French, Esq. of East Hornden, in Essex, and which has been thus described by a late intelligent fellow of the Horticultural Society.

" J. French's garden is situated on elevated ground, greatly exposed to the east and north winds; the soil too is heavy and cold. With these disadvantages to contend with, he succeeds uniformly in producing an abundant crop, by the plan which he follows; even in the present unfavorable season, whilst the neighbouring noblemen and gentlemen's houses are nearly unproductive, his trees are profusely covered with the finest fruit, now ripe. He has two forcing-houses, a vinery, and a nectarine house; and I shall proceed to describe his method of treatment as accurately as an interview of a few hours has afforded me the means of doing. About the beginning of March, J. French commences his forcing, by introducing a quantity of new long dung, taken from under the cow-cribs in his straw-yard; being principally, if not entirely, cow-dung, which is laid upon the floor of his house (*fig.* 319.), extending entirely from end to end, and in width about six or seven feet, leaving only a path-way between it and the back wall of the house. The dung being all new at the beginning, a profuse steam arises with the first heat, which, in this stage of the process, is found to be beneficial in destroying the ova of insects, as well as transfusing a wholesome moisture over the yet leafless branches; but which would prove injurious, if permitted to rise in so great a quantity when the leaves have pushed forth. In a few days the violence of the steam abates as the buds open, and in the course of a fortnight the heat begins to diminish; it then becomes necessary to carry in a small addition of fresh dung, laying it in the bottom, and covering it over with the old dung fresh forked up; this produces a renovated heat and a moderate exhalation of moist vapour. In this manner the heat is kept up throughout the season, the fresh supply of dung being constantly laid at the bottom in order to smother the steam, or rather to moderate the quantity of exhalation; for it must always be remembered, that French attaches great virtue to the supply of a reasonable portion of the vapor. The quantity of new dung to be introduced at each turning, must be regulated by the greater or smaller degree of heat that is found in the house, as the season or other circumstances appear to require it. The temperature kept up is pretty regular, being from 65 to 70 degrees.

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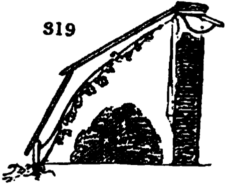

" J. French contends, that the moist vapor which is transfused through the house is essentially beneficial, not only because it discourages the existence of insects, and destroys their ova, but it likewise facilitates the setting and swelling of the fruit. I ought to observe, that I am not offering any opinion of my own in the present statement, but merely recording, as faithfully as possible, the remarks made to me by a person of ingenuity and observation, whose extraordinary success is, in my mind, the best test that can be given of the merits of his practice. *Anderson in Hort. Trans.* vol. ii.

J. Mearns " approves greatly of applying the steam and heat of dung to the forcing of grapes, and uses it in the earliest part of forcing with great advantage, forming a large ridge of it in the back part of his vinery, and introducing the additions of recent litter always under the old dung." *Hort. Trans.* iv. 256.

The practice of applying the heat of horse-dung, and of other fermenting substances, to the forcing of vines and the growing of pines and other plants, usually excited or preserved by means of fire-heat, is becoming very general, and is attended with this advantage, that the ammoniacal and carbonic gas which is disengaged during the decomposition of the dung is highly noxious to insects, while to vines before the buds protrude themselves, and to pine-plants at most seasons, it is found not at all injurious. These things known, every farmer might have an excellent vinery attached to his straw-yard, or placed over, or near to his dung-pit, at very little expence, and with very little contrivance in ordinary cases. A few apertures along the upper part of the house being kept at all times open, there could hardly occur any injurious accumulation of steam, and the same openings would render daily attention in giving air unnecessary; for there is abundant experience to prove that a vinery in which the apertures for admitting air at bottom and top are opened in spring, may be left with them in that state night and day till autumn, without the smallest injury. All that the farmer would have to do, would be to water the plants two or three times a week with a syringe or engine, and to tie up the shoots as they grew to the trellis. As in this way the enjoyments of a numerous class of men might be encreased at very little expence and labor, we intreat the attention of head-gardeners and proprietors to the subject, as calculated, like the dissemination of every other rational luxury, to be conducive to the general good.

Opulent, or proprietor farmers, who have extensive farmeries, and probably two or three separate straw-yards (*fig.* 320. *a* and *b*), might raise all the fruits grown in first-rate gardens by the same means, and add not a little even to the elegant appearance of their establishments. A pinery, for example, might be formed over a large dung-pit, and the side walls, being hollow, like those of Silverlock (*Hort. Trans.* iv. 244. and *fig.* 146.), or of Wade (*Hort. Trans.* iv. 290. and our *fig.* 312.), would preserve the air within perfectly pure, so as to admit the growth even of ornamental exotics, &c. The additional expence of management to the farmer in this case would be chiefly the difference between keeping a half-bred gardener and a common laborer.

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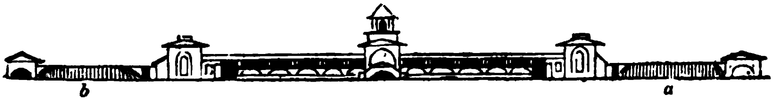

1227. *Forcing the Vine in Hot-bed Frames, and other Glass Cases.* T. A. Knight, after describing his inclined hot-bed and frame, and its advantages in respect to cucumbers and melons, adds, " I have often used, with great success, a frame and hot-bed thus formed for forcing grapes, by placing the bed at three feet distance from the wall, to which the vines were trained, and introducing their branches into the frame, through holes made at the north end of it (the vines having been trained to a south wall), as soon as the first violent heat of the bed had subsided. The white *Chasselas* grape thus treated, ripens in July, if the branches of the vine be introduced in the end of April; and a most abundant crop may be thus obtained; but the necessity of pruning very closely renders the branches which have been forced, unproductive of fruit in the succeeding season; and others from the wall must consequently be substituted. I have always put a small quantity of mould in the frame, and covered it with tiles.

" If an inclined plane of earth be substituted for the hot-bed, and vines be trained in a frame adapted to it, the grapes (the *Chasselas*) ripen perfectly in August; and if small holes be made through the sides of the frame, through which the young shoots of the vines can extend themselves in the open air, a single plant, and a frame of moderate size, will be found to yield annually a very considerable weight of grapes. For this purpose, the frames should not be more than eight or ten feet long, nor more than five or six in breadth, or the young shoots will not be so advantageously conducted out of them into the open air; and the depth of the frame, either for the hot-bed or inclined plane of earth, should not be less than eighteen inches. The holes in the side of the frame, through which the young shoots are to pass, should of course be closed during the spring, and till wanted; and if the weather be cold, it will be necessary to cover the frames at night. When the grapes are nearly full-grown, and begin to ripen, it will also be highly advantageous to draw off the glasses during the day in fine weather, by which means the fruit will be exposed to the full influence of the sun, without the intervention of the glass, and will attain a degree of perfection that it rarely acquires in the vinery or hot-house."

J. Mean, gardener to Sir A. Hume, has practised a mode very similar to that of

T. A. Knight for a number of years; and, as such simple modes of obtaining early or well-ripened grapes are within the reach of every one who has a grape-vine trained against a wall or house, we shall quote his account of it.

"This method is particularly applicable in cases where vines are trained to walls, and do not ripen their fruit, nor bear well. The frame must be high enough in the sides, to admit of the vines being trained horizontally on a trellis, to keep the pendant bunches clear of the dung, and to give free room for the leaves between the vine branches and the glass. The frames used at Wormleybury have either one or two lights; the latter are nine feet long and six feet wide; the fronts of the frames are eighteen inches high, and the backs are two feet high; the trellis is fixed nine inches from the glass, which gives sufficient space above and below. The upper board at the back of the frame being nine inches wide, lifts up or slides off, so that the branches are laid in without suffering the injury they would sustain in their buds, if they were drawn through holes. In the first or second week in April, just before the vines begin to move, you make up a common dung hot-bed at a convenient distance from the wall, or from the place where the shoots of the vines are; lay your frame on the bed, with its back towards the vine, and fronting the sun, as it would naturally be, if placed against a south wall: the branches must then be introduced into the frame; these you train along the trellis already mentioned, with their points directed downwards, towards the front of the frame. By these means, through the heat of the dung, and that of the sun from the glass, your vines produce an abundant crop; and it is found, that the ripening of the fruit is accelerated, by laying slates or tiles all over the dung. At the end of the season, those shoots which have borne their crop are cut entirely away, and a fresh supply introduced of young shoots, which have been making and ripening their wood on the wall; these are treated in the same manner, the wall annually yielding a successive supply of young wood to be taken into the frame." *Hort. Trans.* ii. 230.

Lindegaard, Torbron, and various gardeners, foreign as well as British, but more especially those of Holland and Flanders, construct temporary frames or glass cases against walls of vines. Sometimes a temporary furnace and flue is built, and at other times a dung-bed is resorted to, and very excellent crops are obtained.

About twenty years ago, a market-gardener at Bath published a plan of ripening grapes under common hand-glasses. He planted the vines in a soil composed in great part of lime-rubbish; placed a glass over each plant, taking out half a pane in its summit, through which the leading shoot of the vine protruded itself, and grew in the open air. The bunch or bunches of grapes remained within the hand-glass, and enjoyed the advantages of protection from cold winds, dews, and rains, during night, and of a high degree of confined solar heat during the day.

1228. *Forcing Vines in Pots.* This is not a very common practice, because the vine requires a greater extent of pasturage for the roots than any other fruit-tree. It has, however, been occasionally attempted by gardeners in pits and stoves, and three or four bunches are sometimes thus obtained from one plant. The soil must be as rich as possible, and every attention paid to keeping the plants regularly supplied with water and liquid manure. Knight employed water impregnated with pigeons'-dung to the color of porter, and found, in consequence, the most vigorous growth. He states, that a pot containing two cubic feet of very rich mould, properly supplied with water and manure in a liquid state, is fully adequate to nourish a vine, which, after being pruned in autumn, occupies twenty square feet of the roof of a hot-house. Such vines he constantly found to produce more vigorous wood when forced very early, than others of the same varieties, whose roots were permitted to extend beyond the limits of the house. *Hort. Trans.* vol. ii. 373.

P. Marsland, Esq. of Woodbank, near Stockport, has a succession of grapes during eleven months in the year, by forcing vines in pots. The pots are placed on stages, and as the fruit is cut, they are removed and replaced by others; the plants are from one to four years old, and at the latter age they bear abundantly, and produce large bunches. *Hort. Trans.* iii. 363.

Vines are grown under the rafters in most kinds of forcing and other hot-houses; but, as the gardener who understands their culture in the vinery and pine-stove, can be at no loss in any case of that sort, we do not consider it necessary to introduce here any thing farther on the subject. The excellence of the fruit, and the grateful nature of the plant, than which none is more certain of rewarding the gardener's care by abundant crops, will, we trust, justify our having brought together the practice of so many cultivators.

1229. A method of *retarding the ripening of grapes* in hot-houses, so as to obtain a supply in the winter season, by R. Arkwright, Esq. of Willersley, is thus described in the Transactions of the Horticultural Society:

"The sorts cultivated for this late crop are the white muscat of Alexandria, the black Damascus, the black Teneriffe, the St. Peter's, the black raisin, the Syrian, and the white Nice. They are grown in houses alternately used as pineries and vineries. About the second week in February, the pine plants are always removed into another vinery. The grapes which remain on the vines are all cut, and the house thrown open for the free admission of air *at all times*, till the end of April, when the vine-buds begin to swell, when a gentle fire is applied in the night, and in dark and cold days; but air is admitted freely when the thermometer is up at 70°. At this period, a proportion of the pine plants is again brought into the house, where they remain till the succeeding February. The treatment from this time is quite in the common way; and by this late and slow process, the grapes do not begin to ripen till towards the end of October, and the very late sorts, such as the St. Peter's, are scarcely ripe at Christmas. The following note is added to this paper by the secretary.

"The specimens of grapes ripened in the manner described in the preceding paper, which were exhibited by R. Arkwright to the society on the 3d of February, were as rich, perfect, and fresh, as if they had been produced at the usual season: and the leaves of the vines, which were sent at the same time, were in an undiminished state of vegetation. These leaves, R. Arkwright has since informed us, were from the late sorts of vines, viz. the Syrian, the Nice, and the St. Peter's; those of more early kinds, such as the Muscat and the Damascus, begin to assume their yellow tinge about Christmas, but their fruit continues quite fresh and good for a considerable time afterwards. The conclusion is obvious, that the vines made to produce these late grapes, had acquired the habit of late bearing, and this habit, R. Arkwright states, has been brought on gradually. Whenever he introduces a young vine into the house, where his late grapes are grown, it is treated exactly like the vines which are in bearing, and in the second or third year after planting, when it begins to yield fruit, it is found to have lost its disposition to break into leaf at the accustomed season. R. Arkwright began to practise his present plan of growing late grapes about twelve years ago, at which time he also used to force early grapes; and so successful was his plan of retardation, that, on the 1st of May, 1810, he had on his table fresh-gathered fruit, the produce of two years, viz. of the late crop of the past, and the early crop of the present year. He has now ceased to force any vines for early fruit, and confines his cultivation to that of late grapes alone."

In a temporary vinery, or glass case placed against a wall on which grapes were trained, T. Torbron has ripened a late crop, and kept the fruit on the trees in a state fit for use till February. *Hort. Trans.* iv. 118.

1230. *Insects and Diseases.* Speechly and Abercrombie recommend washing the stem and all the shoots with soap and water; the stem being previously divested of the loose bark. Abercrombie adds, give the border two or three soakings over the roots with soap-suds. If the plants get infested with the pine-bug or turtle insect, it is to be extirpated by syringing the leaves with a strong infusion of tobacco-stalks. Watering is the best preventative of the red spider, and aphis or green fly, and fumigation keeps down, and in part destroys the latter and the thrips. M'Phail observes, that the red spider, the mealy white bug, and the brown turtle insects, are the most injurious to the vine. "These insects lodge upon the wood of the trees, and upon their leaves, and upon their fruit. To prevent accidental infection, care should be taken not to introduce infected plants into the house; keeping the air in the house among the plants sweet, and to a strong degree of heat, with constant admission of fresh air, are good preventatives against insects. To help to destroy insects on the vine, peel off, in the autumn, winter, or spring, before the plants begin to grow, all the loose, outside bark, and wash, with soap-water mixed with sulphur, the stem and all the branches, rubbing them well with a sponge or brush, which will destroy the insects, and the spawn of them that have been deposited thereon. If they happen to be infested very much, after they are well washed with clean water, let the stem and all the branches be smeared with a mixture of sulphur, soot, and water, put upon them with a painter's brush."

Rotten and decayed berries or leaves are to be removed, that they may not spread their infection.

The red spider, Nicol considers as the grand enemy to the vine. After every winter pruning and removal of the outward rind on the old wood, he directs to anoint the branches, shoots, and trellis, with the following composition, the object of which is the destruction of their eggs or larvæ.

"Soft soap, two pounds; flowers of sulphur, two pounds; leaf or roll tobacco, two pounds; nux vomica, four ounces; and turpentine, an English gill; boiled in eight English gallons of soft or river water, to six." This composition is to be laid on, milk-warm, with a painter's brush, "then with a sponge, carefully anoint every branch, shoot, and bud; being sure to rub it well into every joint, hole, and angle." If the house is much infected, the walls, flues, rafters, &c. are also to be painted over with the same liquor. Watering over the leaves and fruit at all times, except the ripening season, is the preventative which he proposes, and which all gardeners approve.

Birds, Wasps, *Flies, &c.* several gardeners direct to be excluded by gauze frames, calculated to fit the openings by which air is given. Some recommend putting bags of gauze over each bunch; others hang up bottles, boiled carrots, &c. M'Phail says, "Fix nets on the parts of the house where you admit air, and fix them in such a way as that the sashes will slide backwards and forwards either in the outside or inside of the nets. The net should be as thick in the meshes as that a wasp cannot fly through them." It may be noted, that a flying wasp (the wings being distended) will not require meshes smaller than an inch square.

1231. *Gathering and keeping the Fruit.* With respect to the gathering of grapes, Nicol observes, "they should be allowed to hang till fully matured and ripened; especially the thick-skinned and fleshy sorts. Even the thin-skinned and juicy kinds, as the white sweetwater, white Frontignac, and muscadine, (that are often cut before nearly ripe,) are much improved in flavor, by being allowed to remain on the plant till the skin become transparent, and of a russet or yellowish color."

The grapery, when the fruit is ripe, ought to be kept dry and cool in order to preserve the fruit as long as possible on the branches, and thus to prolong the grape season. Covering the border an inch or two with dry sand, ashes, or gravel, Nicol says, contributes to dry the air and dispel damps. The leaves round the bunches are to be picked off for the same end, and a fire to be made in the day-time in gloomy weather.

J. Thompson, gardener to Earl Cowper, at Panshanger, preserves grapes in his vinery till February, by lighting fires in the day time, and giving plenty of air; but putting them out in the afternoon, and shutting the house close up at night. "The fire in the day, aided by the circulation of the air, renders the whole interior of the houses perfectly dry, so that no damp exists in them when shut up; a night fire, on the contrary, with the houses closed, creates a vapor, which causes the fruit to become mouldy, and to decay. The sorts used were the Frontignacs, sweetwater, and black Damascus." *Hort. Trans.* iv. 132.

"There are some sorts of grapes," M'Phail observes, "such as the black muscat of Jerusalem, the Syrian, Tokay, and some others, which will keep on the tree a long time after they are ripe, provided the house be kept dry and cool."

J. Braddick covers the floors of his vinery in autumn about three inches thick with coal-ashes, which, by preventing any damp from rising, to mildew or injure the fruit, enables him to preserve the grapes hanging on the tree in a very perfect state till the end of January, or later. *Hort. Trans.* iv. 143.

Decayed granite or trap, which have been discovered by Professor Leslie to be powerful absorbents of moisture, where they can be obtained, would be excellent substitutes for ashes; or oatmeal might be used, (being swept up and dried occasionally,) were the harboring of vermin not to be dreaded. See *Supp. Encyc. Brit.* art. *Cold.*

To *preserve* grapes by removal from the tree, Forsyth directs, "Where there are several bunches in one branch you may cut it off, leaving about six inches in length, or more, of the wood, according to the distance between the bunches, and a little on the outside of the fruit at each end; seal both ends with some common sealing-wax, such as wine merchants use for sealing their bottles with, which you may buy at the wax-chandler's; then hang them across a line in a dry room, taking care to clip out, with a pair of scissars, any of the berries that begin to decay or become mouldy, which, if left, would taint the others. In this way I have kept grapes till the 6th of February; but, if they are cut before the bunches are too ripe they may be kept much longer.

"Grapes," he adds, "may be kept by packing them in jars (every bunch being first wrapped up in soft paper), and covering every layer with bran, which should be well dried before it is used, laying a little of it in the bottom of the jar; then a layer of grapes, and so on, a layer of bran and of grapes alternately, till you have filled the jar; then shake it gently, and fill it to the top with bran, laying some paper over it, and covering the top with a bladder tied firmly on to exclude the air; then put on the top or cover of the jar, observing that it fits as close as possible. These jars should be kept in a room where you can have a fire in wet or damp weather." *Tr. on Fr. Tr.*

SECT. III. *Culture of the Peach-House.*

1232. *Soil.* Abercrombie recommends three parts of mellow unexhausted loam, and one part of drift-sand moderately enriched with vegetable mould or the cooler dungs. The border or bed to be thirty inches or three feet deep. The nectarine wants the warmer, richer, and deeper soil, if any difference be made. *Pr. G.* 292.

The soil for peach-trees which are to be forced, M'Phail recommends to be "fine loamy, well-prepared earth of a medium texture, neither very light, nor of a strong binding quality, well mixed with some good manure. The border to be four feet deep, and so broad, that the roots cannot get into a bad soil." *Gr. Rem.* 18.

The bottom being made "comfortable by draining and paving, if not naturally dry, Nicol directs the breadth of the border to be the width of the house within, and to the extent of ten or twelve feet without. The average depth thirty inches at the least; but if a yard, it would not be too much. The soil to be thus composed: three-fourths strong loam, an eighth part light sandy earth, and an eighth part rotten stable-yard dung, with a competent quantity of lime and marl; all being properly mixed before planting." *Kal.* p. 291.

Choice of Sorts.—The following list is given by Abercrombie as the most proper for forcing:

PEACHES.

Cling-Stones.
Late admirable. Mid. Sept.
Old Newington. Late in Sept.
Portugal. End Sept.
Golden. Sept.
Catharine. Early in Oct.
Monstrous pavie. End Oct.

Free-Stones.
White nutmeg. End of July.
Large Mignonne. Mid. Aug.
Belle Chevreuse. Late in Aug.
White Magdalen. End Aug.
Red Magdalen. End Aug.
Montauban. End Aug.

Chancellor. End Aug.
Early admirable. Beginn. Sept.
Malta. Early in Sept.
Royal George. Mid. Sept.
Noblesse. Mid. Sept.
Le Teton de Venus. Late in Sept.
Late purple. Late in Sept.

NECTARINES.

Cling-Stones.
Red Roman. Late in Aug.
Newington. End Aug.

Golden. Sept.
Brugnion. Late in Sept.

Free-Stones.
Scarlet. End. Aug.
Murray. Early in Sept.

Temple. Sept.
White. Aug. and Sept.

M'Phail says, "The names of peach trees fit for forcing are the Magdalen, Montauban, royal George, and noblesse; of nectarines, the scarlet, temple, Murray, and red Roman." *G. Rem.* 18.

Nicol recommends the following:

PEACHES.

Red Magdalen.
White Magdalen.

Royal George.
Noblesse.

Montauban.
Admirable.

Teton de Venus.
Late purple.

French Mignonne.
Smith's Newington.

Early purple; and
Orange.

NECTARINES.

Elruge. | Duc de Tello. | Scarlet. | Murray. | Temple. | Roman. | Newington, and | Brugnion.

1233. *Choice of Plants.* "Before a house for forcing peaches and nectarines be built," M'Phail observes, "trees to plant in it had best be got in readiness; and if they be growing on the premises it will be an advantage. If it can be avoided, no tree should be planted in a forcing-house until the fruit of it have been seen and tasted. The trees should be well trained ones, four or five feet high: indeed it is of no consequence what their age be, provided they be healthy, well rooted, and in a bearing state: and if they have been transplanted several times since they were budded, they will be the fitter for transplanting again; and if the work of taking them up and of planting them in the peach-house be carefully and methodically done, the trees by their removal will be but little retarded in their growth.

"When every thing in a forcing-house is got in readiness for the reception of the trees, loose them from the wall to which they were fastened with nails and shreds, and dig a wide semicircular trench four feet distant from the stem of each tree, and a little deeper than their spreading roots; then by little and little with a pointed stick work the earth out among their roots, taking care to break as few of them as possible: in this manner the roots of the plants are to be divested of earth in a careful manner, so as to undermine the stem, that the tree may be lifted out of its place without straining the roots of it. Having holes previously prepared about eight or ten inches deep, and four feet wide, set the trees into them one after another, training their roots out in a regular horizontal manner at full length, and after the ends of the roots be cut so as to take the raggedness off, cover them no deeper than about six inches at their extremities, and at the stem of the tree about four inches."

"Clean, healthy dwarfs, that have been one or two years trained," Nicol prefers to older plants; and riders three or even four years trained; because, being temporary, it is desirable to have them produce fruit as soon as possible, for if the dwarfs thrive, the former will have to be removed in three, or, at most, in four years. In a house thirty-five feet long, three dwarfs should be planted, and in a house thirty-five or forty feet long, four dwarfs; in both cases with riders between them. *Kal.* 323.

Situation of the Plants in the House. Permanent occupants, intended to be forced early, Abercrombie plants in a front border, training them on a trellis just under the roof. In late forcing-houses, he trains them to an upright trellis near the back wall.

M'Phail plants so as to train under the glass; and Nicol's practice concurs with that recommended by Abercrombie.

"For a late peach-house, dwarfs should be planted in front, to be trained about half way up the roof; and dwarfs, with riders between them, against the back wall, to be trained to the top. In this case, the trees on the back trellis would not be shaded by those in front, provided they be not trained to more than half way up the sloping-glass; and thus the greatest possible extent of unshaded surface, and the greatest quantity of unshaded fruit may be obtained. A house planted in this manner, about forty, or forty-five feet in length, may have four dwarfs in front, and four dwarfs and five riders at back; and when in a full-bearing state, would produce a large quantity of nectarines and peaches. If only thirty, or thirty-five feet in length, three dwarfs in front, and three dwarfs and four riders at back, would be trees enough to fill it." *Pract. Gard.*

Season of Planting. — Abercrombie recommends November and December as preferable; if not February and March: M'Phail, "any time when the weather is open, between October and March;" which practice is also agreeable to that of Nicol.

1234. *Training.* All seem agreed in recommending fan-training for peaches and nectarines; which being the simplest and most natural of all training, we deem it unnecessary to quote opinions at length.

Pruning. This, according to Abercrombie, may be performed at the fall of the leaf; but should be completed before the blossom buds are considerably advanced. M'Phail says, the best season is the spring, when the blossom-buds can be distinguished.

In the case of a newly-planted house, Nicol heads down the maiden plants, or cuts in the trained trees, about the end of March or beginning of April. "With respect to the dwarfs, the shoots on the lower branches should be cut back to two or three buds, that the trellis may be furnished from the bottom with young wood. The shoots on the upper or farther extended branches may be shortened back to half, or one-third of their lengths, according to their strength, provided they have been well ripened, and are free from canker; but if the tree be anywise diseased, let them be cut so far back as to get rid of the cankered or mildewed part. I mention this as a matter of precaution, but would rather advise that no diseased tree be planted, unless of a particular kind, that cannot be easily obtained.

"The riders need not be headed so much in as the dwarfs; the object being rather to throw them into a bearing state, than to cause them push very strong shoots, which would not be fruitful. If they make moderately strong shoots, and if these be well ripened in autumn, a good crop may be expected on them next year. "Let the young shoots be laid in, as they advance, at the distance of about nine inches from each other; that is, of the dwarfs. Those of the riders may be laid in considerably closer, it not being intended they shall grow so vigorously as those of the dwarfs."

In a bearing-house the *winter* pruning is supposed to take place in November; and if the summer shoots have been regularly trained, and laid in at the distances of nine inches in the dwarfs, and rather less in the riders, they will not require much pruning at this time. A few of the shoots may be shortened about the lower and middle parts of the tree, for the purpose of providing a supply of young wood in these parts, and thinning out such shoots here and there as have been left too thick; for others should not be shortened, but should be laid in at full length; that is, such as are short, stout, nearly of an equal thickness, and have a bold wood-bud at the extremity; as from these may be expected the best fruit next season. "In some parts of the tree, perhaps, or in some particular trees, it may be expedient to cut out such old branches as have but few young shoots on them, provided there be neighbouring branches better furnished, whose shoots may be spread out, so as to fill, or nearly to fill, the vacancy occasioned by such lopping. In this case, the shoots borrowed, as it were, for this purpose, must be shortened more or less, according to the size of the vacancy to be filled up, and according to their strengths, in order that the plant may appear complete in all parts as soon as possible."

In *summer* he pinches off all fore night-shoots as they appear, and all such as are ill-placed, weakly, watery, deformed, or very luxuriant, leaving a leader to every shoot of last year, and retaining a plentiful supply of good lateral shoots in all parts of the tree.

If any blank is to be filled up, some conveniently-placed strong shoot is shortened in June to a few eyes, in order that it may throw out laterals.

Sir Joseph Banks, in speaking of the culture of peaches at Montreuil near Paris, (*Hort. Trans.* vol. i. *App.*) says, "Much advantage is derived from the practice of rubbing off the leaf-buds from the fruit-bearing branches, leaving only as many as are wanted to produce wood for the succeeding year. This *taille d'été* does not only leave the remaining wood to grow stronger, and to ripen sooner, but it materially increases the size of the fruit."

The fruit is thinned after the stoning season, as already described in treating of thinning of wall-fruit (1124).

Abercrombie says, "There should be a preparatory thinning before the time of stoning, and a final thinning afterwards, because most plants, especially such as have overborne themselves, drop many fruit at that crisis. Finish the thinning with great regularity, leaving those retained at proper distances, three, four, or five, on strong shoots; two or three on middling, and one or two on the weaker shoots; and never leaving more than one peach at the same eye. The fruit on weakly trees thin more in proportion."

Nicol concurs with these remarks. "If," he says, "the trees set an immoderate quantity of fruit, which plants not in a healthy and vigorous state will often do, (that is to say, such will frequently set more than they are able to sustain or nourish), they should, in that case, be moderately thinned at this time. Also, the fruit on trees in a more vigorous condition should be thinned; thinning most where health is most wanting, and least where it prevails over sickness. And observe, that for want of timely and judicious thinning, sickness is often induced, and the whole crop lost." "In a peach-house in a state of bearing, when the fruit is swelling off, in order that it may attain a greater degree of perfection, such leaves and summer shoots as overhang and shade the fruit are taken off or thinned."

The leaves of peach-trees "may be dressed off," when the wood is ripened, by the use of a withe or small cane, which is more necessary in a house than if the trees were growing in the open air, where the wind or frost might make them tumble down fast.

In the newly-planted peach-house, "the dwarfs must be well cut in, in order to make them push shoots freely for furnishing the trellis next season. Those situated in the lower and middle parts of the tree, should be cut back to half their lengths, or to a few buds, less or more, according to their strength; and those of the extremities, to one-third, or to about half their lengths, also according to their strength, and how well they have been ripened. They should be thinned so at this time, as that the shoots which are to issue from them next season, may be laid in at the medium distance of about six inches. The riders need not be pruned near so much as the dwarfs, as we are wishful to have them produce a full crop of fruit next season; shortening no shoots that are fully ripened, except a few of those at the extremities of the tree, in order to make them throw out others for its full extension upwards next year."

Stirring the Soil. The borders are to be pointed and forked up after pruning, and a little well-rotted dung or compost added where deemed necessary. That part of the borders on the outside may, in addition, be covered with dung; and after forcing is commenced, those in the inside may be occasionally watered with the drainings of the dunghill." *Kal.* 324 & 438.

1235. "*Time of beginning to force.* From the rise of the sap," according to Abercrombie," it occupies, in some sorts, about four months to make mature fruit; in the later varieties, five months; and when much of winter is included in the course of forcing, the time is proportionally lengthened. To ripen moderately early kinds by the end of May, begin to force on the 21st of December. Little is gained by commencing sooner. But you may put on the glasses a week before, and make gentle fires, admitting a constant stream of fresh air, to get the house ready."

M'Phail says, "Those who wish to have peaches and nectarines ripe in May, should begin to force them about the beginning or middle of December." For a general crop, Nicol, Weeks, and most gardeners, recommend forcing to begin the month of February. Nicol offers "a word to the novice in forcing: be diffident, and drive too slow rather than too fast. Most new beginners in this business make haste to outdo, or to eclipse their neighbours; and so drive on at a pace they cannot long keep up, but founder their steed, and stop short by the way."

Temperature. Abercrombie directs to "begin at 42° min. 45° max. from sun-heat; and rise in a fortnight to 45° min. 50° max. from sun-heat, giving plenty of air; in the progress of the second fortnight, augment the temperature from three to eight degrees, so as to have it at the close up to 53° min. 56° max. from sun-heat, admitting air in some degree daily. When the trees are in blossom, let the minimum heat be 55° min. 60° max. Continue to aim at this till the fruit is set and swelling. When the fruit is set, raise the minimum to 60°, the artificial maximum to 65°, in order to give fresh air: when the sun shines, do not let the maximum, from collected heat, pass 70°, rather employing the opportunity to admit a free circulation of air."

M'Phail, beginning in February, keeps the thermometer to about 55°, increasing it as the days lengthen; when set and swelling, raise it to 60° with fire-heat; when the sun shines, let it rise to 65° or 70° with air. A short time before the fruit begins to ripen, from 55° to 70° is not too much, with fire-heat, and in sun-shine days a little above 75°.

In a house begun to force on the 1st of February, Nicol begins with 45° for the first fortnight, and then increases the heat to 50° or 52°. The times of regulation are supposed to be at six or seven in the morning, and eight or nine at night. At the end of a month the temperature is to be kept as steadily as possible to 55°. In two months, keep it to about 65°, seldom allowing it to pass 70°, which, if it does, it will have the effect of drawing the shoots up weak, and may cause the setting fruit to drop. He recommends 60° by fire-heat, mornings and evenings, as proper after the fruit are fairly stoned.

T. A. Knight finds that neither peaches nor nectarines acquire perfection either in richness or flavor, unless they be exposed to the full influence of the air and sun during their last swelling, without the intervention of the glass. In consequence, he says, some gardeners take off the lights wholly before the fruit begins to ripen; but he recommends taking them off only in bright sunshine, and putting them on during rain, and at night to protect the fruit from dews, &c.

1236. *Air.* A constant stream of fresh air is to be admitted before beginning to force, and plenty of air during sunshine during the whole progress of forcing. M'Phail says, when the fruit is set and swelling, "give the house air every day, whether the sun shine or not." Give plenty of air, and keep the house dry, when the fruit begins to ripen.

When the intention is to begin to force on the 1st of February, Nicol shuts up the house from the middle of January, admitting plenty of free air through the day. During the first month of forcing, he admits air freely "every day, even in frosty weather, by the sashes, till the flowers begin to expand; after which time by the ventilators, except in fresh weather, till the season become mild. Air should be admitted all this month, to such an extent as to keep down the temperature, in sunshine, to within five degrees of the fire-heat medium; and this in order to strengthen the buds as they break, and that the young shoots may spring in a vigorous manner." Admit large portions of air every day when the fruit is swelling off, except in damp weather, from seven or eight in the morning to five or six in the evening; opening the sashes to their fullest extent from ten till two or three o'clock, giving and reducing gradually, &c.

Watering and Steaming. "While the fruit is in blossom," Abercrombie observes, "steaming the flues must be substituted for watering over the herb; at the same time, you may water the roots now and then gently, avoiding such a copious supply as might risk the dropping of the fruit to be set. Let the water be warmed to the air of the house."

M'Phail directs to keep the border moist by watering; and after the fruit are as big as nuts, sprinkle the flues now and then with water to raise steam, and wash the trees about once a week with clean water, not too cold. It is better not to wash all over the top till the fruit are set. A sunshine morning is to be preferred, and the water may be about 65°. Do not water after the fruit begins to ripen, but recommence when it is all gathered. *Gard. Rem.* 148. 191.

Newly-planted peach-trees should be "freely supplied with water at the root throughout the season, in order to promote their growth; and the engine must be applied with force to the branches, for the suppression of the red spider, and refreshing the foliage, generally once in two or three days." *Kal.* 358.

In a fruit-bearing house, after the fruit is set, "water should be given pretty freely to the plants at root, once in two or three days; increasing the quantity as the fruit begin to swell, and as the shoots advance in growth. Also, continue the operations of the engine regularly; and do not be sparing, or be afraid to hurt the foliage, if the red spider appear on it. Hit hardest at, or near to the top of the house; as it is there he preys most, being fostered by the extreme heat, in which he delights. In looking out for this enemy, therefore, keep your eye particularly on this part." Withhold water from the border, and cease to exercise the engine on the foliage when the fruit are swelling off." *Kal.* 401.

1237. *Insects and Diseases.* The red spider is the grand enemy to peach-trees; but they are also attacked by blight, mildew, the aphis, thrips, and sometimes even the coccus.

The blight, Abercrombie says, "is caused by small insects, very pernicious both to the trees and fruit in their growth; this is apparent by the leaves curling up, and often by the end of the shoots being bunched and clammy, which retards their shooting. In this case, it is advisable to pick off the infected leaves, and cut away the distempered part of the shoots. Further to check the mischief, if the weather be hot and dry, give the trees a smart watering all over the branches. A garden-engine will perform the watering much more effectually than a common watering-pot, as it discharges the water in a full stream against the trees. Apply it two or three times a week; the best time of the day is the afternoon, when the power of the sun is declining. These waterings will clear the leaves, branches, and fruit, from any contracted foulness; refresh and revive the whole considerably; and conduce greatly to exterminate the vermin."

When the plants have begun to expand their blossoms and leaves, the aphis or green insect often makes its appearance; in which case M'Phail directs to fill the house full of tobacco-smoke once a week, or oftener. If there be any appearance of mildew, dust a little sulphur on the infected parts; and if the gum or canker be seen on the shoots or any part of the trees, open the bark, and cut out the dying wood. Inspect the trees in every part minutely, and if you perceive the bark dying, or the gum oozing out of any part of them, cut off the bark as far as it is dead or decaying; and if the branches be strong, that you cannot well effect it with your knife, take a chisel with a semicircular edge, and a mallet, and cut out the wood as far as you see it is affected; you need not be afraid of hurting the tree, even if the branches or main stem are cut half away. I have cut sometimes more than half of the stems of standard trees away from the ground farther up than where the branches began to separate, which was the means of saving them alive. This method exposes the old wood to the sun and air, by which it is dried, and the tree is thereby assisted in casting off the unwholesome juices, or those kept in it too long for want of a more dry, genial climate." *Gard. Rem.* 131.

J. Mitchel, of Montcrieff-house, Perthshire, hangs on his peach-trees, when the fruit are ripe, "large white glass phials, with a little jam or jelly in them, in order to entice *large black flies*, which he finds very destructive to peaches. Wasps he destroys by finding out their nests in the day, marking them with a stick; and going in the evening with a lantern and candle, he introduces a burning stick smeared with wet gunpowder, which stupifies the wasps. He then pours water over them, and with a spade works up the nest, earth, and water, into a sort of mortar. Nests on trees or hedges he stupifies by the wet gunpowder, which causes the wasps to fall nearly dead, when he crushes them, &c." *Caled. Hort. Trans.* vol. i. 194.

Nicol strongly recommends watering for keeping down insects, especially the red spider. If the green fly or thrips make their appearance, recourse must be had to fumigation. Shut the house close up at night, and fill it so full of tobacco-smoke that one person cannot see another. If this should be repeated the next evening, they will be completely destroyed. Calm weather is most favorable for this operation. *Kal.* 340. 358.

"The coccus and chermes," he says, "are not so immediately hurtful, and unless very numerous, need not be much minded at this season; but they must be more particularly attended to at the time of pruning in November. The males, which have wings, and are active, will be dislodged by the operations of the engine; and the females, which are stationary, and adhere to the shoots and branches, if very numerous, may readily be crushed by the finger, or by a small flattish stick, that can easily be insinuated into the angles of the branches, where they often lodge."

In November, the winter pruning being finished, the plants and trellis are to be anointed with the composition recommended for vines. (1229.)

1238. *Gathering the Fruit.* M'Phail advises laying moss or some soft material over the borders, to save those which drop off of themselves. Nicol recommends the peach-gatherer (*fig. 66.*). Sir Joseph Banks, quoting from a French author, states, that "Peaches are never eaten in perfection, if suffered to ripen on the tree; they should be gathered just before they are quite soft, and kept at least twenty-four hours in the fruit-chamber." *Hort. Trans.* vol. i. App.

John Williams, esq. of Pilmaston, says, "Should the season prove wet when the peaches are ripe, they should be gathered, and placed for about two days in a dry, airy room before they are eaten." *Hort. Trans.* vol. ii. p. 113.

Ripening the Wood. Abercrombie says, "On account of the fruit of most sorts of peaches ripening somewhat earlier than grapes, and the growth of the shoots stopping sooner than the summer-wood of vines, it is not so often necessary to assist the plant, in September or October, by artificial heat; but in some of the late kinds, if, by the time the external air is down to 60°, the shoots have not taken a greenish-brown tint as high as several eyes from the origin, and if the blossom-buds on these, round when full swelled, are not distinguishable from the oblong wood-buds, apply a little fire-heat, and continue it till the leaves fall."

Nicol directs attention to be had to the ripening of the wood of peach-trees in September. A little fire-heat may be necessary fully to mature the shoots, especially of young trees. "Fire-heat should be continued till the growth of the smaller and middle-sized shoots stop, their bottom parts become greenish-brown, and the buds upon them, that is, the flower-buds, appear turgid, and be distinguishable from the wood-buds. The stronger and more extreme shoots of the dwarfs in particular will continue to grow later than the above shoots; which, as they are to be considerably shortened back in November, for the production of wood to fill the trellis next season, is not very material, provided the bottom part be pretty well hardened."

Resting the Wood. The management of the peach-house, when at rest, Abercrombie says, "Should be nearly the same as for the grape-house, except when there is but one set of frames to serve both an early peach-house and late grape-house; in which case, as soon as the young wood of the vines is perfectly ripened, the glasses should be brought back to the peach-house; for although the fruit of the grape is to be set and ripened in a higher heat, the peach-tree, as a plant, is more tender than the vine; and independently of forcing, comes into blossom about two months sooner."

M'Phail keeps on the glasses from the time the fruit is gathered till he begins to force, in order to keep the wood dry; but gives them all the air he can. *Gard. Rem.* 367.

Nicol exposes the house fully day and night, only shutting up in the time of heavy rains. *Kal.* 420.

1239. *Forcing the Peach-tree in Pots.* "All the varieties of the peach and nectarine," Abercrombie observes, "are extremely well suited for forcing in large pots or tubs. Small plants, intended to come in before or after those in the borders, may be excited, in the first stage, in a distinct house; so as the temperature of that in which they are brought to finish fruiting be suited to their progress. The compost for plants in cradles ought to be lighter and richer than the mould in the borders."

The pots or tubs should be such as not to contain less than a cubic foot of earth; the soil should be lighter and richer than that recommended for the borders, and liquid manure should be plentifully supplied, to make up, in some degree, for the confinement of the roots. They are best forced in a peach-house, but succeed in a vinery or succession-stove; best of all, however, in a pit or Dutch frame (*fig.* 305.) where the temperature can be regulated at pleasure, and where they are near the glass. Great care must be taken to supply them regularly with water, for which purpose some place saucers under the pots; others cover their surface with moss, or, what is better, fresh cow or rotten horse dung. Casing the pots with ropes made of moss, is also a very good method, as it not only preserves a uniform degree of moisture, but also of temperature. Of course the moss must be kept watered. Peach-trees, in pots, are sometimes trained to small fan trellises attached to the pot; but in general they are pruned as dwarf-standards, in which form they bear fully better than when trained. When the fruit is nearly ripe, the pots ought to be removed from the hot-house or vinery to a cooler and more airy situation; or, if in pits, the sashes may be taken off a part of every fine day. In other respects, the treatment of peach-trees in pots is similar to that of trees in borders. With respect to the quality of fruit from peach-trees in pots, J. Williams observes, "By far the best-flavored peaches I have ever tasted, were from trees planted in large pots, and kept in a vinery from February till the first week in June; when the trees were removed into the open air, and after being shaded a little from the sun for the first ten days, were placed in the most open part of the garden till the fruit became ripe. Treated in this way, the peach becomes beautifully colored on the outside, and of a most exquisite flavor."

Occasionally, in very warm seasons, peach-trees in pots, when forced very early in the season, and afterwards plunged in the open air, will produce a second crop late in autumn; but this is more matter of curiosity than of utility. It frequently happens with forced cherries and strawberries. *Hort. Trans.* iii. 367.

Peach-Trees as Standards. The peach bears remarkably well in the standard form, planted in the middle of a house; and the flavor of the fruit is universally acknowledged to be preferable to that grown on the trellis, from the comparatively free circulation of air. The glass tent, or moveable house, (*fig.* 134.), might be most advantageously applied in this way; and when the fruit began to ripen, the sashes could be removed, and applied to ripening a late crop of grapes against a common wall, or to cover pits or houses which had not been forced.

SECT. IV. *Of the Culture of the Cherry-House.*

1240. Though the cherry be a native of Britain, no fruit is more difficult to force. M'Phail observes, "No tree forced for obtaining fruit early is more liable to fail of a good crop than the cherry; the blossoms are apt to fall off before the fruit is set, and the fruit will keep falling off before and after they are as large as peas. This is occasioned by a kind of stagnation of air about them, which affects the tender blossoms and young fruit."

Soil. M'Phail says, "Take light, sandy, rich, mellow earth, and make a border of it the whole width of the house, and four feet deep.

According to Nicol, "The border should be from twenty-four to thirty inches deep; the bottom, if not naturally mild and dry, to be drained and paved. The soil should be a sandy loam, or light, hale garden earth, made moderately rich with stable-yard dung well reduced, or with other light compost. If a small portion of lime, or a moderate quantity of marl, were mixed with it, so much the better. The soil for cherries to be forced in pots or tubs, should be considerably richer than the above." Torbron uses fresh virgin-soil and rotten-dung. *Hort. Trans.* iv. 116.

Choice of Sorts. M'Phail, Nicol, and all gardeners, agree in giving the preference to the May-duke. Nicol says, "None of the other kinds set so well, except the Morella, which I do not hesitate to say well deserves a place: it is a good bearer, and the fruit, when forced, acquires a superior size and flavor. *Kal.* 295.

Choice of Plants. M'Phail takes standards of different heights in a bearing state; Nicol, clean, healthy, young plants, that have been one or two years in training against a wall. Torbron trees eight or ten year's from the bud, and selected of such various heights as best suited the size of the house.

Choice of Situation. M'Phail and Torbron plant in rows, beginning with the tallest in the back side, reserving the shortest for the front, letting them slope to the south gradually, somewhat in the form in which plants are set in the green-house. *G. Rem.* 146, & *Hort. Trans.* iv. 116.

Nicol has a trellis against the back-wall for wall-trained trees, and a border in front, in which he plants dwarf-standards. The dwarfs against the back trellis, he plants eight or ten feet apart. Riders that have been three or four years trained, and are well furnished with fruit-spurs, may be planted between the dwarfs. They may probably yield a few fruit the first season; and will hardly fail to produce plentifully in that following. "In the border may be planted, as dwarf-standards, to be kept under five feet in height, some well-furnished plants that have been kept in large pots or tubs for a year or two; such being more fruitful, and less apt to grow to wood than plants that have grown in the open ground. In planting these, the ball of earth should not be very much reduced; only a few of the under roots should be spread out; for if the ball were reduced, and the whole roots spread out, as in the ordinary way of planting, when it is wished that a plant may push freely, the intention here would be thwarted; which is, to have the plant dwarf and fruitful, growing little to wood. Along with these may be planted in the same way, an apricot or two, or figs, or both, that have been dwarfed in pots or tubs, as above. If they succeed, it would give a pleasant variety; of which there need be little doubt, as the temperature, soil, and general treatment for cherries will suit apricots, and not far disagree with figs. These little standards may be allowed a space of about four feet square each, which is sufficient, as they must not be suffered to rise high, or spread far, on account of shading the trees on the trellis. In planting of the principal dwarfs and riders, let the work be carefully performed. They should be raised with as good roots, and be kept as short time out of the ground as possible; placing them just as deep as they have been before; spreading out their roots and fibres, and filling in with fine earth. The whole should have a moderate quantity of water, and have air freely admitted every day; defending them, however, from snow or much rain. The house should not be forced the first year; and it will be better to defer heading in the plants till the middle or end of March, than to prune them now. I shall, therefore, take no further notice of them till then, supposing they are to be attended to with respect to air, and moderate waterings. It is necessary, however, to remark, that the plants should be carefully anointed with the liquor, either just now, or some time in the course of the month."

Time of Planting. According to Nicol and M'Phail, January and February; to Torbron, early in the autumn.

1241. *Pruning.* Trees planted in January may be pruned about the middle or end of March. The dwarfs, planted against the trellis, should be well cut in; that is, each shoot of last year should be shortened back to three or four buds, that the plants may throw out a sufficiency of young shoots to fill the rail from the bottom. The dwarfs, planted in the border as little standards, need not be headed in so much; as the intention is to have them fruitful, and that they may grow little to wood from the beginning. Their short, stubby shoots need not be touched, unless bruised or hurt in transplanting; shortening back the longer and weaker ones only, a few inches, according to their strengths. The riders, planted against the back-trellis, may be treated very much in the same manner; the sole intention being to obtain a few crops of them while the dwarfs are making wood and filling their spaces."

In November following, the trees may be pruned for the succeeding season. In order to produce wood to fill the trellis as soon as possible, the dwarfs should be pretty much headed in. The shoots "may be pruned very much in the manner of the trees in the early house, shortening no shoots that are fully ripened, except a few of those at the extremities of the tree, in order to make them throw out others for its full extension upwards next year.

November is also the proper time for pruning an established cherry-house, preparatory to forcing for next year. As cherry-trees which have been forced make very little wood, very little pruning is required; "probably nothing further than moderately to thin out the spurs, and to prune off any accidental breast-wood or water-shoots that may have risen since the crop was gathered." "The leading shoots, except for the purpose of producing wood to fill up any blank or vacancy, need not be shortened; nor need those in the lower parts of the tree, except for the same reason. But if it be necessary to shorten these, let them be cut pretty well in, as otherwise they will push very weakly. Shoots on the extreme parts of the tree, that should be shortened for the above purpose, need not, however, be cut so closely in. If they be headed back one-third, or to half their lengths, it will generally be found sufficient."

Summer Pruning. Very little of this is requisite, such water-shoots or breast-wood as arise among the spurs, are to be pinched off as they appear; laying in such shoots only of this description as may be wanted to fill an occasional vacancy. Train in the summer shoots of the dwarfs as they advance, at the distance of about eight or nine inches from each other; and otherwise observe the general rules for pruning cherries on walls and espaliers.

Stirring the Soil. After pruning, the borders are to be forked up, and a little well-rotted dung, mixed with sand, worked in, if thought necessary. In summer, they may be slightly stirred on the surface, and weeded to keep them fresh, clean, and neat, and where a part of the border is outside the house, cover with horse-dung or litter in the early part of the season.

1242. *The Time of beginning to Force* is sometimes December, but more generally January or February.

"Newly-planted trees," Nicol observes, "will bear gentle forcing next spring, from the first or middle of March; which ought to be considered merely as preparatory to forcing them fully, from about the first of February, the third year."

Torbron, if the trees have been removed with good balls, admits of gentle forcing the first spring, but prefers deferring it till the third year. He says, "I have had an abundant crop of fine cherries, from trees which had been planted only a few months before forcing, but would not recommend the risking a whole crop, unless the trees have been longer established." Where cherries are to be ripened early in the season, he "shuts in about the beginning of December, and lights the fires about the third or last week of that month." *Hort. Trans.* iv. 116.

Temperature. Abercrombie begins at 40°, "and throughout the first week, lets the minimum be 40°, and the maximum 42°, giving plenty of air. By gradual advances in the second, third, and fourth week, raise the course to 42° min. 45° max. In strong sunshine, admit air freely, rather than have the temperature above 52°, by collecting the warm air. In the fifth and sixth week, the artificial minimum may be gradually elevated to 45°, but the maximum should be restrained to 48° from fire-heat, and to 55° from sun-heat, until the plants are in flower. After the blossoms are shown, and until the fruit is set, aim to have the heat from the flues at 48° min. 52° max. At this stage, maintain as free an interchange of air as the weather will permit; and when the sun-heat is strong, do not let the temperature within exceed 60°. As the fruit is to be swelled and ripened, the requisite heat is 60° min. 65° max."

In January, M'Phail does not let the cherry-house rise higher than 50°. In February, "If the thermometer in a morning is as low as 35°, there is no danger; but it should rise in the course of the day, to imitate nature as near as possible. In the month of March, the thermometer in the open air in the shade seldom rises above 55°. In the month of April, it seldom rises above 65°. But it is observed, that when the sun shines on a cherry-tree or other trees in the open air, the heat on them is higher than in the shade. The cherry-tree is of such a delicate nature to force, that it is impossible for any person to write down the exact temperature of the air, which would insure a crop of fruit from it in the forcing way."

Nicol does not force the newly planted cherry-house the first season. The established house be begins in January, making fires so moderate for the first ten or twelve days, as that the thermometer shall not rise by the force of fire-heat to more than 40°; afterwards increase the fire-heat gradually, and so as to raise it to 45°; at which keep as nearly as possible for the remainder of the month. In sunshine, in good weather, the thermometer may be allowed to rise to 50° or 55°, but not more. In February, continue to regulate the temperature of the house, so as that the thermometer may not rise, by the force of fire-heat, to more than 50°; and by the free admission of air in sunshine, keep it down to 60° or 55°. In March the fruit will be setting, and the temperature of the house must therefore be kept as steadily as possible to about 50°, lest the fruit drop; this being the most critical period of the forcing with all stone-fruit. In April the fruit will be beginning to color and swell off for ripening, when the temperature may be raised four or five degrees.

Torbron says, "For the first three, four, or five weeks of lighting fires, if the weather be so severe as to depress the thermometer in the open air from twenty-two to twelve degrees; then let the thermometer inside the house be kept from thirty-five to forty degrees, or just sufficient to exclude the frost. If the weather be not severe during the above period, the thermometer may be kept to forty-five degrees inside the house. As the season advances and becomes more mild, and the days longer, probably about the first or middle of February, the thermometer may be raised to fifty degrees, and then it is expedient to give gentle sprinklings by an engine or syringe, two or three times a week, in the evening. Whilst the trees are in bloom, no sprinkling must be used; but the flues, when only moderately hot, are to be steamed morning and evening, and every day and hour of sunshine, and calm and mild weather, fresh air must be copiously admitted. When the petals begin to drop, and when the fruit is set, the temperature may be raised to fifty-five degrees, the house being engined three or four times a week in the evening; but never till the bloom is all down. When the cherries are completely stoned, the thermometer may be raised to sixty degrees by fire-heat, sprinkling every evening by engine, till the fruit is nearly ripe; the house may be kept higher by day, as well as by night, after stoning." *Hort. Trans.* iv. 119.

1243. *Watering.* M'Phail waters occasionally at root and over the top, till the trees are in blossom; but when the stones in the fruit are become hard, the trees may be washed all over occasionally with clean water, not too cold. "Let this be done in a fine sunny morning, and take care not to spatter the fruit with any kind of dirt. In April, when the cherries are grown large, give the border a good watering now and then, which will enable the trees to swell their fruit to a good size: by keeping them in a healthy growing state, the fruit will be fine-flavored, and the trees will make strong flower-buds for the ensuing season. If the fruit are not ripening, wash the trees occasionally, in a fine sunshine morning, with sweet clean water."

Nicol, after he begins to force in January, "gives moderate supplies of water at the root; and once in two days, let them be well scourged with the engine; first right and then left. This is done to refresh the branches and infant foliage; but chiefly, at this time, for the suppression and prevention of insects that are as troublesome here as in any other forcing-house, and are easier kept down than brought down." In February, "the plants must have regular and moderate supplies of water at the root till the fruit be set, and then more freely, as the season, and as their growth advances. The engine may be exercised upon their branches, in a moderate manner, once in two days; generally in the afternoon about sun-set; using always well-aired soft water. But from the time the flowers begin to open, until the petals begin to drop again, desist from using the engine. At this interval, the foliage must be refreshed by steam, which may be produced plentifully every evening, by pouring water on the flues when the fire is at the strongest. A very fine dew might be thrown on the plants by a soft syringe; but as soon as the fruit are set, the engine is the instrument we should trust to for the suppression of insects." In March, the fruit will be setting, and till this is completed, "the border should be kept rather in a drier state than heretofore; as if it be kept too moist, it may occasion their dropping; but afterwards, let it be regularly and freely watered, in order to promote the growth of the plants, and the swelling of the fruit. Now again resume the use of the engine; and exercise it with force upon the branches, every second day, for the suppression of the red spider, and to keep the plants clean. In April, "when the fruit begins to color and swell off, withhold water from the border by degrees, and towards their being ripe, entirely. At this time also, watering with the engine must be withheld; but previously exercise it with force, and often, for a week or two, so as completely to subdue the red spider, if he have gained any ground lately. After the crop is gathered, these waterings must be resumed, and should be continued till the foliage begin to drop; not, however, so much on account of the cherry-trees, as on account of other plants that may be placed in the house; for if the enemy be allowed a footing on the former, he will soon show himself on the latter, where perhaps he may be less vulnerable, especially if the plants be of a tender kind. The border may be kept in a moderately moist state till the leaves fall, or till the house be exposed, or be uncovered."

According to Torbron, "From the time the flower begins to open, till the fruit is completely stoned, the soil should be but sparingly watered; but when the stoning is effected, water may be applied to the roots freely, till the fruit is nearly ripe." *Hort. Trans.* iv. 119.

1244. *Air.* "In forcing the cherry, it is essential to continue a free renovation of air; always sustaining the minimum heat in the different stages. The blossoms will sometimes fall abortive, or the young fruit drop off after setting, from no other cause than a stagnant atmosphere."

At first beginning to force, M'Phail gives plenty of air night and day. In February, when the trees are in blossom, "let air be at the house day and night; and as much as you can when the fruit are swelling off."

Nicol says, the airing of the cherry-house may be performed by the sashes, with every safety, till the buds begin to expand; and after that, in frosty or bad weather, air may be admitted by the ventilators. In February, nothing is more conducive to the health of the plants, and the setting of the fruit, than a regular and free circulation of air; and if this be denied them for many days together, the effect will soon be visible. The foliage will become languid, and the flowers will drop away. Therefore a day should not pass in which less or more air is not admitted.

"As the fruit ripen, give as large and regular portions of air as possible; opening the sashes by eight or nine in the morning; giving full air about ten; reducing about two or three; and shutting up about four or five, sooner or later, according to the state of the atmosphere. In conducting this matter, however, regard must be had to the temperature; but air may be admitted, in sunshine, to such an extent as to keep down the mercury or spirits in the thermometer to 65°, and at other times to 60°." *Kalendar*, p. 339.

Torbron says, "The cherry, in forcing, requiring more fresh air than most other fruits, particular attention must be paid to its admission, by the gardener having it in his power occasionally to make as many inlets or openings as convenient. It will be conducive to this end, that the roof, and the upright or front sashes, if any, be moveable, and all with little difficulty; because, in changeable weather, the current of air may be required to be augmented or reduced many times in one day. Air must be admitted freely and copiously when the weather is mild and calm, and accompanied with sunshine, during the time the cherries are in bloom, and also near the time of their ripening." *Hort. Trans.* iv. 119.

1245. *Insects, Diseases, and Depredators.* "The cherry is liable to be infested by a small grub-worm, which rolls itself up in the leaves, and extends its ravages to the fruit. As soon as this insect is perceived, the trees should be searched daily, that it may be destroyed by the hand, and prevented from spreading. It usually shows itself first about the time of flowering." *Pract. Gard.* p. 661.

"Cherries set, or in blossom, require great attention. Like rose-buds, they are liable to be destroyed by a small grub worm, which rolls the leaves round itself, occasionally, for a covering: it preys on the leaves as well as the fruit. The trees should be searched once or twice a-day, to destroy them with the hand as soon as they can be observed. Whenever a leaf appears to begin to curl, be sure there is an insect in it, or the embryo of one. The cherry-house, as the season advances, may be smoked once a-week or ten days, which will prevent the trees from being infested with a blackish kind of insect, frequently very pernicious." *Gard. Remem.* 191.

When the fruit are ripe, it is likely the birds will fly in and eat them, if you do not contrive nets, or some other method, to keep them out. If the meshes of the nets which you employ are narrow, the wasps and flies, as well as the birds, will be prevented from getting in; for, as these insects generally fly in, they therefore require room for their wings extended, otherwise they are repulsed in their attempt. *Gard. Remem.* p. 246.

Nicol, after every winter-pruning, washes the trees over with the mixture of soap, sulphur, &c. already mentioned (1229.); and in spring and summer waters over the leaves, picks off grubs, and fumigates, like M'Phail.

Torbron fumigates for the *black fly*, and picks off the *grub*.

Gathering and keeping the Fruit. If it be found necessary, cherries will keep for some time on the trees, provided the birds can be kept from them. Keep the house, for this purpose, dry, cool, and well aired. *Gard. Remem.* 246.

Exposing the Wood. This, according to all the authors quoted, may be done from the time the fruit is gathered, till within a week or ten days of the re-commencement of forcing. The glass should be entirely taken off, unless the cherry-house is in part used for some other purpose, to which this practice would be injurious.

1246. *Forcing Cherry-Trees in Pots.* M'Phail and Nicol concur in approving the very general practice of planting cherry-trees in pots; in which, or in tubs of a foot or fifteen inches diameter, they may be successfully forced. "Three or four dozen good plants, well managed in this way, would give a deal of fruit; which might be had in succession for a considerable length of time, by dividing the plants into three or four classes or divisions, and shifting them from one compartment to another. In January, the first twelve trees may be placed (from the open air of course) in the green-house or conservatory, if there be one, or in a peach-house now at work; placing them in the coolest part of the house, but in the full light, and where they may have plenty of air. They must be duly attended to with water at the root, and be frequently syringed at top, generally once in two days. The pots being occasionally watered with the drainings of the dunghill, would add much to the vigor of the plants: there is no method of manuring more effectual, or so easily accomplished. The plants may remain here till the fruit be fairly set, the stoning over, and all danger of dropping be passed. They may then be placed in a vinery or stove to ripen off, where they would come in early, and be very high-flavored, if placed near the light, and so as that they might have free air daily. In February, a second and third dozen should be taken in, and a fourth in the beginning of March, and each similarly heated." *Kalend.* — "It is very common with early-forced cherry-trees to bear a second crop late in the same season." *Hort. Trans.* iii. 367.

Forcing by a temporary Structure. Torbron observes, that "Where a portion of wall (especially with a southern aspect), already well furnished with May-dukes, perfectly established, and in a bearing state, can be spared for forcing, a temporary glass-case may be put up against it; the flue may be built on the surface of the border, without digging, or sinking for a foundation; neither will any upright glass or front wall be requisite; the wooden plate on which the lower end of the rafters are to rest may be supported by piles, sunk or driven into the soil of the border, one pile under every, or every alternate rafter. The space between the plate and the surface of the soil should be filled by boards nailed against the piles, to exclude the external air, for the plate must be elevated above the level of the surface from eighteen to thirty inches, or whatever height may be sufficient to let the sashes slip down, in order to admit fresh air. I believe this to be an uncommon structure, and it may perhaps be objected to; but I am confident that it will suit well for cherries, for I have constructed such places even for forcing peaches with good success, as well as for maturing and preserving a late crop of grapes." *Hort. Trans.* iv. 117.

Sect. V. *Of the Culture of the Fig-House.*

1247. A house is seldom built expressly to force the fig, partly from there being no great demand for that fruit in most families, and partly because figs are generally forced in pots or tubs placed in the peach or cherry house, and managed as these trees. The fig-tree, when forced, is very apt to cast its fruit before it is half swelled.

"A separate hot-house," Neill observes, "is but seldom erected for the cultivation or the forcing of the fig; a few dwarf-trees, such as the brown Italian, and purple Italian, introduced into the peach or cherry house, being by most people thought sufficient. It has been found by experience, that dwarf-standard fig-trees, planted in the middle of a vinery, between the flues, and thus under the shade of the vines, bear fruit plentifully, ripening both the spring and autumn crops. This may be seen in the vinery erected by J. Hay, at Preston Hall, near Edinburgh." *Ed. En.* art. *Hort.*

J. Sabine recommends training fig-trees on the back walls of vineries, where he has seen them answer well, the vines being trained immediately under the roof. He says, "It is advisable not to train the vines entirely under the whole of the glass, but to leave a space in the centre of each light, its whole length, for the admission of the sun's rays;" judiciously adding, "the grapes will be perhaps as much benefited by this practice as the figs." *Hort. Trans.* iii. 410.

The *soil* for fig borders, or plants in pots, is in all respects the same as that for the cherry.

Choice of Sorts. Abercrombie recommends the

- White Genoa
- Chestnut
- Black Ischia
- Brown Ischia
- Black Genoa
- Malta.

To which Nicol adds the brown Italian, and black or purple Italian.

Choice of Plants. Such as are two or three years trained, either as wall or dwarf-standards, are to be preferred.

The Situation of the Plants is generally against a back-wall trellis.

1248. *Pruning.* Figs are to have a spring and summer pruning; both of which, Nicol observes, may be comprised in one, by rubbing or pinching off the infant shoots, thought necessary to be displaced, in order to give the tree air, and strengthen such as remain. The summer pruning, or rather thinning, consists chiefly in keeping them moderately thin of leaves, so as not to overshadow the fruit.

J. Sabine's trees are pruned in the autumn, after their wood is well hardened; but as "the object is to get the trees to the largest possible size, in which state they will produce more of the short fruit-bearing shoots, they are cut but little, except it be occasionally necessary to thin them, by taking out a strong limb." *Hort. Trans.* iii. 410.

Fig-trees, intended to bear fruit abundantly, should never be allowed to produce suckers, or any shoots from the main-stem, within eighteen inches of the ground; fan-training is in general the best method, and the points of the young shoots may be turned downwards, where it can be done without producing fracture, or inducing them to throw out shoots by the strain requisite for this purpose.

Stirring the Soil, &c. After the gathering of the fruit, the borders are to be forked up and manured, if necessary, as in the cherry-house, and in summer weeded and refreshed.

The Time of beginning to Force is generally the same as that for the cherry or peach house: December, January, or February. J. Sabine, in the case above referred to, where the trees are planted against the back-wall, says, "the time of beginning to force is in the middle of April; the first crop of figs ripens in June, and the second crop in August." *Hort. Trans.* iii. 410.

Temperature. "From the leafing time," Abercrombie observes, "till the ripening of the fruit, the fig requires a temperature between that scale which is proper for the peach, and that for the cherry." M'Phail says, "They require a greater degree of heat than the cherry." When bringing forward their fruit, they will bear a good strong heat, if care be taken to keep a free circulation of air moving out and into the house. G. Rem. 147.

Water. Fig-trees in a house, and especially those in pots, require abundance of water in the stages suitable for watering fruit-trees. *Abercrombie.*

M'Phail says, "The border in which fig-trees grow, should be kept sufficiently watered, till May, when watering over the leaves may be commenced."

Air. When figs are planted under glass, Miller observes, "The heat should not be too great, nor the glasses or other covering kept too close, but at all times, when the weather is favorable, a good share of free air should be admitted. In this respect the fig does not greatly differ from the vine, though it will thrive with less air than any other fruit-tree." *Dict. in loco.* In summer, as the fruit advances, water even in that part of the border which is without the house. Refrain from watering over the leaves and fruit, when the latter begin to ripen. *G. Rem.* 192.

1249. *Insects.* Very much pains, Nicol observes, should be taken to suppress the red spider on the foliage of figs; whether by the engine, syringe, or by frequently brushing with a painter's sash-tool, the under sides of the leaves, "in order to destroy his webs, which are there thickly wove." Few other insects annoy the fig, except sometimes the coccus or scaly insect; which is destroyed by washing with soap-suds and sulphur; or the liquor recommended for destroying that insect on pines. *Kalendar,* 319.

Gathering the Fruit. Figs begun to be forced in January, Nicol states, will be ripe about the end of June and July. "If fig-trees in a forcing-house," Miller observes, "are properly managed, the first crop of fruit will be greater than upon those which are exposed to the open air, and will ripen six weeks or two months earlier, and a plentiful second crop may also be obtained, which will ripen early in September." To preserve the bloom, gather with the peach-gatherer. They may be preserved a short time on the trees, by covering with mats from the sun, and admitting abundance of air among the branches. This alludes to what is called the second crop, or that produce from the wood of the current year. Sometimes a few of the first crop ripen, but in general it is not to be relied on. W. T. Aiton, Sir Joseph Banks informs us, (*Hort. Trans.* i. 253.) "has for several years practised the forcing of figs in the royal gardens of Kew, with great success, and his chief dependence is on the second crop."

Exposure of the Wood. After the fruit is gathered, the glasses may be removed, till winter sets in, when they must either be put on, or the trees covered with mats or straw, to protect them from the frosts.

Forcing the Fig in Pots. M'Phail says, figs may be ripened at an early season, by planting them in pots, and setting them into a hot-house or forcing-house. "The plants should be low and bushy, so that they may stand on the curb of the tan-bed, or they may be plunged in a gentle tan-heat, or in a bed of leaves of trees. The best way to propagate plants for this purpose is to take layers or slips which have good roots: plant them in pots in good earth, one plant in each pot, and plunge them in a bed of tan or of leaves of trees, in which is a very gentle heat: a brick bed will answer the purpose very well; or they will do in the forcing-house, if there be room for them. Let them be put into the house in the latter end of February or beginning of March, and keep them sufficiently watered. When they are two years old, they will be able to bear fruit; the pots in that time having become full of roots. In the month of November or December, turn the plants out of the pots, and with a sharp knife pare off the outside of the ball, by which the plant will be divested of its roots matted against the inside of the pot: then place them into larger pots, filling up the vacancy round the balls with strong loamy earth. During the winter, let them be kept in the greenhouse, or in a glazed pit of a like temperature, till the month of February; then set them into the forcing-house, where it is intended they shall ripen their fruit. In this manner let them be treated every year, which will be a means of preventing the fruit from falling off before it come to maturity." *G. Rem.*

Nicol says, fig-trees kept in pots or tubs, may be treated very much as directed for cherries. Two dozen, or thirty plants, would be a good stock for that purpose. The first division might be placed in a cherry or peach house about the middle or latter end of January. *Kalendar,* 319.

1250. *Culture of the Fig-Tree in the Stove.* The fig formed one of the different species of trees which T. A. Knight subjected to a very high temperature during bright weather, and a comparatively low temperature during the night. (*Hort. Trans.* iii. 459 and 1212.) "The large white fig-tree succeeded perfectly, just ripening its spring-figs, (those which usually ripen in the open air in this country,) and afterwards its summer-figs. The trees then produced new leaves and branches; and the fruit, which would have appeared in the next spring, ripened in high perfection in September. Subsequently also, a few of those, which, in the ordinary course of the growth of the tree, would have appeared as the summer crop of next year, have ripened, and these, though inferior to those of the preceding crops, have not been without merit." At the time this communication was made, this *fourth* crop was only beginning to ripen, and was thought of inferior quality: but T. A. Knight informs us, in a subsequent communication, (read July 18. 1820.) that "the subsequent portion of it proved most excellent; and some figs which were gathered upon Christmas-day, were thought by myself, and a friend who was with me, much the best we had ever tasted. The same plants have since ripened four more crops, being eight within twelve months; and upon a ringed branch of one year old, and about an inch in diameter, a ninth crop, consisting of sixty figs, will ripen within the next month. I possess only two plants, each growing in a pot, which contains something less than fourteen square inches of mould, and occupying together a space equal to about sixty-four square feet of the back wall of my pine-stove: from which space the number of figs that have been gathered within twelve months has been little, if any, less than 300: and I see every prospect of a succession of crops till winter. I therefore send the following account of the mode of culture, which has been employed, in the hope that it may prove useful to those who are sufficiently admirers of the fig, to think it deserving a place in the forcing-house.

"My trees grow, as I have stated in the communication to which I have above alluded, in exceedingly rich mould, and are most abundantly supplied with water, which holds much manure in solution. They consequently shoot with great vigor, notwithstanding the small space to which their roots are confined; and they require some attention to restrain them within the limits assigned to them; but I have found the following mode of treatment perfectly efficient and successful.

"Whenever a branch appears to be extending with too much luxuriance, its point, at the tenth or twelfth leaf, is pressed between the finger and thumb, without letting the nails come in contact with the bark, till the soft succulent substance is felt to yield to the pressure. Such branch, in consequence, ceases subsequently to elongate; and the sap is repulsed to be expended where it is more wanted. A fruit ripens at the base of each leaf, and during the period in which the fruit is ripening, one or more of the lateral buds shoots, and is subsequently subjected to the same treatment, with the same result. When I have suffered such shoots to extend freely to their natural length, I have found that a small part of them only became productive, either in the same, or the ensuing season, though I have seen that their buds obviously contained blossoms. I made several experiments to obtain fruit in the following spring from other parts of such branches, which were not successful: but I ultimately found that bending these branches, as far as could be done without danger of breaking them, rendered them extremely fruitful; and in the present spring, thirteen figs ripened perfectly upon a branch of this kind, within the space of ten inches. In training, the ends of all the shoots have been made, as far as practicable, to point downwards." *Hort. Trans.* iv. 202.

For various opinions and practices in pruning and training the fig in the open air, which may also deserve attention in the forcing department, see the Horticultural Catalogue.

Sect. VI. *Of the Culture of the Cucumber.*

1251. To produce cucumbers at an early season, is an object of emulation with every gardener; and there is scarcely any person, not even the humblest tradesman, as M'Phail observes, who has not his cucumber-bed in his garden. We shall follow our usual plan, and lay before the reader a systematic view of the practices of the most approved gardeners in the culture of this plant. Cucumbers are forced in hot-beds, pits, and hot-houses, and the heat of fire, and steam, and dung, have been applied to their culture; but dung, as the author last quoted observes, is the only thing yet found out, by the heat of which the cucumber may be advantageously cultivated.

Soil. Cucumbers, like every other plant, will grow in any soil, though not with the same degree of vigor, provided they be supplied with a sufficiency of heat, light, water, and air.

For early-forcing, Abercrombie recommends a mould or compost of the following materials: — "One third of rich top-spit earth, from an upland pasture, one-half of vegetable mould, and one-sixth of well decomposed horse-dung, with a small quantity of sand."

M'Phail used vegetable mould, made from a mixture (accidental) of the leaves of "elm, lime, beech, sycamore, horse and sweet chestnut, spruce and Scotch fir, walnut, laurel, oak, evergreen, oat, ash, &c." and among them withered grass, and weeds of various sorts. "This vegetable mould," he says, "without a mixture of any thing besides, is what I used for growing cucumbers in, and, by experience, I found it preferable to any other moulds, earths, or composts whatever, either in my new method of a brick bed, or in the old method of a bed made of hot dung."

Nicol says, soil thus composed will produce cucumbers in great abundance: "Three-fourths light, rich, black earth from a pasture, an eighth part vegetable mould of decayed tree leaves, and an eighth part rotten cow-dung. *Kal.* p. 393.

W. T. Aiton, gives the following as the compost used in the Kew garden: "Of light loam, a few months from the common, one-third part; the best rotten dung, one-third part; leaf-mould and heath-earth, of equal parts, making together one-third part: the whole well mixed for use." *Hort. Trans.* vol. ii. p. 282.

G. Mills (*Hort. Trans.* vol. iii. p. 148.) states, that the soil he uses, "is half bog, or black mould, got from a dry heathy common, and half leaf-mould; after lying twelve months in a heap, the compost is fit for use."

Time of beginning to Force. Abercrombie says, "Managers who have to provide against demands for early cucumbers, must raise the seedlings from twelve to ten weeks before the fruit will be required, according to the length of the days in the interval.

"In proportion as the entire course embraces a greater part of midwinter, the liability of failure from obstacles in the weather will be greater. The last fortnight in January, or first week of February, is a good time for beginning to force the most early crop. In the subsequent months, both main and secondary crops may be started as required; and will come forward more freely. To have a constant succession, seedlings should be originated twice a month. As the course of forcing more coincides with the natural growing season, the length of it will be educed to eight, seven, or six weeks."

M'Phail says, "Those who are desirous of having cucumbers early, had best sow the seeds about the 20th of October; they may be sown at any time of the year, but the spring and autumn are the best seasons. Cucumber plants may be made to bear fruit plentifully from about the middle of March till the middle of September; but from the middle of September till the middle of March their produce will be but scanty. Cucumber plants raised from seed in October, will begin to produce fruit in February or March, and will continue to bear till the following month of October, provided they be kept in frames, and get plenty of heat and water."

Nicol recommends the middle of January. He says, "Some begin sooner, but it is striving hard against the stream to little purpose. If the dung be prepared, and the bed be got ready, so as to sow about the 1st of February, the success will often be greater than by sowing a month earlier; the growth of the plants being frequently checked by bad weather, and sometimes they are entirely lost."

"Aiton, in the paper above quoted, sowed on the 12th and 20th of August, with a view to cultivate in stoves; a regular supply of this vegetable being annuallv required for the royal tables."

G. Mills sows on the 14th of October.

Sorts. Abercrombie recommends "the short prickly for very early fruit; and the long prickly kinds for the chief early, and main summer crops."

M'Phail prefers "the green cucumber with black prickles, as best for forcing. When fit for table, it runs from six to nine inches long, and when ripe, runs to about eighteen or twenty inches long."

Nicol says, "Every gardener has his favorite sort of cucumber, and it is no easy matter to advise. He names, as early sorts generally known, the early short prickly as the earliest; the early smooth green, a long fruit; the long green prickly, and the white prickly, a white fruit."

Aiton and Mills do not mention the varieties they used.

Choice of Seed. "It is advisable," Abercrombie observes, "to have that from two at least to four years' old, in preference to newer seed, which is more apt to run luxuriantly in vine, and the plants from it do not show fruit so soon, nor so abundantly as those from seed of a greater age. But when seed has been kept more than four years, it is sometimes found to be too much weakened."

Forming the Seed Bed. "A one-light frame," Abercrombie says, "will be large enough for ordinary purposes. Choose a dry sheltered part of the melon ground, and form a bed for a one-light frame. When high winds are suffered to blow against a cucumber bed, they have a very powerful effect on it; for, in that case, the heat in a short time will not only be greatly abated, but also forced and driven into the corners of the frames, and, consequently, some parts thereof are rendered too cold, whilst other parts are made too warm; and, of course, the plants are all equally endangered, retarded in their growth, and perhaps some, if not all of them, totally destroyed. Therefore, when a cucumber-bed is about to be built, the first object of consideration should be, to have it, as well as possible, sheltered from the high winds and boisterous stormy weather." Having put on the frame, and waited till the bed is fit for moulding, lay in five or six inches depth of the proper earth or compost."

M'Phail makes up "a bed of good dung, four feet high, for a one-light box."

"Nicol builds a bed of dung, carefully fermented, to the height of five feet at back, and four at front, keeping it a foot larger all round than a one-light frame, or about five or six feet by three or three and a half. He then covers with turf; and on that lays fine sand, as free of earth as possible, to the depth of about six inches; laying it in a sloping manner, corresponding with the glass, and to within six inches of it; over which lay an inch or two of dry light earth."

" Aiton and Mills also prepare a bed for a one-light box; the latter forms it on a stratum of wood one foot high for drainage, and eight inches higher in the middle than at the sides, 'as the sides are liable, from the weight of the frame, to settle faster than the middle,' which causes the piles of earth to crack; by which, in fruiting-beds more especially, the roots of the plants are greatly injured."

Sowing. Abercrombie sows some seeds in the layer of the earth, which he spreads over the bed, putting them in half an inch deep. He also sows some seed in two, three, or more small pots of the same kind of earth, which may be plunged a little into that of the bed.

M'Phail sows in a pot filled with rich earth, covers about two inches thick, and sets the pots on the surface of the naked dung on the bed.

Nicol sows immediately after the bed is made, without waiting till the heat arise, which, he says, is losing time, and the opportunity of bringing on vegetation by degrees as the heat rises. He sows in a broad pan four inches deep, or in small pots four or five inches diameter, and as much in depth. These he fills with " fine light earth" or vegetable mould, and covers the seeds two inches. He plunges these to the brim in the back part of the bed (which it will be recollected contains a stratum of earth six inches thick over one of sand, and another of turf,) puts on the light, and lets the frame be matted at night in the ordinary way.

Raising Plants from Cuttings. M'Phail says, " Instead of raising cucumber plants from seed, they may be raised from cuttings, and thus kept on from year to year in the following manner: the method of sticking them is this: take a shoot which is just ready for stopping, cut it off just below the joint behind the joint before which the shoot should have been stopped, then cut smooth the lower end of the shoot or cutting, and stick it into fine leaf or other rich mould about an inch deep, and give it plenty of heat, and shade it from the rays of the sun till it be fairly struck. By this method, as well as by that of laying, cucumber plants may readily be propagated."

J. Mearns, gardener at Shobden Court, near Leominster, propagates his cucumber-plants for a winter crop in this way, and " finds, that the plants raised from cuttings are less succulent, and therefore do not so readily damp off, or suffer from the low temperature to which they are liable to be exposed in severe weather; that they come into bearing immediately as they have formed roots of sufficient strength to support their fruit, and do not run so much to barren vine as seedlings are apt to do." He takes the cuttings from the tops of the bearing shoots, and plants them in pots nine inches deep, half-filled with mould. He then waters them, covers the tops of the pots with flat pieces of glass, and plunges them into a gentle bottom-heat. " The sides of the pot act as a sufficient shade for the cuttings during the time they are striking, and the flat glass, in this and in similar operations, answers all the purposes of bell-glasses. The cuttings form roots, and are ready to pot off in less than a fortnight." *Hort. Trans.* iv. 411.

Temperature of the Seed-Bed. Abercrombie says, " The minimum heat for the cucumber is 58° at the coldest time of night; in the day-time 65° is sufficient for the maximum; because, air admitted when the sun has great influence, will do more good than a higher heat."

M'Phail says, " If it were possible to keep the heat in the frames always to 80 degrees, with the concurrence of proper air and moisture, I am of opinion that that would be a sufficient heat for the production of the cucumber."

Nicol keeps the air in the bed to about 65° in the night, allowing a few degrees of a rise in sunshine.

Aiton rears and fruits his plants in a stove, and therefore we shall take no farther notice of his practice at present. Mills says, " The heat I wish to have in the seed-frame is from 65° to 75°."

1252. *Treatment till removed to the Fruiting-Bed.* " After sowing, Abercrombie continues the glasses on the frame; giving occasional vent above for the steam to evaporate, that the bed may keep a moderate heat, and not become too violent. The plants will be up in a few days, when it will be proper to admit air daily, but more guardedly, at the upper ends of the lights, which may be raised from half an inch to an inch or two, according to the temperature of the weather, that the plants may not draw up weak, or be injured by the steam. In frosty weather, hang part of a mat over the aperture. When the plants are a little advanced, with the seed-leaves about half an inch broad, take them up, and prick some in small pots of light earth, previously warmed by the heat of the bed. Put three plants in each pot, and insert them a little slopingly, quite to the seed-leaves. Plunge the pots into the earth; and you may prick some plants also into the earth of the bed. Give a very little water just to the roots: the water should be previously warmed to the temperature of the bed. Draw on the glasses; but admit air daily, to promote the growth of the plants, as well as to give vent to the steam rising in the bed, by tilting the lights behind, from half an inch to an inch or two high, in proportion to the heat of the bed and temperature of the weather. Cover the glasses every night with garden-mats, and remove them timely in the morning. Give twice a week, once in two days, or daily, according to the season, a very light watering. Keep up a moderate lively heat in the bed, by requisite linings of hot dung to the sides."

M‘Phail, having sown, and placed the pots on the naked bed, says, the plants will come up in a few days; and when they have fully expanded their two seed-leaves, transplant them into small pots, three plants in each pot; set them on the surface of the dung in the bed, and let a little air be left at the light day and night, to let the steam pass off freely. "When the seedling plants have one or two joints, stop them, after which they generally put forth two shoots, each of which let run till they have made one or two clear joints, and then stop them; and afterwards continue throughout the season to stop the plants at every joint."

Nicol directs "to guard the seeds from mice, which generally swarm about hot-beds, by laying a pane of glass over the pot or pan till they have come up; and afterwards, at night, by covering with a pot of equal size, till the seed-leaves have expanded, and the husks have dropped: for, until then, the plants are liable to be destroyed. The cover, however, should always be removed by sun-rise, and be replaced in the evening. It is at night these vermin generally commit their depredations. No air need be admitted till the heat begin to rise, and steam begin to appear; but after that, the light should be tilted a little every day, in whatever state the weather may be, until the plants break ground. Air must then be admitted with more care; and, if frosty or very chill, the end of a mat should be hung over the opening, that the air may sift through it, and not immediately strike the plants. A little aired-water may be given once a day, from the time the seeds begin to chip; and if a very strong heat rise, the pots should be raised a little, to prevent the roots from being injured. They should be frequently examined on this account, and if the heat be violent, should be set loosely in the sand, or be placed entirely on the surface. The air of the bed should be kept to about 65° in the night; allowing a few degrees of a rise in sunshine. If the weather be severe, therefore, the mats must be doubled or tripled; and if mild, perhaps a single one may suffice. But, unless in very bad weather, they should always be removed by sun-rise, in order to admit all the sun and light possible to the plants, which is very essential to their welfare. When the plants are about an inch and a half high, they are then fit to be pricked out into nursing-pots. These pots should be about three and a half or four inches diameter at top, and as much in depth. The mould to be used should be the same as that the seeds were sown in, and should be laid in the frame a few hours previous to potting, in order to bring it to a proper degree of warmth, that the tender fibrils be not chilled by it. Let the pots be filled about one-half with the earth; turn the plants carefully out of the seed-pot; place three in each, against the side of the pot, and so as that their leaves may be just above its margin; then cover the roots with the mould, rubbing it fine between the fingers, and filling the pots nearly to the brim. Work over the sand in the frame to its full depth; plunge the pots to within an inch of their rims; and cover the whole surface with a little dry earth as at first, making it level with the tops of the pots. Then give a little aired-water, in order to settle the earth to the roots of the plants. As these tender seedlings, at this early period, are liable to many accidents, it will be proper to sow a little more seed of the same kinds at this time, in order to provide a supply of plants. If they should not be wanted, the trouble is not much; and they may be given to a neighbour, or be thrown away.

"The plants will now require due attention. Let air be admitted to them as freely as the state of the weather will allow; and supply them moderately with water once in two or three days. Examine the pots frequently, if the heat be violent, lest the roots be scorched; setting them loosely, or pulling them up a little in that case; or, if thought necessary, placing them entirely on the surface. If much steam abound in the bed at this time, it may be proper to leave the light tilted half an inch in the night; observing to hang the lap of a single mat two or three inches over the tilt. But if the bed was carefully turfed over, as directed at making up, this will seldom be necessary; never but in thick hazy weather. Mat up carefully at night; but make a point of admitting all the sun and light possible to the plants; therefore uncover always by sun-rise, and frequently wash or wipe the glasses clean, outside and inside, as they are often clogged by a mixture of steam and dust. Also, occasionally stir the surface of the sand or earth in the frame with the point of a stick, in order to extirpate vapor that hovers on the surface, and so purify the internal air of the bed. If the heat begin to decrease, and particularly if the weather be severe, it may be necessary to line one or more sides of the bed, that the plants may receive no check in their growth. If it be a one-light box, both back and front may be lined at the same time; and, if necessary, in ten or twelve days, the two sides; and if much steam arise from the linings after they come into heat, be careful in matting, at night, to tuck up the edges of the mat, lest it be thrown into the bed."

Mills, as soon as the seed-leaves of the plants are fully expanded, transplants them singly into pots of the 48th size, gives a little water and air night and day. His temperature for seedlings, as already stated, is from 65 to 75 degrees. With this heat and water, as the earth in the pots become dry, and a little air night and day, so as to keep the internal air in the frame sweet, and fluctuating between the degrees of heat above mentioned, the plants will be fit for finally transplanting out in one month, that is, by the 14th of November, into the fruiting-frames. *Hort. Trans.* vol. iii.

1253. *Forming the Fruiting-Bed.* Abercrombie directs, " When the plants are advanced in some tolerable, stocky growth, that is, when the first rough leaves are two or three inches broad, or when the plants have been raised about five weeks, transplant them to a larger hot-bed, with a two-light or three-light frame, sometimes called the *ridging-out-bed.*" Form the bed on general principles, of superficial extent, according to the frame it is to support, leaving from four to six inches all round, and fixing the height according to the season; thus, in January, Abercrombie directs the bed to be " three feet nine inches high in front; four feet six inches at the back; and six inches larger than the frame all round. In February, three feet three inches high at the front; four feet at the back; and four inches to spare round the frame. In March, three feet high in front; three feet six inches at back; and four inches beyond the frame every way." Put on the frame and glasses presently after the body of dung is built up, to defend it from the weather. At the same time raise the glasses a little at the upper end, in order both to draw up the heat sooner, and to give vent to the rising steam, until the bed is reduced to a regular temperature. In connection with the thermometer, the cultivator may be assisted to form a judgment of this, by *trying-sticks,* that is, two or more sharp-pointed smooth sticks, thrust down in different parts of the bed; which at intervals may be drawn up, and felt by a quick grasp of the hand. The smell of the vapor is also a criterion: it should not be strong and fetid, but mild and sweet. While taking care that the heat is not so intense as to burn the mould when applied as below, let it not be suffered to evaporate unnecessarily by delay. If the temperature appear not sufficiently high, take off the frame, and add another course of dung."

M'Phail, when he fruits the cucumber on dung-beds, begins to make preparations for the fruiting-bed, about three weeks before the plants are ready to be planted out for good. The dung collected, after being well worked, is " made up into a bed of about four or five feet high, and the frames and lights set upon it. It is afterwards suffered to stand for a few days to settle, and until its violent heat be somewhat abated; and when it is thought to be in a fit state for the plants to grow in, its surface is made level, and a hill of mould laid in just under the middle of each light, and when the mould gets warm, the plants are ridged out in it. After this, if the bed has become perfectly sweet, and there be heat enough in it, and the weather prove fine, the plants will grow finely."

Nicol builds his fruiting-bed about four feet and a half high at back, and three feet and a half in front, keeping it fully a foot longer than the frame all round. He turfs it, and lays on sand as in forming the seed-bed, if the dung has not been well fermented. " But otherwise, placing a thick round turf, a yard over, in the middle of each light, so as that its centre may be exactly under the plants, will generally be found sufficiently safe." The frames are now put on; and the beds matted up at night to make the heat rise the sooner.

Mills says, " Well preparing the dung, is of the greatest importance in forcing the cucumber, and if not done before it is made into a bed, it cannot be done after, as it requires turning and watering to cause it to ferment freely and sweetly; fresh dung from the stable will require at least six weeks' preparation before it will be fit to receive the plants. A month before it is made into a bed, it should be laid into a heap, turned three times, and well-shaken to pieces with a fork, and the outsides of the heap turned into the middle, and the middle to the outsides, that the whole may have a regular fermentation; and if any appear dry, it should be made wet, keeping it always between the two extremes of wet and dry. A dry spot of ground should be chosen to prepare the dung on, that the water may drain away from the bottom of the heap. The dung having been a month in heap, I make the bed as follows: I form a stratum one foot high, of wood of any kind, but if large the better (old roots of trees, or any other of little value will do); this is to drain the water from the bottom of the bed; for, after a month's preparation, with every care, it will frequently heat itself dry, and require water in large quantities, which, if not allowed to pass off freely, will cause an unwholesome steam to rise, in which the cucumber-plant will not grow freely: on this bottom of wood I make the bed, four feet high, with dung, gently beating it down with a fork: this is done about the 1st of November, and by the month of February the four feet of dung will not be more than two feet thick, which, with the foot of wood at the bottom, will make the bed three feet high; this I consider a good height, for if lower, it cannot be so well heated by linings, which is the only method of warming it in the months of February and March, as by that time the first heat of the bed will have quite declined.

"Having made the bed, I put on the frames and lights, which I shut close till the heat rises. I then give air night and day, sufficient to allow the steam to pass off, and once in two days I fork the surface over, about nine inches deep, to sweeten it, and if, in the operation, I find any part dry, I carefully wet it. The bed being quite sweet, I prepare it for the mould, by making the middle about eight inches lower than the sides, as the sides are liable, from the weight of the frames, to settle faster than the middle, which often causes the hills of earth to crack, by which the roots of the plants are greatly injured." *Hort. Trans.* vol. iii. p. 147.

Moulding. "As soon," Abercrombie observes, "as you deem the bed to have a lively, safe, well-tempered heat, which may be in a week or ten days after building, proceed to mould it. Earth the middle of each light, laying the mould so as to form a little hill, from six to ten inches in height, according as seed is to be sown, or plants from the seed-bed inserted. Then earth over the intervals between the hills and the sides of the frame only, from two to four inches, as a temporary measure, until the heat is ascertained to be within safe limit. After the whole bed has been some time covered, examine the mould: if no traces of a burning effect appear, discoverable by the mould turning of a whitish color, and caking, it will be fit to receive the plants. But if the earth appears burnt, such part should be replaced by fresh, and vacuities made to give vent to the steam, by drawing away part of the hills from the centre. When the bed is in fit order, level the mould to six inches deep, to receive seeds; but to receive plants in pots, the hills of earth should be kept ten inches deep or more. If there be any motive for haste while an excess of heat is to be suspected, the danger from burning may be obviated by leaving vacancies in the top mould; by placing patches of fresh cow-dung or decayed bark to receive the pots of seeds or plants; and by boring holes in the bed with a round pole sharpened at the end, which holes should be filled up with hay or dung when the heat is sufficiently reduced. Some persons place a layer of turf with the sward downwards between the dung and the mould: but this, if ever expedient, is only in late forcing; for in winter the full effect of a sweet well-tempered heat is wanted, much of which, by being confined at top, may be forced out at the sides."

M'Phail, in moulding common hot-beds, also raises hills in the centre of each light in the usual way. *Gard. Remem.* p. 51.

Nicol gathers up from the surface of the beds a sufficient quantity of earth to raise hills whereon to plant; one exactly in the middle of each light, about a foot broad at top, and to within six inches of the glass. If the frames be of a proper depth, they should be twelve or fifteen inches high above the turf. *Kal.* 365.

Mills puts under the centre of each light one solid foot of earth, the top of which is then within nine inches of the glass, and the top of the plants, when planted in it, will be within three inches of the glass.

Planting out. Abercrombie, when the temperature is ascertained to be right, brings the plants in their pots; turns over the hills of mould, forming them again properly, and then proceeds to planting. "Turn those in pots clean out, one pot at a time, with the ball of earth whole about the roots; and thus insert one patch of three plants which have grown together, with the ball of earth entire, into the middle of each hill, earthing them neatly round the stems. Also any not in pots, having been pricked into the earth of the bed, if required for planting, may be taken up with a small ball of earth, and planted similarly. With water warmed to the air of the bed, give a very light watering about the roots, and shut down the glasses for the present, or till next morning. Shade the plants a little from the mid-day sun a few days, till they have taken root in the hills, and cover the glasses every evening with large mats, which should be taken off in the morning."

Nicol, before planting, if the beds have settled anywise unequally, rectifies and sets level the frames, by placing boards, slates, or bricks, under the low corners, so as to make them correct. He then makes up the outsides of the bed with dung, a few inches higher than the bottoms of the frame; over which he lays some dry litter, or fern fronds, and planks at top to walk on. He then takes the pots of plants, each of which are supposed to have got two or three rough leaves, and making a hole in each full large enough to receive the balls, turns them out of the pots as entire as possible, placing them level with the surface of the hill, fitting the earth round their sides, and settling all with a little water. In the case of planting older plants than the above, at a farther advanced period of the season, or such as have quite filled their pots with roots, the balls may be reduced a little, and the fibres should be singled out, if anywise matted. But the above plants are supposed to have barely filled the pots with roots, and then the balls should be kept entire, that they may not receive a check in the transplanting."

1254. *Temperature for Fruiting Plants.* Abercrombie's minimum is fifty-five degrees, and maximum in the day-time sixty-five degrees, the same as for the seed-bed.

M'Phail says, "It appears, that during the winter and spring months, the medium heat of the air in the frames should be seventy-five degrees, and the medium heat of the mould eighty degrees. But when the sun shines, the heat of the air in the frames is often raised to a much higher degree; so that reckoning this heat, the medium for that of the air of the frames may be eighty degrees." *Gard. Remem.* p. 59.

Nicol's medium heat for cucumbers is sixty degrees; in sunshine he admits as much air as will keep down the thermometer to sixty-five degrees. *Kalend.* p. 366.

Mills, in the fruiting-frames, wishes "to have at all times from seventy to eighty degrees of heat, which I regularly keep up by applying linings of hot dung, prepared one month previously, in the same manner as that for the beds. For the first month I cover the glass with a single mat only; and as the nights become cold, I increase the covering, using hay, which I put on the glass, and cover that with a single mat. I regulate the heat at night by the warmth of the glass under the hay, for when the glass is warm, which should be in two hours after covering up, a little air is required. When the glass and hay covering are warm, which is easily known by putting the hand under the hay on the glass light, the internal heat of the bed will be about seventy-eight degrees, in which degree of heat, the cucumbers shown to the society have grown in length, in sixteen hours, one inch and a quarter. I give a little water round the insides of the frame as often as I find them dry, which causes a fine steam to rise, and I think it better than watering the mould, for if this latter practice is often repeated in winter, when the sun's power is insufficient to absorb the moisture, and the glasses can be but little open, to allow the damp to pass off, the earth, in a few weeks, will lose its vigor, and the roots of the plants will perish. Great care should also be taken, at this season, not to injure the roots by too much heat, which is not less detrimental than too much moisture; they can only be secured by keeping up a regular warmth, just sufficient to expel the damp, which arises in the night, from the fermenting dung."

Linings. The requisite degree of heat, Abercrombie is careful to support in the bed, when declining, "by timely linings of hot, fresh dung, which may be applied to the sides, fifteen or eighteen inches in width, and as high as the dung of the bed. Generally line the back part first, and the other in a week, or from ten days to a fortnight after, as may seem necessary by the degree of heat in the bed. Sometimes if the heat is fallen abruptly below the minimum degree, it may be proper to line both sides, moderately, at once, to recover the temperature sooner and with better effect: but be particularly careful never to over-line, which would cause a too violently renewed heat and steam in the bed. The dung for linings must be fermented, as in first building a bed."

When the heat decreases, Nicol cuts away the old dung perpendicularly by the frame, and adds new linings (generally beginning with the back first), two feet broad, to the height of six inches above the bottom of the frame. As it will sink considerably in heating, he adds to it in a few days.

Mills applies linings of hot dung prepared a month previously.

Covering. This must be nightly performed till June; proportioning the warmth of the cover to the heat of the air in the bed, and that of the external air. Mats are laid next the glass; on these a layer of hay, and over this mats, made fast by boards, but not hanging over the linings, is the usual mode, early in the season. M'Phail says, "My method of covering up was as follows: in the first place, I laid clean single mats on the lights, in length and breadth, just or nearly to cover the sashes, taking care not to suffer any part of the mats to hang over the sashes on or above the linings, for that would be the means of drawing the steam into the frames in the night-time. On these mats was spread equally a covering of soft hay, and on the hay was laid another covering of single mats, upon which were laid two, and sometimes three or four, rows of boards, to prevent the covering from being blown off by the winds. The mats laid on next to the glass are merely to keep the seeds and dust which may happen to be in the hay from getting into the frames among the plants. If the bed be high in covering up, steps or short ladders must be used by those whose office it is to cover and uncover; and great care must be taken not to break or injure the glass."

1255. *Air.* Abercrombie directs to "admit air every day, when the weather is moderate, without much wind; and always more freely in sunny days, than when cloudy and cold, or frosty. Open the lights behind, only a little at first, sooner or later in the day, according to the temperature of the season; increasing the opening, from about half an inch, to one, two, or three inches, or very little more; (decrease the opening occasionally, if the weather, in the early part of the season, changes very cold); and shut closer in the same gradual order towards afternoon; generally shutting close in the evening, unless, in the early state of the bed, a considerable heat and steam continues. In this case, you may occasionally leave open about half an inch, hanging the end of a mat before each opening."

M'Phail says, "A cucumber-plant delights to grow in a strong heat, and in sweet, wholesome air; but if the air in which it grows be contaminated, unhealthy, or impure, the plant will not continue long in a healthy, flourishing condition. Whatever is disagreeable to the smell becomes in time hurtful to the cucumber-plant; therefore, whoever would wish to know if the air in a cucumber-frame be of a healthy nature for the plants, should smell to it." He adds, in giving and taking away the air, do it gradually, that is, by little and little at a time, which, without doubt, is the best way: for sudden changes are always attended with unpleasant consequences. A due proportion and continual supply of fresh air is at all times necessary, and more or less is required according to the heat of the linings, the temperature of the weather, and the thickness of the coverings put on at nights. *Gard. Rem.* p. 42.

Nicol admits air regularly in as large portions as the state of the weather will allow; being careful to let off rank steam, if it abound, by leaving a *tilt*, even in the night.

Mills says, "My usual times of giving fresh air to the frames, and permitting the foul to escape, in the winter months, (that is, from the middle of November to the middle of February), is as follows: between eight and nine in the morning, I raise the lights, and let the confined air pass off, shutting them again; about ten I give a little air; at eleven more; at one I lower the lights a little, and between three and four I close them entirely. About two hours after the covering of hay has been put on, I give a little air for the night. Should the weather be changeable, the lights must be raised or lowered more or less, as circumstances may require; but some air about the times of the day above-mentioned is absolutely necessary to keep the plants in a free-growing state."

1256. *Water.* Give necessary waterings, with water warmed to the air of the bed, mostly in the forenoon of a mild day, in early forcing; and in a morning or afternoon, in the advanced season of hot, sunny weather." *Abercrombie.*

M'Phail says, "The quantity of water requisite to be given to the plants depends upon the heat of the bed, the strength and age of the plants, and also on the temperature of the weather. When the weather is cold, wet, or gloomy, and the air moist, they require less water than when the weather is clear, and the air more dry. If too much water be given, or if water be given too often, it will hinder the fruit from setting and smelling kindly; and if too little water be given, the plants will grow weak, and the fruit hollow. I seldom watered the plants with water warmer than 85 degrees, nor colder than 65; although, in general, I tried by the thermometer the warmth of the water I used, yet it is not necessary so to do. A good way to know if the water be of a proper temperature is to take a mouthful of it, and when it feels neither hot nor cold, then it is in a fit state for accelerating the growth of the plants, or for making them grow fast. I made it a constant rule never to water the plants but with clean, sweet water; and if the water be clean and sweet, I am of opinion it makes little or no difference whether it be pump-water, spring-water, rain-water, or river-water. However, it is a good quality in water to bear soap, and make a lather therewith, which rain and river-water readily do; but the pump and spring-waters are found too hard to do it; yet this may easily be remedied in them, by letting them stand a few days in the open air and sun's rays.

"With regard to the time of the day in which the watering of the plants ought to be performed, I think it is not material, nor did I ever make any rule with respect to the time, but give them water at any hour of the day when I saw they stood in need of it, and when it best suited my conveniency. Those who have hot-houses may get their water warmed there, and those who have no hot-houses may get some from the house, or from some other place where water is frequently heated. One gallon of hot water will properly warm several gallons of cold water. Late in spring and in the summer months the water may be warmed by exposing it to the rays of the sun."

Nicol airs his water "by some means or other;" waters once in two or three days after planting, and liberally from the rose of the watering-pot as the plants advance. The time chosen is the afternoon, about four or five o'clock, in order not to scorch the plants, which, he says, often happens when, after morning waterings, the sun's rays suddenly dart on the plants. *Kal.* p. 366. 385.

J. Mearns, already mentioned (1251), uses water impregnated with sheep's-dung, as does T. A. Knight. Mearns tried this water first "on some cucumber-plants in the pine-stove, which had been planted in January, but which, in consequence of dull weather, had become weak, and of a pale green color; he applied the liquid to the roots, and in a few days a great change in the appearance of the plants was produced; the foliage assumed a hardy green, the shoots acquired an unusual degree of strength, with short joints, and although the stove had scarcely any air given to it, yet the fruit swelled off rapidly, and attained a large size." These plants continued in bearing till May, and were then cut back to within six inches of the root, when they started again with vigor. "No water was ever given over the leaves, but a continual supply of the liquid pigeon-dung manure to the roots." *Hort. Trans.* iv. 412.

For Mills's practice as to watering, see his process under *temperature*, (1254).

Earthing. "Observe," says Abercrombie, "in proper time, when the first heat of the bed is moderated, to begin adding more earth between the hills, as the extending roots require to be covered, or the runners to be supported with mould; raising it by degrees equal with the tops of the hills, all in level order, from eight to ten inches thick." *Pr. Gard.* p. 72.

Nicol, by the time the plants have sent out runners, and the roots spread quite over the hills, enlarges them; beginning by stirring up the earth in the other parts of the frame to its full depth with a hand-fork, or weeding-iron, breaking it fine if anywise caked by the heat. To this, add fresh mould sifted or finely broken, and in a dry state, so as to raise the surface nearly to the level of the hills; laying it in a sloping manner from back to front. Previously, he rectifies the position and level of the frames, and raises it so that the glass may be eight or nine inches above the mould in the centre." *Kal.* p. 367.

1257. *Training.* To force the cucumber into early fruit, Abercrombie directs to "stop the runners as soon as the plants have made two rough leaves, as the bud that produces the runner is disclosed at the base of the second rough leaf, it may be cut off or picked out, or, if the runner has already started, it may be pinched off close. This is called stopping at the first joint, and is necessary to promote a stronger stocky growth, and an emission of fruitful laterals; and from these, other prolific runners will be successively produced. The vines, without the process of stopping, would generally be both weaker, and so deficient in fertile runners, that they would sometimes extend two or three feet without showing fruit. When plants which have been once stopped, have extended the first runners to three joints without showing fruit, they are to be again stopped for the purpose of strengthening the plant, and disposing it for bearing. As fertile runners extend, train them out regularly along the surface, fastening them down neatly with pegs."

M'Phail stops his plants when they have two joints; and "when the plants shoot forth again after the second stopping, they seldom miss to show fruit at every joint, and also a tendril; and between this tendril and the showing fruit may clearly be seen the rudiment of another shoot; and when the leading shoot has extended itself fairly past the showing fruit, then with the finger and thumb pinch it and the tendril off just before the showing fruit; so that in pinching off the tendril and the shoot, the showing fruit is not injured. Thus stopping the leading shoot stops the juices of the plant, and is the means of enabling the next shoot (the rudiment of which was apparent when the leading shoot was stopped) to push vigorously, and the fruit thereby also receives benefit.

"When the plants are come into bearing, if the vines are suffered to make two joints before they are stopped, at the first of these joints, as I before said, will be seen showing fruit, a tendril, and the rudiment of a shoot; but at the second joint there is seldom to be seen either showing fruit or the rudiment of a shoot, but only a tendril and the rudiments of male blossoms. It is therefore evident, and but reasonable, that the shoot should be stopped at the first of these joints; for were the shoot to be let run past the first joint, and stopped before the second, perhaps no shoot would ever spring forth at the said second joint, but only a cluster of male blossoms or leaves, which would serve for no good purpose, but would rather exhaust the juices of the plant, which ought to be thrown into the productive parts of it.

"If the plants are suffered to bear too many fruit, that will weaken them, and in such case some of the shoots will lose their leaders, that is, the rudiment of some of the shoots will not break forth, the numbers of fruit having deprived them of their proper share of the vegetative juices. The rudiments of some of the shoots may also be injured by accident, which sometimes prevents their pushing; but from whatever cause this happens, it matters not; for by the losing of its leader the shoot is rendered unfruitful, and therefore should be cut entirely off. In the course of the spring and summer months several shoots break forth here and there from the old ones. When too many break out, cut off the weakest of them close to the old shoots, and those which remain with regard to stopping, serve nearly in the same manner as young plants. If the old shoot from which the new one bursts forth, lie close to the mould, it sometimes sends forth roots from the same joint from which the young shoot proceeded, by which the young shoot is much invigorated, and the old plant, in some measure, renovated. When this young plant is fairly formed on the old shoot, it somewhat resembles a young plant formed and struck root on a strawberry runner; and if the shoot were to be cut off on each side of the newly-formed plant, and no part of the plants left in the frame but itself, by proper treatment it would soon extend itself all over the frame. In winter, when the plants are young, and before they come into bearing, it sometimes happens that they send forth too many shoots: in that case cut the weakest of them off, not suffering them to become crowded and thick of vines, for that would weaken and prevent the plants from bearing so early as they ought to do. Keep the leaves of the plants always regularly thin. The oldest and worst of them cut off first, and cut them off close to the shoot on which they grow. This is necessary and right; for if any part of the stem of the leaf were to be left, it would soon putrify and rot, and perhaps destroy by damp the main branch from which it proceeded."

Nicol says, "Cucumber plants will put out runners or vines, whether the heart-buds be picked out or not, which is a matter of trivial concern, although much insisted on by some, as being necessary to their doing so at all. For my own part, I never could discover any difference, and I have repeatedly made the comparison in the same bed, which otherwise of course could not be fair. When the vines have grown to the length of four or five joints, and if fruit appear on them, they may be stopped at one joint above the fruit; but otherwise, they may be allowed to run to the length of seven or eight joints, and may then be stopped, which will generally cause them to push fertile shoots. These should be regularly spread out, and be trained at the distance of eight or ten inches apart."

Upright Training. "Cucumber plants being climbers by means of their tendrils, some branchy sticks being placed to any advancing runners, they will ascend and produce fruit, at a distance from the ground, in a clean growth free from spots, and well-flavored."

1258. *Setting the Fruit.* "The cucumber," Abercrombie observes, "bears male and female blossoms distinctly on the same plant. The latter only produce the fruit, which appears first in miniature, close under the base, even before the flower expands. There is never any in the males; but these are placed in the vicinity of the females, and are absolutely necessary, by the dispersion of their farina, to impregnate the female blossom; the fruit of which will not otherwise swell to its full size, and the seeds will be abortive. The early plants under glass, not having the full current of the natural air, nor the assistance of bees and other winged insects to convey the farina, the artificial aid of the cultivator is necessary to effect the impregnation.

"At the time of fructification, watch the plants daily; and as soon as a female flower and some male blossoms are fully expanded, proceed to set the fruit the same day, or next morning at furthest. Take off a male blossom; detaching it with part of the foot-stalk. Hold this between the finger and thumb; pull away the flower-leaf close to the stamens and anthera or central part, which apply close to the stigma or bosom of the female flower, twirling it a little about, to discharge thereon some particles of the fertilizing powder. Proceed, thus, to set every fruit, as the flowers of both sorts open, while of a lively full expansion; and generally perform it in the early part of the day; using a fresh male, if possible, for each impregnation, as the males are usually more abundant than the female blossoms. In consequence, the young fruit will soon be observed to swell freely. Cucumbers attain the proper size for gathering in about fifteen, eighteen, or twenty days from the time of setting; and often in succession, for two or three months or more, in the same bed, by good culture. The above artificial operation will be found both necessary and effectual in forcing the cucumber, between the decline of Autumn and May, while the plants are mostly shut under glass. In plants more fully exposed to the free air, in the increasing warmth of spring, and in having the full open air in summer, from June or July till September, the impregnation is effected mostly or wholly by nature. The male flowers, being by some ignorantly denominated false blossoms, are often plucked wholly off as useless, under a notion of strengthening the plant: but this should not be generally done. Where crowded too thick in clusters, some may be thinned out moderately; but their agency being absolutely necessary in fertilizing the females, they should only be displaced as they begin to decay, except where they are superabundant."

"It is the female blossoms or flowers," M'Phail observes, "that bear the fruit; but if they were not to be impregnated by the male flowers, they would prove barren and unfruitful. The female blossoms are easily to be distinguished from the male ones, for the rudiment of the fruit is apparent at the bottom of the female flowers, and the flowers have no stamina, but have three small-pointed filaments without summits: whereas the male blossoms have not any rudiment of fruit about them, but in the centre of the flower are three short stamina, which are inserted in the impalement. When the female or fruit blossoms are in full blow, take a male blossom which is in full blow, and holding it in one hand, with the other split and tear off the flower-leaves or petals, taking care not to hurt the stamina or male part. Then hold the male blossom thus prepared between the finger and thumb of the right hand, and with the left hand gently lay hold of the female blossom, and holding it between two fingers, put the prepared male blossom into the centre of the female blossom, and there the farina, polen, or dust of the anthers, clings or sticks to the stigma, and thus the impregnation of the fruit is effectuated, and the plants are thereby rendered fruitful, which, being in frames in a climate by art made for them, would otherwise in a great degree be rendered barren and unproductive; and which I have frequently known to have been the case, even when at the same time the plants were in a vigorous flourishing state. Generally leave the prepared part of the male blossom sticking in the centre of the female one, and take a fresh male blossom to every female blossom. But if male blossoms run scarce, which seldom or never happens, make one male blossom do for two or three female ones."

Nicol states, that cucumbers will grow and will arrive at full size without the female flowers being impregnated; the seeds, however, will prove abortive. The directions he gives for impregnating are in substance the same as those of M'Phail.

The fruit being set and swelling, some lay fragments of glass or slate beneath it, in order to keep it clean, and to admit as much air and light as possible to the under side, so as to cause its approach in greenness to the upper.

Gathering the Crop. Cucumbers are used green or unripe, and before they have attained their full size. They are cut and gathered when four, five, six, or eight inches long, according to the kinds. To this size they attain in ten days, or a fortnight, in the best part of the season.

To save Seed. "Select some best summer fruit, from good productive plants; which permit to continue in full growth till they become yellow. Then cut them from the vine, and place them upright on end, in the full sun, for two or three weeks; when they may be cut open, and the seed being washed out from the pulp, spread it to dry and harden: then put it up in papers or bags for future sowing. It will remain good many years: and seed of three or four years' keeping is preferable for early frame crops."

Insects and Diseases. The thrips sometimes attacks early cucumbers, and is to be destroyed by fumigation. The red spider rarely makes its appearance; when he does, water must have been improperly withheld. Some soils produce canker in the shoots, especially where they branch from the main stem. When this is the case, the only resource is to renew the soil and the plants.

1259. *Growing the Cucumber under Hand-Glasses.* The following method is given by M'Phail as that generally practised: "The seeds are sown some time about the middle of April in a cucumber or melon bed, and when they come up, they are potted out into small pots, two or three plants in each pot, and are kept properly watered, and stopped at the first or second joint. About the middle of May, a warm situation where the mould is very rich is pitched on, and a trench is dug out about two feet deep, three feet broad, and the length is proportioned according to the number of lights it is intended for. This trench is filled with good warm dung, and when the dung is come to its full heat, it is covered over with eight, ten, or twelve inches deep of rich mould. The glasses are then set upon it about three feet distant from each other, and when the mould gets warm under them, the plants are turned out of the pots with their balls whole, and plunged in the mould under the glasses, and a little water given them to settle the mould about their roots, the glasses set over them, and after they have made roots, and begin to grow, in fine days they are raised a little on one side to let the plants have the free air; and as the weather gets warmer and warmer, air is given more plentifully, to harden the plants, so that they may be able to bear the open air, and run from under the glasses. When the plants begin to fill the glasses, they are trained out horizontally, and the glasses are set upon bricks or such like, to bear them from the plants. After this the plants require nothing more but to be supplied with water when the summer showers are not sufficient, and to stop them when they run too thin of branches, and thin them of leaves or branches when they are likely to become over-crowded. In warm summers and in warm situations, by this mode of management, the plants will bear plentifully for about two months, provided they be not attacked by insects or weakened by diseases."

Abercrombie describes the practice somewhat different, but with his usual attention to detail and order. He says, "To have a general summer crop, to fruit in hot-bed ridges under hand-glasses, sow some seed of the long prickly kind in a hot-bed, under a frame or hand-glass, or in any cucumber hot-bed in cultivation, about the middle of March, or thence till the middle of April. When the plants have been up three, four, or five days, prick some in the same or another hot-bed, three or four inches asunder. A portion may be put in small pots, three plants in each, and plunged in the bed. Give water, and shade from the sun, till they take root; and manage as for the frame-crop. In three or four weeks, when advanced in the first rough leaves, about two inches broad, and stopped at the first joint, as directed in the early crop, the plants should be ridged-out, that is, transplanted into hot-bed ridges, under hand-glasses, to remain for fruiting. The period for this may fluctuate from the middle of April to the beginning of May.

"Having a sufficient quantity of prepared dung, make a hot-bed on the level ground, three feet and a half or four feet wide, and two and a half high, the length as required, according to the number of hand-glasses intended. Earth it at top, six or eight inches thick, and place the hand-glasses along the middle, at three feet and a half distance. Sometimes the bed is made in a moderate trench, twelve or fifteen inches deep, in some good soil in the kitchen-garden, in order to have the excavated earth of the trench ready at hand for moulding the bed. When the earth under the glasses is warm, proceed to put in the plants, removing them from the nursery bed, with as much earth as will adhere about the roots. If you have any plants in small pots, turn them out with the ball entire, and plant three plants under each glass. Give a light watering; put down the glasses; and shade the plants from the sun, till they have taken root; after which, let them enjoy the sun and light fully, only covering the glasses and bed every night with mats till June, or commencement of warm weather. Admit air every mild day, by propping up the southward side of the glasses one or two inches; moderate waterings will be necessary twice a week or oftener.

"As the plants push runners of considerable length, train them regularly. When extended to the limits of the glasses, and when the weather is settled warm, about the beginning or middle of June, they should be raised upon three props, two or three inches high, and the runners trained out in regular order; but cover them in cold nights with mats, for the first week or two. Continue the glasses, and circumspectly water in dry weather, as may be necessary; the plants will produce fruit in June, July, August, &c. in plentiful succession.

"To obtain a crop from hot-bed ridges under hand-glasses, you may, in default of plants raised in a previous nursery-bed for transplanting, sow seed under the glasses in April or May, inserting several seeds in the central part under each glass. When the plants have been up a few days or a week, thin them to three or four of the strongest in each patch, managing them afterwards as the others. They will come into bearing towards the end of June or July, and thence till September.

"(Should there be a scarcity of dung to make a regular bed:) in the last week of April, or in May, you may dig circular holes two feet wide, a spade deep, and four or five feet asunder; fill them with hot dung, trodden down moderately firm, and earthed over six inches. In these put either plants or seed; and place on the glasses: the plants will produce fruit in June or July till September.

"(In default of hand-glasses:) make a hot-bed, or holes of dung, as above, in May: put in plants or seed, and defend with oiled-paper frames to remain constantly, day and night, till settled warm weather in June or July. Give the additional protection of mats over the paper frame in cold nights and bad weather.

"In the culture of all the crops, give proper supplies of water in dry warm weather, two or three times a week, or every day in the hottest season of June, July, and August.

"In the hot-bed ridges made above ground in April or May, if in three or four weeks or more after making, the heat be much declined, and the nights, or general season, remain cold, let a moderate lining of hot dung be applied to the sides; which will both throw in a reviving heat, and widen the bed for the roots and runners of the plants to extend."

1260. *Cultivation of the Cucumber in a flued Pit.* Nicol says, "Those who would have cucumbers on the table at Christmas, (a thing sometimes attempted,) will find it more practicable, and less troublesome, if the plants be grown in a flued pit, in the manner of late melons, than if they be grown on a common hot-bed. In this case the cucumbers should take place of the melons planted in this compartment in July, and which will, by the middle or end of the month, have ripened off all their fruit of any consequence.

"The seeds of some of the early sorts, (those best for early being also best for late), should be sown in small pots, about the first of the month, and should be placed in the pit along with the melons, or under a hand-glass on a slow dung heat; where let the plants be nursed, and be prepared for planting about the second or third week in the month, as hinted at above. Observe to sow *old* seeds, not those saved this season, which would run more to vines than to fruit. Let the pit be prepared for their reception, by trenching up the bark or dung, and by adding fresh materials, in so far as to produce a moderate growing heat; observing the directions given for preparing the pit for the melons in July, and moulding it (however with proper cucumber earth) all over, to the depth of a foot or fourteen inches. The plants may be placed closer in planting them out, than is necessary in a spring hot-bed. They may be planted at the distance of a yard from one another, and two rows lengthwise in the pit, as they will not grow very vigorously at this late season. They should be moderately supplied with water once in four or five days, and should always be watered over the foliage; the more especially when strong fire-heat becomes necessary, as cucumbers naturally like a moist rather than a dry heat. The temperature should be kept up to about 64 or 65 degrees in the night, by the aid of the flues, and by matting, or otherwise covering the pit. Air should be as freely admitted as the state of the weather will allow; and so as to keep the mercury down, in sunshine, to about 70 degrees. The plants will require little other pruning than to stop the vines, as they show fruit, at a joint or two above it; for they will not push many superfluous shoots. Observe to pick off all damped leaves as they appear; and otherwise carefully attend to them, as above directed, while they continue to flourish, or to do any good worthy of such attendance."

1261. *Cultivation of the Cucumber in M'Phail's Brick-Bed or Pit.* "When I used," observes M'Phail, "to cultivate cucumbers on a dung-bed, the fruit were sometimes watery and ill-tasted; but after I began to cultivate them on a brick-bed, the fruit were constantly firm and well-flavored; which is certainly occasioned by the goodness and wholesomeness of the food with which the plants are fed or nourished.

Besides this objection, M'Phail mentions several others, the principal of which are,

1. The risk of burning the plants at first, as well as on the application of every fresh lining. In a few days after a cucumber-bed has been planted, the "heat of the dung begins to decline, and perhaps the weather changes from fine, and becomes cold, wet, and gloomy; and in that case a lining of fresh dung to enliven the heat of the bed is undoubtedly required. When this fresh lining is applied, it sets the bed into a fresh fermentation, and very frequently gives too much bottom-heat, and it even often happens that the heat becomes too great under the plants before a lining is applied; for the heat of a dung-bed is changeable, and is raised and lowered by the changes of the weather."

"There is no necessity for having heat directly underneath the roots of the plants; for if the air in the frames be kept up to a proper degree of heat, that is sufficient. In climates where the cucumber naturally grows, I apprehend there is no heat in the earth but what is raised in it by the heat of the sun and the circumambient air, which seems to be warmed by the reflection of the sun upon the earth."

2. The risk of destroying the plants by impure air, and steam from the bed. "It is not only necessary that in the frames the air be kept up to a sufficient degree of heat, but it is absolutely necessary that nothing pernicious or unwholesome be conveyed into, or caused to arise in, the frames among the plants by means of that heat. If the steam of the linings get in, it will hurt the plants: and if there be any thing which smells disagreeably in the mould, or underneath the mould in the frames, the heat of the linings will cause unhealthy vapors to ascend from it, which in time will prove injurious to the plants. So that, although there may be a degree of heat in the frames strong enough for the growth of the plants, yet, through means of that heat, something may arise in the frames which will become progressively, if not almost instantaneously, destructive of the plants, especially when they are young and tender. Care, therefore, must be taken that nothing be introduced into the frames among the plants but what is of a sweet wholesome nature.

3. The difficulty of keeping up the proper heat in winter.

"4. The great attention and expence attending the formation and general management of dung-beds in winter.

The chief advantages of M'Phail's pit seem to be: —

1. That the coldest place in the bed is exactly in the centre of each pit, from which centre the heat increases on each side to the linings where the heat begins. "The plants being planted, he says, in this centre, or coldest part of the bed, their roots can never be hurt by the heat increasing on each side gradually, being in every respect suitable for their increase and extension."

"The heat in the centre of each pit, just where the plants are first planted, seldom rises higher than to about eighty or eighty-five degrees, nor does it ever rise higher in any part of the pits than about ninety-six or ninety-seven degrees; nor do I believe it ever can be raised higher than that, without scorching the plants by top heat or heated air: whereas, in a bed made of dung, the heat in the centre of the bed, under the mould in which the plants are planted, frequently rises to above 120 degrees, when, at the same time, the air in the frames can scarcely be kept up to a proper degree of heat; this frequently happens in cold weather in winter. The scorching heat of a hot-bed of horse-dung, when too hot for plants, is equal to 130 degrees and more, and hereabout is probably the heat of blood in fevers."

2. "The dung for the linings of the bed of my invention requires no more working than what is necessary to bring it to and keep it in a proper degree of heat, and to let some of its more rancid qualities pass off by evaporation; and as soon as the heat rises in the linings, it circulates in the flues, and warms every part of the bed; whereas the dung for making a common cucumber-bed must be turned and worked, and lie,

till, by fermentation, its rank qualities be evaporated, and its violent heat be somewhat diminished." This, as already noticed, is a very great advantage.

3. "The linings of my brick-bed seem to retain the heat longer than the linings of a dung-bed do, and that because the flues are constantly full of steam; but a dung-bed having little or no vacuity for the retention of the steam, the steam of the linings of it is perhaps more immediately evaporated, and consequently the heat of the linings is sooner exhausted than the heat of the linings of the brick-bed."

4. "In the course of the winter a dung-bed sinks so low, that it becomes difficult sometimes to get a proper heat raised in the linings; but my brick-bed being always of the same height, such difficulty can never happen."

5. "A brick-bed may be built and set to work immediately; the heat of the linings will dry the lime of the joints of the bricks. The evaporation in the frames, from the moist lime of the joints of the brick-work, has no bad effect on the plants; but when a bed is set to work before it be dry and steady, great care must be taken not to injure the brick-work in filling up the pits."

6. "All the materials of my newly-invented bed are clean and sweet; and the flues being made perfectly close, no tainted or bad-smelling air can get through them into the bed, so that it is of little or no concern whether the dung of the linings be sweet or otherwise, or whether the linings be made of dung, or of any thing else, provided there be a sufficient heat kept in them, and no pernicious steam be drawn in among the plants by the current of air."

The plan of M'Phail's pit has already been given and described (626, and *fig.* 140.) It is almost needless to repeat that a sheltered dry situation for placing it is of the first consequence. The bed being built, "when the frame is about to be set upon it, a layer of mortar is spread all round upon the upper course of brick-work on which the bottoms of the frames are to rest. Thus the frames are set in mortar on the bricks; and the flues are, with a bricklayer's brush, well washed, and rubbed with a thick grout made of lime and water, which stops every crack or hole, and prevents the steam of the linings from getting into the frames. This washing of the flues I had done once a-year, for no crack or hole must ever be suffered to remain unstopped in the flues.

"I found little or no trouble in keeping the flues perfectly close, nor is it indeed likely that they should become troublesome if the bed stands on a sound foundation, for the heat of the dung has not that powerful effect on the flues, as fire-heat has on the flues of a hot-house; because the heat of dung is more steady, and not so violent as the heat of fire; and besides, the flues of the cucumber-bed are almost always in a moist state, which is a preventative in them against cracking or rending.

"When the bed is first built, the pits are about three feet in depth below the surface of the flues. These pits I had filled up about a foot high, some of them with rough chalk, some of them with small stones, and some of them with brickbats: this is to let the wet drain off freely from the mould of the beds. After this filling up with chalk, stones, and broken bricks, there is a vacancy in the pits about two feet deep below the surface of the flues; this vacancy I had filled to a level with the surface of the flues with vegetable or leaf-mould; and in putting it in, it was gently pressed, to prevent it from sinking too much afterwards.

"On the surface of the mould with which the pits were filled, under the middle of each light, and which is just in the centre of the mould in each pit, make hills of mould in the same form as is commonly done on a dung-bed. These hills are to set the plants in, and are to be raised at first nearly close to, or within a few inches of the glass. Raising the mould at first pretty nigh the glass is necessary, on account of the sinking of it; for as the frames are set on bricks, they cannot sink, but mould newly put in is sure to settle, and the measure of settlement will ever depend upon the lightness and texture of the mould with which the pits are filled. Therefore, these and such like matters must be left to the discretion of those who are entrusted with the direction and management of the frames. When the bed is thus finished, and ready for the reception of the plants, if the flues be strewed over with mould, so that their surface be just covered, to a stranger it is altogether a deception, for in every respect it has the appearance of a dung-bed.

"The sashes of the frames which I used were glazed in lead; but if any person who rears early cucumbers have lights which are not glazed in lead, but are slate-glazed, the vacancies between the glass had best be filled up close with putty, to prevent too much air from getting into the frames in the cold days in winter. The frames under my management were constantly kept in good repair, and painted over once every year. This method, I am clearly of opinion, is more profitable than if the frames were neglected for two or three years, and then have a thorough repair with two or three coats of paint. When frames are new painted, they should be suffered to lie and sweeten for some time, at least for two or three weeks, or until the disagreeable smell of the paint be somewhat lessened.

"Although the frames I used were of a very good size, yet if they were a little smaller or larger, they would answer the purpose very well. Therefore those who intend to build a bed after my plan, have no occasion to make new frames merely for the purpose, but they may get the bed built to fit the frames they are already in possession of."

"The linings are to be applied to the bed a few days before the plants are ready for finally planting out, in order that the mould and every thing in the frames may be properly warmed for their reception.

"The dung of which the linings are to be made may either be cast together in a heap, to bring it to a heat before it be laid round the bed, or it may be laid round the bed as it is brought from the dung-yard; but whichever of these methods be taken, when the linings are making up, the dung should be well-shaken, and laid up lightly, so that the heat of it may come up freely. As it takes some days before the linings are able to warm the earth in the bed sufficiently for the reception of the plants, the rank steam of new dung linings is evaporated, unless the dung came immediately from the stables, which seldom is the case.

"The linings are to be made nearly three feet broad in their foundation, and tapered up to about thirty inches at the top, by which they will retain their heat long, and in sinking will keep close to the bed, which is what should at all times be paid proper attention to.

"In the winter and spring months the linings should be trodden upon as little as possible, for treading on them would be the means of stagnating their heat. But should it at any time, in managing the plants, be found necessary to stand or kneel upon them, boards should be laid on their tops for that purpose; which will prevent the weight of a person from taking that effect on them which it otherwise would do.

"As the linings sink, they are to be raised with fresh dung; but they should seldom be raised higher than about the level of the mould in the frames in which the plants grow, especially when there is a strong heat in them; for, when there is a great heat in them, if they are kept higher than the level of the mould, the heat dries the air in the frames too much. Nor should they be suffered to sink much below the level of the mould in the frames; for that, on the contrary, would cause too much moisture in the frames, especially in the winter and spring months.

"When the heat begins to be too little, notwithstanding the linings being kept to their proper height, the fresh unexhausted dung on the top or upper part of them is to be laid aside, and the exhausted dung underneath to be taken away, and that which was laid aside put in the foundation, and fresh dung laid above it in lieu of that which was carried away.

"Both the side linings may be raised at one time, but both of them should never be renewed together; for if both were to be renewed at the same time, it would for a time cool the frames too much, and when the heat of both came to its full strength, it would probably be too powerful for the roots of the plants when extended to the flues.

"I seldom or never renewed the end linings, because I found the heat of the side ones fully sufficient; for as there are flues or vacuities in every part of the bed, the steam, being fluid, circulates in, and warms every part thereof. And for the very same reason there is no occasion for having a strong heat in both the side linings at one and the same time, except in very cold weather. In making up and pulling down the linings, care should be taken not to injure the brick-work.

"The covering the lights in the winter and spring is absolutely necessary; for, notwithstanding the heat of the linings, it would be impossible to keep up a proper degree of heat in the frames for the plants without coverings. Therefore, the covering up in the evenings, and uncovering in the mornings, must be particularly attended to, and more or less put on according to the heat of the linings and the temperature of the weather."

"After the bed is set to work, heat and sweet moisture are the two principal agents required for promoting the growth and vigor of the plants; therefore, if there be a heat kept in the linings strong enough to keep the heat in the centre of the pits of mould fluctuating between eighty and ninety degrees, cold water may be poured on the flues twice or thrice a-week. There is no danger of creating damps or impure air in the frames by watering the flues; for the water is no sooner poured on them, than it runs down their sides, and passes clear off through the drains of the bed; consequently water being poured upon the flues, gives only a momentary check to the heat of the frames; for the flues being at all times full of hot steam, when the watering is finished, the heat quickly resumes its former vivacity, and raises a warm vapor in the frames, well adapted for promoting vegetation, and for increasing the growth, and invigorating the plant in all its parts.

"The mould round about the sides of the pits close against the inner sides of the flues, should be kept nearly on a level with the surface of the flues; and as it is the mould that joins to the flues which receives the first and greatest heat from the linings, it should continually be kept in a moist state; for if the mould against the flues be suffered to become dry and husky, air will be generated in the frames disagreeable to the plants."

In all other respects, the culture of the cucumber or melon, on M'Phail's brick-bed, corresponds with the culture of these fruits on common dung-beds.

M'Phail has, in his "*Gardener's Remembrancer,*" as well as in his "*Treatise on the Cucumber,*" given the temperature of one of his beds for every day in the year, of which the following table shows the extremes for every month.

		Morn.		Noon.		Even.
Jan.	from	58 to 86	from	56 to 86	from	54 to 77
Feb.	from	68 to 88	from	66 to 90	from	58 to 84
Mar.	from	62 to 85	from	65 to 90	from	62 to 85
April	from	69 to 84	from	68 to 93	from	64 to 90
May	from	67 to 79	from	70 to 90	from	66 to 96
June	from	62 to 85	from	80 to 98	from	67 to 90
July	from	61 to 79	from	72 to 105	from	69 to 95
Aug.	from	60 to 78	from	80 to 96	from	70 to 89
Sept.	from	69 to 80	from	74 to 100	from	72 to 97
Oct.	from	64 to 81	from	71 to 101	from	68 to 89
Nov.	from	62 to 82	from	65 to 92	from	61 to 80
Dec.	from	65 to 88	from	64 to 77	from	56 to 71

"By the heat described in these tables, and plenty of water, the cucumber-plants, the seeds of which were sown on the 22d day of October, were maintained in a healthy fruit-bearing state, in the brick frame of my inventing, from the month of January to the beginning of December. The melon-plants in the management of the author were kept in about the same degree of heat which he has given for the culture of the cucumber in the forcing-frames; and he ventures to predict, that if any person keep melon or cucumber-plants in nearly the same degrees of heat as are set down in the following plain tables, and manage the plants well in other respects, the way to do which he thinks he has clearly pointed out in this treatise, he is persuaded they will not fail of having success."

He adds, that notwithstanding the objections of some who have not been successful in making trial of his bed, "it is now generally approved of, and in practice by numbers of the best gentlemen's gardeners in the kingdom; and by various market-gardeners in the neighbourhood of London."

We may be allowed to subjoin, as our opinion, that West's pit (1164. and *fig.* 312.) seems superior to M'Phail's, as requiring much less dung; presenting a much more neat and orderly appearance, and giving a greater command of temperature.

1262. *Cultivation of the Cucumber in a common Pit without Flues.* Some form a narrow dung-bed along the middle of such a pit, leaving room for adding a lining on each side when the heat declines. This method succeeds very well late in the season; but at an early period the sinking of the bed from the glass leaves the plants at a great distance from the light.

Cultivation of the Cucumber in Stoves. "Cucumber plants," M'Phail observes, "will grow in a hot-house where the pine-apple is cultivated; but they will not be very long-lived there, for that is not a healthy climate for them."

In August, sow the seeds in boxes filled with vegetable or other light earth, and place them on shelves in the back side of the hot-house, where the sun may not be interrupted from shining on them in the short days. They may, perhaps, produce a few fruit in the month of December or January. *Gard. Remem.* p. 301.

Abercrombie says, "Some gardeners, ambitious of early fruit, try a sowing in the stove under the disadvantages of December. For fruiting this plant in the house, narrow boxes, three feet long, and full twenty inches deep, may be found more commodious than pots. The boxes may stand upon the crib-trellising over the flues, — or be suspended near the back-wall eighteen inches from the upper tier of lights, so as not to shade the regular house-plants: this is the best situation for a very early crop. The plants may be originated in small pots, plunged into the bark-bed, in order to be transplanted with a ball of earth into the boxes. Those who aim to have fruit at Christmas, introduce seedlings about the middle of August."

"The chief deviation from the course of the hot-bed is, that the plants must be trained in the house upright; for which purpose form a light temporary trellis of laths. Give water every other day at least." *Pract. Gard.* p. 618.

We have already quoted the particulars of Aiton's method of raising cucumber-plants in August, with a view to their being fruited in the stove through the winter. We now subjoin the remainder of that excellent paper.

The plants being raised on a well-prepared one-light hot-bed; "when the cotyledons or seed-leaves became nearly of full growth, the plants were potted out two into each pot, known to gardeners about London by the name of *upright thirty-twos.* When these pots became filled with roots, the plants were again shifted into larger ones called *sixteens,* and removed from the seed-bed into a three-light frame, with a sufficient bottom-heat to allow a considerable portion of air being given day and night, both in the front and back of the frame. About the middle of September, the plants having again filled their pots with roots and become storky, were taken from the frame to the stove, and after a few days received the last shifting into larger pots of the following dimensions: at the top fourteen inches over: the bottom ten inches across, and twelve inches deep, all inside measure; each pot at equal distances apart, having three side-drain-holes near the bottom, and a larger one in the centre of the bottom, and containing about three pecks of solid earth.

"The cucumber-plants were fruited this season in a pinery. On the front edge of the back flue of this stove, a fascia-boarding, six inches deep, was affixed, the whole length of the building, forming all along a trough or inclosure for a reserve of compost after the exhaustion of the mould in the pots had taken place. The pots were now placed in regular order upon the mould-trough over the flue, at three feet apart, and remained in this station for good, for succession. A setting of the second sowing was placed upon the end flues of the house; underneath each pot was set an upright circular garden pan, six inches deep, and fourteen inches diameter, which being filled with earth, the pots were plunged therein about two inches deep, and the drain-holes being sufficiently covered with mould, served as outlets to the roots.

"From this time, the fire-heat of the stove was kept day and night at sixty to sixty-five degrees Fahrenheit's thermometer, varying only a few degrees when the sudden influence of sun or steam produced an additional glow of climate. The plants being now established and vigorous, required stopping for laterals and fruit; and these second and third lateral shoots in their turn were stopped also, and the blossoms from time to time set, as usual, for succession of supply.

"Waterings were necessary only when the surface of the earth was evidently dry, and light sprinklings of soft water, tempered in the stove, were occasionally given over the leaves of the plants and path with good effect.

"Steam from a well-regulated flue was considered always favorable to the cultivation, but applied sparingly on account of its scalding effect upon the leaves when the vapor proved over-heated.

"For the mildew flower of brimstone, colored leaf-green by a little soot, has been applied with the best success in all stages of the disease, and copious fumigations of tobacco were used for the destruction of the several species of the aphis tribe.

"Under this simple practice, winter-cucumbers have been produced abundantly in the months of October, November, December, and part of January, in all the royal gardens of His Majesty, during a series of years."

Cultivation of the Cucumber in Weeks's Patent Frame (625.). We know only of two instances in which this ingenious invention has been tried, both of which are mentioned at the end of "*Weeks's Forcer's Assistant.*" The chief objection to the plan is, that the bed or stratum of earth in which the plants are grown being but of moderate depth, and surrounded by air above and below, is extremely difficult to retain at an equable moisture.

Sect. VII. *Of the Culture of the Melon.*

1263. This exotic requires the aid of artificial heat in the greater part of the year, and even in the warmest months, it cannot be brought to perfection without the protection of glass. Its culture is an object of emulation among gardeners; and the fruit of the best sorts have a peculiarly rich flavor, thought by some to bear some resemblance to that of the pine.

"Ripe fruit," Abercrombie observes, "may be had by forcing at any season; but the main crops raised for the general demand, are seldom cut, at the earliest, before May, and the last succession mostly ceases to yield fruit after October."

"To ripen the best, largest, fine kinds," M'Phail observes, "as great an atmospherical heat, and a bottom-heat to its roots also, is required as is sufficient to ripen the pine-apple in this country; but as the melon is produced from an annual plant, the seeds of which must be sown every year, it requires a different mode of culture. Different methods of culture and various kinds of earths and of manures have been recommended, and used successfully in rearing of melons. The great thing after planting is to give them plenty of atmospherical heat, and a sufficiency of external air and water. Those methods which are most simple and the least expensive, and best calculated to assist in making a suitable climate for the melon-plant to grow in and ripen its fruit well, should be preferred."

Soil. Abercrombie says, "The melon will succeed in any unexhausted loam, rich in vegetable rudiments, with a mixture of sand, but not too light. The following is a good compost: two-thirds of top-spit earth from a sheep common, adding sharp sand, if the earth contains little or none, till half is sand; one-sixth of vegetable mould; and one-sixth of well-consumed horse-dung. Or, if the earth is not obtained from a pasture, rotted sheep-dung may be substituted for the last. The ingredients should have been incorporated and pulverized by long previous exposure and turning over. The compost should be dried under shelter before it is used, and warmed in the frame for potting."

M'Phail says, "Melons will grow and produce fruit of a good flavor, if they be planted in any kind of earth not of too light a texture, whether it be taken from a quarter of the kitchen garden or from a corn-field mixed well with good rotten dung; but earth of a loamy nature is the best, because it retains moisture longer than light earth. Earth dug from the surface of a common, where sheep and cattle have long been pastured, is excellent for the melon. It should be broken well, and lie a few months before it be used; and if it be exposed to a winter's frost, it will do it good. This sort of earth, if it be taken from the surface of the common, will require no manure the first year of using. I would here mention, that unless the earth which I used for the melon-plants was very strong, I made it a practice, when the melon-beds were wholly earthed up, to tread the surface all over, which makes the earth retain its moisture longer than if it were left loose."

"Earth for melons," according to Nicol, "may be thus composed: one half strong brown loam from a pasture; a quarter light sandy earth; an eighth part vegetable mould of decayed tree leaves; and an eighth part rotten stable-yard dung. The mould for both cucumbers and melons should be well incorporated; should be exposed to the frost, and be frequently turned over to meliorate."

It appears from a passage in Morier's second journey into Persia (p. 147.), that pigeons'-dung has from time immemorial been much sought after for manuring melons. Immense pigeon-houses are built on purpose to collect it, and when there is a dearth, as melons produce the earliest return of food, every one is eager to cultivate them, and doves'-dung being then in great demand, sells very high. During the famine in Samaria, mentioned in 2 Kings, ch. vi. it is said to have sold for five pieces of silver the cub.

1264. *Sorts.* The following list is given by Abercrombie.

Netted cantaleupe, large round.
Early small black rock cantaleupe.
Carbuncled rock cantaleupe, cheese-shaped.
Green cantaleupe (oblong rock).
Orange cantaleupe
Early golden cantaleupe.
Scarlet cantaleupe.
Silver cantaleupe.
Small romana, oval.
Larger netted romana, oval.
Polignac.
Musk, or oblong ribbed, netted-rinded.
Oblong, smooth-rinded.
Round, smooth, green-rinded.
Round white-rinded.
Green-fleshed.
Water melon, a very large roundish green fruit.

Nicol enumerates the following in the order in which they ripen.

The early golden cantaleupe.
The orange cantaleupe.
The netted cantaleupe.
The silver cantaleupe.
The black rock cantaleupe.
The carbuncled rock.
Lee's rock cantaleupe.
Lee's romana.
Large netted romana.
Fair's romana.

Estimate of Sorts. "The cantaleupes are in high estimation for their general superior flavor, although not uniformly such great bearers as some others in the list; they are besides admired for their handsome and curious shapes, some of them growing very large. The netted cantaleupe is a good bearer; the fruit above the middle size, round, heavy, full of juice, and high flavored. The early small black rock cantaleupe is a good bearer: but there is a large black rock which holds an inferior rank, both for bearing and the flavor of the fruit. Of the carbuncled rock, there are two sorts: the smaller is by far the best. The green cantaleupe has a dark green rind, with a pale pulp, grows rather larger than the early black rock, and vies with it in flavor. The orange cantaleupe is an excellent early variety, a great bearer; the fruit under the middle size, but juicy, and of the most generous flavor. The early golden and prolific sets speedily, and soon ripen; the fruit middle-sized, the flavor not so elevated as might be expected from a cantaleupe. The silver cantaleupe bears freely; the fruit middle-sized, and for flavor ranking with the finest. The small romana is one of the most plentiful bearers, either for an early or main crop; the fruit not abundantly juicy, but good flavored. The larger netted romana bears more freely than large sorts in general; the fruit is substantial and heavy, a single melon sometimes weighing ten pounds, not so juicy as the best cantaleupes, but the flavor high and grateful. The polignac is also a rich-flavored fruit. The old oblong-ribbed is generally a good bearer, and the fruit agreeably flavored. The other kinds also will ripen here in good perfection, except the water-melon, which does not always ripen freely with a good full flavor. The principal culture, however, the cantaleupes, romanas, and polignac, are indisputably preferable: any of the others may be adopted in secondary crops, or for variety."

M'Phail says, "Several sorts of melons are not worth propagating, that is, in the estimation of some persons; but there are some kinds of them, such as the early cantaleupes and the rock cantaleupes, which, when well ripened, are delicious in flavor, and very wholesome in quality. Of the varieties, there are those called the rock cantaleupe, the early small black, large black, the orange, the golden, the silver, the green, the carbuncled, the netted, the Roman, the musk, and the scarlet cantaleupes, and likewise the oblong-ribbed, the smooth-rind, the round white, the green-fleshed, the water-melon, &c."

1265. *Time of beginning to force.* "From the time of sowing, ripe fruit may be cut in about fifteen weeks, as an average period: when many short and wintry days fall in the course, it may last eighteen weeks; but when the forcing is not commenced till the days are nearly twelve hours long, and continually lengthening, ripe fruit is sometimes cut in ten weeks. The period also depends upon the sort. Little time is gained by beginning excessively early. The early and main crops are commonly originated from the middle of January to the first week of February; the later or succession crops, at the beginning of March; and late crops intended to fruit at the end of summer, in the middle of April."

M'Phail and Nicol sow in January. The latter says, "I formerly cut melons, for three years successively, on the 15th, 12th, and 10th May, and never sowed before the last week of January, or first of February. In 1788, when at Rainham Hall, in Norfolk, I sowed melons on the 12th March, and cut ripe fruit on the 20th May. The kind was the early golden cantaleupe. This shows how little is to be gained, or rather, how much may be lost, by early forcing."

Forming the Seed-Bed. The plants may be originated in a cucumber-bed, and this is the general practice; but Abercrombie prefers a separate bed, built a slight degree higher than for the cucumber, at the same season, and adapted to a one or two light frame, according to the quantity to be raised.

Nicol raises the melon almost exactly in the same way as the cucumber, and there is very little difference in his subsequent culture of these plants.

Choice of Seed. "Seed under the age of two years is apt to run too much to vine, and show only male flowers; but new seed may be mellowed by being carried in the pocket a fortnight or more, till the heat of the body has dried and hardened it. Seed, twenty years old, has been known to grow and make fruitful plants; but seed, which has been kept three or four years, is quite old enough, and less likely to fail than older."

M'Phail says, "It is best not to sow melon seed till it be two or three years old. It cannot be too old if it be sound and grow well. Young seed is apt to run too much to vine, and to show more male than female blossoms."

Nicol says, "I have sown melon seeds twenty years old, from which I have raised very healthy and fruitful plants." *Kal.* p. 396.

Miller and Nicol say, young melon seeds may be worn in the pocket, near the body, for several months previous to sowing, which has the effect of fully maturing them. "If seeds of the last season," Nicol observes, "be sown without taking this precaution, or something similar, the plants will not be fruitful; but will run much to vines, and show chiefly male blossoms." *Kal.* p. 396.

Sowing. Abercrombie says, "Having moulded the bed, and proved the heat, sow in pans three inches, or pots four inches, deep, rather than in the earth of the bed. Sow a second portion in five or seven days, to provide against failure. Do not at once plunge the pots to the rims." *Pr. G.* p. 108.

1266. *Treatment till removed to the Fruiting-Pit.* "As soon as the plants appear, give air cautiously; guarding the aperture with matting at night, and on frosty or gloomy days. At favorable opportunities, wipe the condensed steam from the glasses. When the seed-leaves are about half an inch broad, prick the plants into small pots five inches in diameter, three in each pot, giving a little aired water just to the roots; then plunge the pots into the earth of the hot-bed partially, or to the rims, according to the heat. Admit fresh air, every day in moderate weather, at the upper end of the lights, raised an inch or two, according to the temperature of the external air; more freely when sunny than cloudy; shutting closer, or quite close, as the afternoon advances towards evening, or sooner, if the weather changes cuttingly cold; and cover the glasses every night with mats, and uncover in the morning, as soon as the sun is high enough to reach the frames. Give occasionally a very light watering, when the earth appears dry. As the plants advance into the first rough leaves, the first runner-bud in the centre should be stopped, by cutting or pinching the top off, close to the first or second joint; an operation which strengthens the plants, and promotes a lateral issue of fruitful runners. Be careful to support a regular tenor of heat in the bed, by laying, first, an outward casing of straw-litter round the sides, to defend it from the weather; afterwards, if the heat declines, remove the above casing; and apply a moderate lining of hot dung to one or more of the sides. In matting at night, be careful not to drive the rank steam of the linings into the beds, by letting the ends of the mats hang down."

Fruiting-Bed. Form it as directed for the cucumber-bed, but six inches deeper; M'Phail says, "four feet high, and after it has stood about a week, tread it down and make it level, and set the frames upon it."

Moulding the Bed. Abercrombie directs to "mould it by degrees to eight, ten, or twelve inches depth; first laying the compost in little hills of that thickness, one under each light, with the intervals earthed only two or three inches, for the present, till the general heat is moderated."

M'Phail lays in under each light a small hill of earth about one foot high.

Planting. When the earth of the hills is warmed by the heat of the bed, and the plants have leaves two or three inches broad, or have begun to push lateral runners, turn them out of the pots "with the ball of earth entire: set a ball, containing one plant, in the middle of each hill, inserted clean over the ball; or set at most two plants under the centre of a large light. After planting, give a gentle watering over the hills and round the roots, avoiding to wet the shanks of the plants: shut down the glasses close, till the heat and steam rise; then give air moderately. Extend a slight shade over the glasses in the middle part of warm summer days, if the plants shrink or flag their leaves, before fully rooted in the hills; which they will be in two, three, or four days after planting."

1267. *Temperature.* The melon requires a minimum heat of about 65° from the time of germination till that of fructification, and a heat of about 75° to fruit in. *Abercrombie.*

M'Phail, as appears from the tables in his "Gardener's Remembrancer," kept his melon and cucumber frames at the same temperature; stating, that if any person keep melons or cucumber plants in the same degrees of heat, they will not fail of success.

Nicol's medium heat for melons is 70°.

The proper temperature must be kept up by repeated linings, at least, till the middle of July. After that, sun-heat may suffice to ripen the crop. Till this season, the greatest care must be taken not to burn or over-heat the plants. M'Phail says, "Examine daily with your hand the heat of the bed, pushing your fingers into the dung immediately under the hills of earth in which the plants grow; and if you find the heat likely to be too powerful, pour cold water all round the bottom of the hills of earth, to lower the heat of the bed. Remember this must be daily attended to till the heat of the bed be so declined in the middle, that the roots of the plants be in no danger of being hurt by the heat of the dung under them. In case this necessary precaution has been neglected till the heat immediately under the stems of the plants has become too hot, pour plenty of water 80° warm round about on the sides of the hills in which the plants grow, and among the stems of the plants, which will bring the earth and dung immediately under the plants to the same degree of heat as the water which is poured into it. When the heat in the middle of the bed becomes so cool, that there is no fear of its being too great for the roots of the plants, watering that part of the bed to keep the burning-heat down, of course, must cease, and as the roots of the plants extend, earth may be added to the hills. As soon as the heat of the bed declines, linings must be applied to it, which will set it into a fresh fermentation, and then the surface upon the bed must be examined occasionally, by pushing the hand into it in different parts, and when a burning-heat is felt, pour in some water as before directed. In this way you should persevere, still keeping a strong heat in the linings. Remember that the surface of the bed all round about the hills should be left uncovered with earth, and the dung should be loosened occasionally, to let the heat rise freely to nourish the plants."

In July, "Melons will do without heat in the linings; but I found by experience, that they do best by keeping a heat in the linings all the summer. If a heat be kept on constantly in the linings, and the plants watered sufficiently, they will continue to produce fruit till the middle of October."

1268. *Air.* As long as weak steam is perceived to rise from the bed, leave an aperture, even at night, for it to escape; guarding against the influx of cold air by a curtain of matting. Admit fresh air to the plants by tilting the glasses more or less at the most favorable hours in a mild dry day. After the bed has come to a sweet heat, shut down close at night. As the fruit enlarges, it becomes more necessary to seize every proper opportunity of admitting air; raising the lights from one to four inches, according to the season, the heat of the bed, and temperature of the external air; shutting close, if that should turn cold, and always timely towards evening. As confirmed summer approaches, admit air still more freely.

Nicol says, "Air should be freely admitted, though not in such quantity as for the cucumbers, which do not require so high a temperature as melons do. In sunshine, however, the mercury in the thermometer should be kept down, by the admission of air, to about 80° or 75°."

M'Phail says, "Look into your melons in the morning, and if there is a dew on them standing like little beads round the edges of the young leaves, it is a good sign; but if there is no dew on them, in the form I have described, they are not in a very prosperous condition. The air in the frames is not sweet: they either want water, or sprinklings of water, or else the heat of the air in the frames is too great in the night. In hot weather, melons are better to have air left at them all night, and in very warm weather to take the glasses entirely off in the evening, and put them on again in the morning: by this means the plants will get a refreshment from the dew in the night."

1269. *Water.* After the plants are placed on the hills, give opportunely gentle waterings, increasing them as the season and the growth of the plants advance. "Water circumspectly and scantily while the fruit is setting or young in growth, as too much moisture would make it decay. Take a warm morning for watering, before the middle of May; in summer, the afternoon or evening. Use soft water warmed to the air of the frame; and let as little as possible fall on the setting or new-set young fruit; nor much near the main-head of the plants, for fear of rotting that part. Shut down the lights, after watering, for a short time; and if in the morning part, and a strong sun, spread a mat over, to prevent the sun from injuring the plants by acting on the water lodged on the spray and leaves. As a strong steam will now arise, remove the mats in an hour or two, and raise the glasses at the top, to give vent to the steam and admit air to the plants. As the fruit becomes nearly ripe, lessen the quantity of water given, barely keeping the plant from flagging; and withhold water when the fruit begins to turn color."

Nicol says, water once in four or five days in the afternoon, watering over the foliage. Repeat them oftener as the season and the growth of the plants and fruit advance, in order to swell it off the better. *Kalendar*, p. 387.

M'Phail says, "If the weather is warm and dry, the melons will probably sometimes require water twice a week; if the weather is wet and cloudy, they will not require it so often." *G. Rem.* p. 300.

It is probable considerable advantage would be obtained by the use of liquid pigeons' dung manure, as in the case of the cucumber. (See 1256.)

Knight, finding that the leaves of melons sustained great injury from the weight of the water falling from the watering-pot, pours the water on the tiles which cover the surface of the bed. See *Training.* (1270.)

Earthing. Perform this operation as directed for the cucumber, after the heat of the dung has become moderate, earthing up by degrees the intervals between the hills, till the depth of the earth become equal.

Eight or ten inches depth of earth, M'Phail states to be enough for the roots of the plants to run in, provided the bed, or fermenting mass beneath, be made of leaves of trees, or of dung well prepared; for if the bed under the earth be in a good state, the roots will grow into it, and draw from thence considerable nourishment to the plants. The roots of the melon do not naturally run deep; they extend horizontally, not far from the surface, especially in forcing frames, where the moist warm air is more confined than in the open atmosphere. *G. Rem.* p. 63.

In early forcing, leave unfilled up with earth a space of about seven or eight inches wide against the inside of the frames, immediately adjoining the hot linings. "By this method the heat of the linings do more powerfully warm the air in the frames than if the earth was made level home to the sides of the boards of the frames to which the linings adjoin. But if melons be not planted earlier than the month of May, this precaution need not be attended to, unless the weather prove uncommonly cold, and but little sunshine."

1270. *Training.* As the plants advance into the first runners, three or four joints in length, if no fruit be shown, stop them at the third joint, in order that they may produce fruitful laterals; and as the runners extend, train them over the surface of the bed with neat pegs. Many of these runners, as the plant proceeds, will show embryo fruit at the joints; but a great many barren ones are occasionally produced, and hence it becomes necessary to regulate them. Abercrombie says, "Cut out the superfluous, unfruitful, or evidently useless shoots, especially the very weak and the most luxuriant; for the middle-sized are the most fertile."

Nicol says, melons should be kept moderately thin of vines, though not so thin as cucumbers, (the foliage being smaller,) which should never be much lopped at a time, as they are also apt to bleed. All bruised, damped or decayed leaves should be carefully picked off as they appear, and the plants should be cleaned from weeds, and other rubbish that may be conveyed into the frames by the wind or otherwise.

M'Phail directs to "cut out of the melon frames all superfluous or decaying shoots. Stop the shoots a joint or two before the fruit, and also cut off the ends of the long running shoots immediately before a showing fruit, if there is a leading shoot coming out by the side of it; for you ought to remember always in pruning melons, that a fruit will not swell well except there be a growing shoot before it; and this shoot, which is called a leader, because it leads or draws the sap from the roots to and past the fruit, should be stopped before a joint that will, if the plant is in good health, sprout out again. Do not let your plants get too full of leaves; and cut off the oldest and worst leaves first. This ought to be done, at least, once or twice a week; by which method they will be nearly always in one medium state of thinness, and the plants and fruit will derive advantages which they would be deprived of were they to be suffered to become over-crowded with leaves and shoots, and then a great many cut out at one time. If melons are of a large kind, no more than one or two fruit should be left on a plant to swell off at one time; if smaller, three or four fruit may be left. *G. Rem.* p. 278.

Knight, in an ingenious and philosophical paper on the culture of the melon, states, that his crops of melons failed, because watering over the foliage, pruning, weeding, &c. had removed the leaves on the extended branches, from their proper position, and these leaves being heavy, broad, slender, and feeble, on long foot-stalks, were never able to regain it. " In consequence a large portion of that foliage which preceded, or was formed at the same period with the blossoms, and which nature intended to generate sap to feed the fruit, became diseased and sickly, and consequently out of office, before the fruit acquired maturity." To remedy this defect, the plants were placed at greater distances from each other, viz. one plant of the *Salonica* variety, to each light of six feet long by four feet wide. The earth was covered with tiles, and the branches trained in all directions, and hooked down over them with pegs. They were thus secured from being disturbed from their first position; the leaves were held erect, and at an equal distance from the glass, and enabled, if slightly moved from their proper position, to regain it. " I, however, still found that the leaves sustained great injury from the weight of the water falling from the watering pot; and I therefore ordered the water to be poured, from a vessel of a proper construction, upon the brick tiles, between the leaves, without at all touching them; and thus managed, I had the pleasure to see that the foliage remained erect and healthy. The fruit also grew with very extraordinary rapidity, ripened in an unusually short time, and acquired a degree of perfection, which I had never previously seen.

" As soon as a sufficient quantity of fruit (between twenty and thirty pounds) on each plant is set, I would recommend the further production of foliage to be prevented, by pinching off the lateral shoots as soon as produced, wherever more foliage cannot be exposed to the light. No part of the full-grown leaves should ever be destroyed before the fruit is gathered, unless they injure each other, by being too much crowded together: for each leaf, when full grown, however distant from the fruit, and growing on a distinct branch of the plant, still contributes to its support; and hence it arises, that when a plant has as great a number of growing fruit upon part of its branches, as it is capable of feeding, the blossoms upon other branches, which extend in an opposite direction, prove abortive." *Hort. Trans.* vol. i.

1271. *Setting.* As the fruit-bearers come into blossom, you may assist the setting of the fruit, by impregnating some of the female blossoms with the male flowers, as described for the cucumber. The melon, however, will also set naturally, and produce fertile seeds, if the time of fructification fall at a season when the glasses can be left almost constantly open. *Abercrombie.*

Nicol says, he has proved experimentally, that melons not impregnated will not swell off so fair and handsome as impregnated ones, and, therefore, considers it more necessary to attend to this operation in melons than in cucumbers. " Therefore, let nature be assisted in this work, considering that she is more under restraint here, than if the plants grew in the open air, where the wind, insects, and other casualties, might be helped." *Kalendar,* p. 384.

Care of the Fruit. As the fruit increases to the size of a walnut, place a flat tile or slate under each, to protect it from the damp of the earth; the slab thus interposed, will also assist the fruit to ripen, by reflecting the rays of the sun. *Abercrombie.*

M'Phail says, " The fruit should lie upon dry tiles, stones, or slates, and no leaves or shoots ought to be suffered to lie upon it. When the fruit is young, it is better to have a gentle shade of leaves; but when it is full swelled, it should be entirely exposed to the sun."

Nicol advises, placing the fruit on bits of slate or glass some time before it begins to ripen, as the flavor might else be tainted; but by no means slate or moss the whole surface of the bed, lest you encourage the red spider. " Think on the reflection of the sun upon the slates or tiles, in hot weather particularly, and of his additional force in shining through glass! It is more consonant to the nature of the plants that they be trained on the earth. By mossing the surface, the indolent may find a pretext, as it no doubt, in some measure, lessens the labor of watering. But it is wrong to do so, in so far as it harbours and encourages the breeding of various insects; and, as the fruit approach to maturity, taints it by unpleasant effluvia."

Time of Maturation. The interval between the setting of the fruit and perfect maturity is generally from thirty to forty days; but the plants in the same bed, and the vines on the same plant, often show some difference in the time of reaching maturity. *Abercrombie.*

Cutting the Fruit. " Ripe melons are distinguished by their full size; sometimes by turning yellowish, more constantly by imparting an agreeable odour; often by the base of the foot-stalk, close to the fruit, cracking in a little circle. On these indications of maturity, the fruit should be cut, before too mellow or dead-ripe, that it may eat with a lively sharp flavor. The morning is the time for cutting."

"Melons," Nicol observes, "if allowed to remain on the plant till they be of a deep yellow color, (which many do), lose much of their flavor. They should, therefore, be cut as soon as they begin to change to a greenish-yellow, or rather, as soon as they begin to smell ripe. They may lie in the frame for a day or two, if not immediately wanted, where they will acquire sufficient color. But if they are let remain many days in the frame, they will become as insipid as if they had been left too long on the plant."

Saving Seed. The ordinary mode is to request the seeds of particularly fine fruits, of approved sorts, to be returned from table. The best way, however, is to pick some best ripe fruit, take out the seed, clean it from the pulp, and let it be well dried and hardened; and then put it up in papers. *Abercrombie.*

Nicol says, wash it very clean, skimming off the light seeds, as those only that sink in water will grow. *Kal.* p. 396.

Great care must be taken that the sorts, from which seeds are saved, are genuine and distinct. When different sorts are planted in the same frame, this cannot be the case.

1272. *Second Crop from the same Plants.* "When the fruit of the first crop is off, a second crop may be obtained from the stools; which often proves more productive than the first. If the first crop is taken before the middle of June, the second will come in at a very good time. For this purpose, as soon as the fruit is cut, prune the plant. Shorten the vigorous healthy runners at a promising joint, to force out new laterals; cutting about two inches above the joint. At the same time take off all decayed or sickly vines, and all dead leaves. Stir the surface of the mould; and renew it partially, by three inches depth of fresh compost. Water the plant copiously; shutting down the glasses for the night. Shade in the middle of hot days; and give but little air until the plant has made new radicles and shoots. Afterwards repeat the course of culture above described, from the stage when the first runners are sent out till fruit is cut."

Nicol says, "When all the fruit of this crop are cut, suppose in three or four weeks, the plants may be pruned for the production of a second crop, equal, and perhaps superior to the first. They should be cut pretty much in, in order to cause them push plenty of new vines, which will be very fruitful; observing to cut always at a joint of some promise, and to thin out all decayed or unhealthy vines, dead leaves, &c. Observe, also, to cut at an inch or two above the joint you expect to push, and then to bruise the end of the stem so lopped with the thumb and finger; which will, in a great measure, prevent it from bleeding. The plants should be shaded from the mid-day sun, for a week or ten days; exposing them to his full rays by degrees. Now, also, let the mould in the frame be well watered, in order to put the roots in a state of active vegetation; point over the surface, with a small stick, or little wedge; and cover the whole with about two inches of fresh mould. This will greatly encourage the plants, and cause them to make new fibres near the surface. At this period, air need not be admitted very freely, especially while the glasses are covered; but rather, as it were, endeavour to force the plants into new life. After they begin to shoot, water, admit air, prune, train, and otherwise manage the plants as before directed. If the season be fine, they may yield you a third crop, by a repetition of the above rules, coming in in September, which might be very gratifying. I once had fifty-two full-sized fruit produced in a three-light frame, a second crop, and two dozen a third, off the same plants, the early golden cantaleupe. Of the first crop, (twenty-six fruit), two were cut the 10th of May. Thus, a three-light box produced, in one season, 102 full-matured melons."

M'Phail says, "If you intend to have melons as long as there is a sufficiency of sun to ripen them tolerably well, you had best put linings of warm dung to some of your beds. These, if applied in time and kept on, will cast a fresh heat into the beds, and, with other necessary assistance, the plants will grow as long as you want them."

1273. *Late Crop on old Hot-beds.* To ripen melons, not earlier than the month of August, M'Phail "generally made beds of dung which had first been used for linings to the early cucumber and melon-beds. For this purpose, this kind of dung is better than new dung, because it does not heat violently, and for a considerable time keeps its heat. Leaves of trees make very good melon-beds, but they do not produce heat enough alone for linings; but of whatever materials melon-beds be made, the air in the frames among the plants should be kept sweet and strong, otherwise the plants will not grow freely. It may be known whether the air be sweet or whether it be not, by putting the head in under the lights, and smelling it. But it frequently happens to be difficult to bring dung-beds into a requisite state of kindliness for these delicate plants, for if the dung by any means get and retain too much water before its noxious vapors pass off by evaporation, it will stagnate and become sour, and, until these pernicious qualities be removed, which requires time and patience, the plants will not grow kindly; and besides this, although corrupted, stinking air hinders the growth of plants of the melon kind, it greatly promotes the health and forwards the breeding of different kinds of insects, which feed upon and otherways hurt fruits, and plants, and esculent vegetables of various kinds."

Insects and Diseases. To prevent melon plants from being infested with insects, or injured by disease of any kind, no better method can be adopted than to keep the plants constantly in a healthy, vigorous, growing state; for this purpose, M'Phail observes, "they must be constantly attended to, giving them plenty of heat and water. In warm weather, in the spring and in summer, they should be watered occasionally all over their fruit and leaves, till the earth in which they grow be thoroughly moistened, and a stronger heat than usual kept in the frames about the plants for a few hours; also the lights should be shut down every afternoon, with a good strong heat among the plants. If there be sufficient moisture in the earth, the greatest sun-heat in the afternoon will not hurt the plants, but it might scorch the sides of large fruit exposed to the sun beams operating upon the glass, which should be guarded against. The frames and lights should be kept clean, and painted over once every other year.

"Melon plants are subject to be infected and hurt by the mildew and by the canker. These diseases come upon them because they are not in a good climate, they have not a sufficiency of heat, or the dung and earth of the bed is in a stagnated state. Melon plants are liable to be greatly injured by an insect called the red spider, which increaseth surprisingly in hot dry weather. As I said before, nothing will prevent plants from the inroads of disease and insects but heat, sweet air, and a sufficiency of water, which sweetens the atmosphere, and makes it healthy for vegetables as well as for animals. And nothing will radicate disease and insects from melon plants but good management, strong heat, and plenty of water given all over them. Diseased plants, or plants much infested with insects, cannot produce good healthy fruit. The mildew is a most pernicious disease to all sorts of plants. On melons it generally makes its first appearance on the oldest leaves and on the extremities of the young shoots. The cause of it, I apprehend, is, unhealthy nourishment comprehended in the elements, or their not harmonizing in the promotion of the growth of the plant; for by practitioners it may be observed, that when a dung hot-bed gets into a stagnated sour state, the plants do not grow kindly, the air in the frames is saturated with unhealthy particles, and so also must be the juices drawn into the plants by their roots. These must breed diseases, if preventive means be not applied. It cannot be reasonably supposed that plants of a delicate nature will continue in a healthy state, growing upon a heap of stinking dung, and in confined air.

"When melon plants have become diseased, or much infested with the red spider, they should either be destroyed or effectual means used to cure them. To destroy the plants is easy; to cure them let the following methods be put in practice: get plenty of horse-dung thrown up in a large heap, turn it over once or twice, shaking and mixing it well, and let it lie till its rankness be somewhat evaporated, and if there be linings at the beds, take them entirely away; examine the dung of the beds, and if it be wet and has a bad smell, take a sharp-pointed stake and make holes all round in the sides of the beds into their centre, in such a slanting way that the water may easily run out of them; then make a strong lining of the prepared dung all round the beds, and by occasional augmentations keep up the linings nearly to a level with the surface of the earth in which the plants grow. As soon as the linings have cast a strong heat into the beds, scatter some flour of sulphur all over the plants, and keep as strong a heat in the frames as the plant can bear; a heat of 120 degrees will not destroy them, if the steam of the linings be prevented from getting in among the plants. Water the plants all over their leaves about once a week with clean water 100 degrees warm, and if the sun shine, keep the lights close shut down all day, and cover them up in the evening, leaving a little air all night at each light, to prevent a stagnation of air among the plants. Continue this process till the mildew and the insects disappear, and the plants appear to grow freely, and afterwards manage them in the usual way, taking care to keep up a good strong heat in the linings. This method sets the old stagnated bed in a fermentation, which makes the moisture run out of it, and dries it so, that water given to the plants has free liberty to pass off. If the linings do not heat the air in the frames sufficiently, let some of the earth in the inside all round the sides of the boards be removed, to let the heat from the linings rise freely in the frame."

1274. *Culture of Melons in a Dung-Pit.* "A glazed pit to receive either stable-dung, leaves, or tanners'-bark, is calculated to ripen superior fine fruit. The well of the pit may be formed either by a nine-inch wall, or by strong planking: a yard in depth, from six to eight feet wide, and in length from ten to twenty feet, or more, as required. A low glass-case is to be fitted to it, adapted to the growth of the melon. Having raised the plants in a small seed-bed as for the frame crop, ridge them out into the pit in the usual manner. Give the proper subsequent culture; and when the strength of the fermenting mass begins to decline, add linings outside the pit, if enclosed by boards; but if enclosed by a nine-inch wall, cut away as much of the dung and earth within, and throw it out, as will admit a lining of well-tempered dung." *Abercrombie.*

Culture of Melons in a Flued-Pit. One such as that proper for the nursing pinery is here understood; and the plants being raised in the usual way, and the bed, whether filled with dung, tan, or leaves, or a mixture of these, being moulded, plant about the end of July. Nicol prefers for such late crops "the early golden cantaleupe, the orange cantaleupe, and the netted cantaleupe, planting a part of the pit with each."

"A very mild bottom-heat is sufficient for the purpose here in view; and if the pit have been occupied in the forcing of asparagus, French beans, or strawberries, on a bark, or bark and dung, or on a bark and leaf heat, it will require no other preparation than to be stirred up, and have a little fresh materials added; keeping the fresh bark, dung, or leaves well down, and finishing the bed with some of the smallest and best reduced. When it has settled a few days, let it be moulded all over to the thickness of twelve or fifteen inches; previously laying on a little more of the above small materials, in order to keep the plants well up to the glass, as the bed will fall considerably in the settling. It should be formed, and the mould should be laid on, in a sloping manner, from back to front, so as in some measure to correspond with the glasses. All being ready for the plants, they may either be planted in a row in the middle of the pit, at two feet apart, or may be planted in two rows at four feet apart; or, if they have been planted, in nursing, three in a pot, plant in the centre of each light, as directed for the common hot-bed in March. Let them have a little water, and be shaded from the sun for a few days; exposing them to his rays by degrees. The future management of the plants differs in nothing from that of melons in a hot-bed, till September, when it will be proper to apply fire-heat." "About the beginning of September, it will be proper to apply fire-heat, in order to further the progress of the late fruit, and to dry off damps. Let the fires be made very moderate at first, however, and increase their strength, as the season becomes more cold and wet. Keep the mercury up to about 70° in the night; and in the day, by the admission of air, keep it down to about 80°, or 75°. Very little water will now suffice for the plants, as their roots will be fully established, and be spread over the whole bed; the heat of which will also now have subsided. They should only, therefore, have a little water once in eight or ten days; and, as the fruit begin to ripen off, entirely withhold it. Keep the plants moderately thin of vines and foliage; be careful to pick off all damped leaves as they appear; and fully expose the fruit to the sun as it ripens, in the manner directed for melons in the hot-bed. In this manner, I have often had melons in October and November, fully swelled, and in good, but not of course in high perfection, for want of sun to give them flavor. Any who have a pit of this kind, however, for the forcing of early vegetables, strawberries, flowers, &c. cannot, perhaps, occupy it to a better purpose in the latter part of the season; as the trouble is but little, and the expence not worth mentioning."

1275. *Culture of Melons in M'Phail's Pit.* The inventor of this pit says, "For the purpose of raising melons early, for many years I cultivated them on a brick-bed, on the same construction as that which I invented for rearing early cucumbers, excepting only that through the pit of each three-light box I carried no cross flues. In each three-light division I made the pit about three feet six inches wide, and ten feet long, and three feet deep below the surface of the flues. When this bed was first set to work, I had the pits filled level with the surface of the flues with well-fermented dung, or with the dung of old linings from the cucumber beds. On the surface of the dung in the pits, I had laid about ten inches thick of good earth, in a ridge of about twenty inches wide, from one end of the pit to the other. When this was done, I made a lining round the bed, and as soon as the earth became warm, I set the plants into the ridge of earth, and gave them a little water, and kept a strong heat in the frames, and filled up the pit gradually as the roots and plants extended themselves.

"The dung or leaves of trees in the pit require not to be changed every year, neither need the earth for the plants be removed entirely every season, for by experience I found it to do very well by digging and mixing with it some fresh earth and manure in winter, and exposing it to the rains, the frost, and the snow."

In forcing melons early, the surface of the cross-flues, as well as of the surrounding or outside ones, should be kept bare of mould till the days in spring get long, which will let the heat of the linings arise freely through the covers of the flues to warm the air among the plants. After the cross-flues are covered with earth, those which surround each frame may be left uncovered till the month of May or June. *G. Rem.* p. 64.

The culture in the brick-bed is in other respects the same as that already given for *melons in frames*, and *cucumbers in brick-beds.* See the *Monthly Table of Temperature* in last section.

1276. *Culture under Hand-Glasses.* "A succession, or late crop, to fruit in August and September, may be raised on hot-bed ridges under hand-glasses. Sow in a hot-bed, from the middle of March to the middle of April. When the plants have been up a few days, while in the seed-leaves, prick some into small pots, two plants in each: water, and plunge them into the hot-bed; managing, as directed for the young frame-plants, till the rough leaves are from two to four inches long, and ready to shoot into runners. From the middle of March to the third week of May, when the plants are a month or five weeks old, they will be fit to ridge out under hand-glasses. With well-prepared stable-dung, or, with a mixture of fermented tree-leaves, build the hot-bed four feet wide, and two feet and a half thick, the length according to the number of glasses intended, allotting the space of four feet to each.

"In a week or ten days, or when the dung, or dung and leaves, is brought to a sweet well-tempered heat, mould the bed ten or twelve inches thick; then place the glasses along the middle, and keep them close till the bed has warmed the earth. The same, or next day, insert the plants: turn them out from the pots with the ball of earth entire; and, allotting plants for each glass, insert the ball into the earth clean down over the top, closing the mould about the stems. Give a little water, and place the glasses over close. From about nine in the morning till three in the afternoon, of the first two or three days, shade the plants till they have taken root; when admit the sun more freely; yet only by degrees from day to day, till they can bear it fully without flagging much. Give air daily, in temperate weather, by tilting the edge of the glasses, on the south side, an inch or two: but in the present stage of the plants, shut close at night. Cover with mats till morning; constantly keeping the glasses over. Give occasional moderate waterings, with aired water. Cover in the day-time with mats, in bad weather, or heavy or cold rains; and continue the night-covering till confirmed summer in July. Meanwhile, attend to the heat of the bed: if this be declined, so that the minimum temperature be not 65° at night, with the aid of matting, line the sides with hot dung, covered with a layer of mould. The revived heat from the lining will forward the plants in fruiting; while the earth at top, will enlarge the surface for the runners, and the bed for the roots. When the runners have extended considerably, and filled the glasses, they must be trained out. Accordingly, at the beginning of June, in favorable settled warm weather, train out the runners; cutting away dwindling and useless crowding shoots: then the glasses must be raised all round, two or three inches, upon props, to remain day and night. Cover with mats in cold nights and bad weather; having, to support the mats, first arched the bed over with rods or hoop-bands. Apply moderate waterings, as necessary, in the morning or afternoon. Oiled-paper frames, formed either archwise, or with two sloping sides, about two feet or two and a half high, and of the width of the bed, are very serviceable in this stage. Some persons use them from the first, under a deficiency of hand-glasses. But the proper time for recourse to them is when the plants have been forwarded in hand-glasses, till the runners require training out beyond the limits of the glasses, some time in June: then removing the glasses, substitute the oiled frames. As these paper-screens will entirely cover the bed and plants, over which they are to remain the rest of the season, they will afford protection from heavy rains or tempests, as well as from nocturnal cold, and also screen the plants from the excessive heat of the sun, while, being pellucid, they admit its influence of light and warmth effectually. Give proper admission of free air below, and occasional watering.

"With respect, however, to the crop, for which no oiled paper-frames have been provided, continue the hand-glasses constantly on the bed, over the main head and stem of the plants, throughout the season, to defend those capital parts from casual injuries by the weather. Throughout June, and thence to the decline of summer, be careful, if much rain, or other unfavorable weather, or cold nights occur, to shelter the beds occasionally with an awning of mats or canvass; particularly when the plants are in blossom. Likewise, turn in some of the best full-set exterior fruit under the glasses; or some spare glasses might be put over the outside melons, to forward them without check to maturity. Some will be ready to cut in July,—others in August, the more general time, and in September; they being generally, after setting, from thirty to forty days in ripening. The crop coming in at the decline of summer will not ripen well, unless guarded from cold at nights, and assisted by linings. The pomes that do not ripen may be used for mangoes.

"*Wide Ridge.* Or, the fruiting-bed may be made six, seven, or eight feet wide, for the plants to have an ample surface for their extending runners; defended either with a regular frame and glasses of proportionate dimensions, or with a case formed of inch-and-half boarding, ranged connectedly along both sides of the bed, without any internal cross divisions other than top cross bars, to stay the sides, and support the glasses."

Sect. VIII. *Forcing the Strawberry in Hot-Houses, Pits, and Hot-Beds.*

1277. This fruit is forced in every description of forcing-house, and also in the pinery, though the heat of the latter often prevents the setting of the blossoms. Where they are forced in large quantities, it is a good method to apply a pit to their sole cultivation. M'Phail says, " They will occasionally do well in a hot-house for growing the pine; but a heat sufficient to force peaches and nectarines is more natural, and likely to secure the obtaining of good crops of fine fruit. A good way of forcing the strawberry," he adds, " is to bring them forward in a gentle-heat in melon-frames, till the fruit be nearly about half-swelled, and then to give them a stronger heat to ripen them." *Gr. Rem.* 29.

Nicol thinks, " The climate of the cherry-house most suitable to the nature of strawberries; they will do well in a hot-bed; but the best method is to force them in flued pits, such as that for nursing pines."

Soil. Strawberries to be forced in pots, require a strong and a very rich loamy earth. *Nicol.*

Choice of Sorts. Abercrombie and Nicol recommend the Alpine and scarlet Virginia; to which Nicol adds the wood strawberry.

Wm. Morgan (*Hort. Trans.* vol. ii. p. 376.) begins with the Alpines; next he takes the Bath scarlets and common scarlets; and after these the pines.

Potting and Preparation of the Plants. Abercrombie says, " The plants selected should be two years old, having attained a full bearing state. It conduces to the perfection of the fruit, to put as many plants as are intended to be forced into pots, that they may be previously nursed for a longer or shorter time, according to the age of the stool.

" 1. New runners of the present summer may be potted in July and August, and nursed in pots for two seasons, having the blossoms pinched off in the second. This course of preparation is attended with most trouble: but the crop repays it. Three offsets may be planted in one large pot.

" 2. Runners made last year may be potted in April, and then plunged in the earth, to be nursed throughout the growing season with a view to forcing, having such blossoms as appear pinched off, while the roots are carefully watered.

" 3. Stools of two years' standing, which have borne one crop, may be put into pots in August, September, or October. They may also be put into pots during any mild interval from the beginning of November till the end of the year; but they will not be so strong and well-rooted. The method of potting established bearers is this: the pots should be twenty-fours or thirty-twos; provide at the same time some fresh and good rich loam. Put some of the earth, well broken with the spade, and free from grubs or hurtful worms, into each pot, to the depth of three or four inches. Then take up the plants, with a ball of earth to the root of each; pare the ball with a knife till it be pretty round; and having cleared the stem of the plant from any withered or rotten leaves, place it in the pot, which fill up to the surface of the ball with the prepared earth. Water the plants as they are potted, and remove them to a warm situation.

" On the approach of winter, all the potted plants, whether established bearers or runners, should be placed under a frame, or other sufficient shelter, till the hot-bed or forcing-house is ready to receive them."

M'Phail says, " Strawberry plants intended for forcing should be planted in pots eight or ten months before they be set into the forcing-house; or strong plants may be taken up with balls of earth about their roots, and be potted and set into the forcing-house immediately.

Nicol says, " Some force old roots or stools, and others the runners only. Those who force the old roots generally lift and pot them about October or November; lifting a bulk from the bed or row, nearly sufficient to fill a nine or ten inch pot, of plants three or more years old. Others plant runners of the former year in April, three or four in a large pot, or two in a middle-sized one, and plunge them in the earth all summer, giving them occasional waterings, and taking proper care of them. These succeed better than old roots, treated as above. But when I was in the practice of forcing strawberries, I used to prepare my plants in the following manner:

" In July or August, I planted runners of that season, three in a nine or ten-inch pot, watered them, and placed them in the shade for a few days; then plunged them to the brim, in a freely exposed situation. In October, their leaves were dressed off, and the plants trimmed; and before winter, they were covered with a little dry litter, in order to preserve the pots from the effects of frost. The following spring, any flowers that made their appearance were pinched off; and throughout the summer, the plants were occasionally refreshed with water, and kept clear from weeds. In autumn, the leaves were again dressed off as before; and when taken up for forcing, the pots were dressed, and fresh earthed at top, previous to being placed in the forcing-house. This method of preparing the plants is no doubt more troublesome than either of the above-mentioned; but the plants, by being completely established, and of a proper age, produce better crops. I have tried all the three ways repeatedly, and prefer the last."

Morgan raises his Alpines from seed, sowing in January in frames or boxes, to be placed in a gentle heat; he hardens them after they come up by removal to a cooler situation; pots in May in pots six inches diameter and six inches deep. In October they are in flower, when he puts them under shelter, and in the latter end of November he places them in the forcing-house or pinery, where they bear fruit through the winter. The scarlets he pots, three plants in a pot, of the same size as those used for the Alpines in May, or early in June, taking the runners of the previous year; he picks off the blossoms as they appear, and keeps them in a shady place till January, when he places them in the forcing-house on shelves eighteen inches from the glass, each pot in a pan. The pine-strawberries he pots in the same manner, and takes them into the forcing-house in February or March.

1278. *Time of beginning to force.* If the plants be wanted very early, the plants are put in hot-beds, or pits, in October; but the crops from strawberries so forced, Nicol thinks hardly worth the trouble. Abercrombie says, "Begin to force strawberries about nine weeks before you want to gather fruit. Plants excited before the first of January seldom repay the trouble; and in proportion as the time of beginning to force approaches the vernal equinox, the returns are more abundant. To have a succession, reserve sets of potted plants for removal into a house, or frame, every three weeks, till the middle of March." He adds, "Strawberries taken into the house in March fruit in higher perfection than those forced earlier.

M'Phail and Nicol begin in January. The latter observes, Those who force strawberries to a considerable extent, perhaps a thousand pots, bring them in, in different successions, perhaps a hundred or two at a time; that is, in places where there are several forcing-houses. *Kal.* p. 330.

M'Phail says, "When the weather begins to get cold in September, strawberries of the Alpine kind in pots may be set in a forcing-house or brick frame; and if they be in good health, they will produce fruit for a considerable time. They require only a gentle heat of from 50 to 60 degrees; give them water occasionally, but as there is constantly blossom and fruit on them, they need not be watered all over broad-cast. Give them great plenty of air: they only require protection from heavy rains and cold weather."

Morgan, as we have noticed above (1277.) begins to force Alpines in November, the scarlets in January, and the pines in February and March. Thus ensuring, as he says, a successional supply of fruit from October till June.

1279. *Temperature.* Abercrombie says, begin at 40°, and raise the heat as in the cherry-house. When a pit is employed, Nicol directs the pots to be plunged in a mild bark-heat; and the temperature, by the aid of the flues, to be kept at 50°, and 55° or 66° in sunshine. Such treatment will make the plants thrive, and the fruit set freely.

Morgan prefers beginning with the heat of a frame on dung, or a pit, and then moves to the peach-house; and, after the fruit is set, removes his plants to ripen in the vinery or stove. Scarlets, he finds, bear more heat than the other sorts.

Air and Water. The former is to be freely admitted in good weather; and the latter plentifully supplied at all times, until the fruit begins to ripen off. Then it is to be withheld, lest the flavor become insipid.

Morgan prefers supplying it from pans, in order not to rot the hearts of the plants. He gives as little water as possible when the plants are nearly ripe, this being essential in order to have good-flavored fruit.

Treatment after gathering the Fruit. The strawberry, it is generally considered, will not force the year after like fruit-trees; but must be rested by plunging in the open ground for one or two years, pinching off all blossoms as they appear.

Williams states, that "the scarlet strawberry, after affording a crop of fruit in the hot-house early in the spring, if carefully removed out of the pots or boxes, and placed in the open ground, will yield another crop of fruit in September. This second crop is very abundant, the warm rains of July and August proving highly favorable to the growth of the fruit; and, as there is no other strawberry to be had at this season of the year, except the Alpine, the addition of the scarlet makes a pleasing variety in the dessert." *Hort. Tr.* vol. ii. p. 93.

Morgan observes, without limiting his observation to any one sort, that "after the fruit has been gathered from the plants, the pots should be plunged into a shady border, giving them a good watering, and at the same time cutting off all the leaves: when thus treated, they will, in the year following, produce as good crops in forcing as fresh-potted plants;

if not wanted for this purpose, they may be turned out into the natural ground, and will then bear a crop in the autumn of the same year, as described by Williams as above."

Sect. IX. *Forcing Asparagus in Pits and Hot-Beds.*

1280. Nicol observes, that asparagus may be forced with equal, or with greater success, and with less trouble in flued pits than in dung hot-beds. M'Phail also recommends his flued pit for this purpose.

The roots, Nicol states, may either be forced on bark, or on dung, or on dung and bark. But old half-rotten bark, in which there is not much heat, is to be preferred. Next to this he uses well-fermented dung underneath, and old bark to the thickness of a foot or fifteen inches at top. "If dung alone, or a mixture of dung and leaves be used, it should be carefully fermented, and should be in a state past heating violently before it is put into the pit. In this case, observe to finish the bed with the smallest and driest part of the materials."

Ross (*Hort. Trans.* vol. ii. p. 361.), instead of a warm stratum of dung or tan, places his roots on a cold bed of the latter, on which nursing pines or melons have been grown, but which has ceased to ferment. He then applies warm linings to the sides, and thus produces the requisite degree of heat. J. Sabine, having seen in Ross's pits, in January, 1817, some of the strongest asparagus he ever noticed at that season, concludes, "that the weak and drawn state of forced asparagus is occasioned by the action of the dung immediately on its root." He therefore greatly prefers Ross's mode.

Plants. M'Phail says, take roots of any age that bear fine grass. Nicol says, they should not be under four years old, nor above eight. Abercrombie takes plants of two or three years' standing.

Planting. M'Phail says, "Lay on the surface of the bark-bed from six to eight inches of vegetable mould, or any other sort of light earth that the heat may easily ascend through, and of such a texture as does not retain water. Take up plants, no matter what age they are, which produce fine asparagus, trim their roots, and place them in rows on the beds; when one row is laid, strew a little fine mould among the roots, then proceed in the same way with one row after another, keeping them on a level, as the surface of the bed at first lay, till you have finished planting them; then lay among the buds and roots some fine vegetable, or other light rich mould, working it in among them with your fingers, and cover the buds over about one inch thick, and above that lay three inches in depth of vegetable mould not very rotten, but such as the water will run quickly through. If you have not got vegetable mould of this description old tan, not very fine, will answer the purpose equally well. If there is a strong heat in the bed, let the glasses remain off till it begin to decline."

Nicol directs, that the roots in the beds in the open air, which are to be taken up and forced, should be kept covered with litter, so as to be easy to come at in time of frost.

Time of beginning to force. Abercrombie says, if in mid-winter, begin six weeks before you propose to have a crop; when the days are longer, five weeks, or but a calendar month before. Nicol says, those who wish to have the asparagus on the table at Christmas, should prepare for forcing it in November, to have a continual succession.

Temperature. The temperature at night should never be under 50°. In the day-time keep the maximum heat down to 62°. *Abercrombie* and *Nicol.* "If by the heat of the bark or dung, and the use of mats or canvass covers at night, the thermometer stand as high as 50°, fire-heat will be unnecessary; but otherwise recourse must be had to the flues. A very moderate degree of fire-heat, however, will be sufficient; and a small fire made in the evening will generally answer the purpose. Sometimes, in dull, hazy weather, a fire may be necessary in the morning, in order to enable you to admit air more freely, and to dry off damp."

Air must be freely admitted every day in some cases to allow any steam to pass off; and for the sake of the color and flavor of the plants. As the buds begin to appear, as large portions of air must be daily admitted as the weather will permit.

Water. When the asparagus bed has, after planting, stood two or three days, and when the heat will have begun to warm the roots, give the plants a sufficient watering. Pour it out of a pot with a rose on it, to imitate a shower of rain; let the bed have enough to moisten the mould well, and to wash it in among the roots. Repeat such waterings now and then. Nicol says, the roots must have moderate supplies of water: once in three or four days, if the heat be not violent; and if otherwise, oftener.

Gathering. "By the time the buds have come up three inches above the surface, they are fit to gather for use, as they will then be six or seven inches in length. In gathering them, draw aside a little of the mould, slip down the finger and thumb, and twist them off from the crown. This is a better method than to cut them; at least it is less dangerous to the rising buds, which come up in thick succession, and might be wounded by the knife, if cutting were practised."

The Roots, after they have furnished a Crop, are considered useless for future culture.

Successional Supplies. If the pit in which asparagus is forced, be twenty-five or thirty feet long, it will be enough, for the supply of an ordinary family, to fill one-half at a time. If the second half be planted when the grass in the first half is fit for use, and so on, a constant succession may be kept up in the same pit for any length of time required. In order, however, to forward or protract the growth of the one part or of the other, the pit may be divided in a temporary way, by fitting a board neatly under the middle rafter. By this means, one-half may be kept cooler or hotter than the other, by matting or not matting, or by the admission of more or less air, &c.

"In filling the first end of the pit a second time, if bark be used, it will not be necessary to add fresh materials; as trenching over the bed will be found to answer the purpose, even a third time. And in using dung, the stirring up of the old, and adding as much new as will raise the bed to a proper height, finishing with the smallest and best fermented part, will generally be sufficient for a second filling. For a third filling, one-half new dung may be necessary, which, however, should be moderately fermented, and be kept well down."

1281. *Forcing Asparagus in Hot-beds.* Asparagus may be brought to perfection in hot-beds at any time from November till it comes in the natural ground. When it is intended to have a constant supply from hot-beds, M'Phail recommends one to be made every fortnight, and Abercrombie once a month, from November till April. This must, of course, be arranged according to the size of the hot-beds, and number of the family.

Forming the Hot-bed. M'Phail says, "Get a quantity of good dung well prepared, by putting it together in a heap to ferment, that the rancidity of it may be evaporated, by turning and mixing it several times when there is a strong heat in it; make it up into a bed about three feet high, and four or five inches larger all round than the size of the frames, which are to be set upon it. When it is made, set the boxes and glasses on, and let it heat and stand till it is sweet, which may be known by the smell of it; then tread it level, and loosen up the surface again, that the heat may have free liberty to arise."

In this stage, Nicol covers the whole with "rolls or squares of turf, cut so as again to join exactly; which lay green side down, and beat them well with the back of the spade, that the whole may be close and compact, in order as much as possible to exclude steam." To this practice M'Phail objects, as preventing the water from sinking freely into the bed; and if there be a sufficient heat in it for winter forcing, unless it receive water, it must become dry and husky. The method, he says, is an old one practised fifty years ago, and now exploded by every good gardener.

Instead of turf, therefore, M'Phail and Abercrombie, after setting on the frame, direct, with the bed from five to eight inches thick, to use any sort of light earth. Nicol says, "I have often used old bark reduced to a fine mould, without any mixture of earth, and have sometimes mixed it with fine sandy earth, with little difference in the success; only I have observed, that when the roots were placed in bark entirely, the buds would come a few days earlier."

Planting. Proceed as directed for planting on a bark-bed. Abercrombie says, "Provide from five to nine hundred (he elsewhere says six hundred) roots for a hot-bed under a three-light garden-frame." "Having prepared the roots, mark out on the surface of the mould the width of the frame; then, beginning at one end, raise a small ridge of earth crosswise, and proceed to planting; placing the first course of roots nearly upright, close against the said ridge, and with the crowns in contact, either upon the surface of the level earth, or with only the lower ends of the roots a little inserted: place more against these in the same manner, as close together as possible, and extending to the width of the frame: add successive ranges, as close as they can be set, with the crowns all of an equal height."

Where the bed is completely planted, the crowns are to be earthed over regularly. Some, as Abercrombie, cover with two inches of light earth, adding, when the buds appear, three or four inches of additional earthing; others, as Nicol and M'Phail, cover at once with four or five inches, adding no more afterwards.

The planting completed, the next thing is to put on the lights, which are to be kept close shut down till the heat begin to rise in the frame; which will generally happen the second or third day, when air is to be admitted, in order to pass off the steam, and dry the surface of the mould. Air must be given every good day till the buds begin to appear above ground; and then more freely admitted to give color and flavor.

Produce. Nicol says, "An ordinary sized three-light frame, completely filled with roots, and properly managed, will only yield a dish every day for about three weeks."

Successional Supply. On the above estimate, if a constant succession of asparagus be required, it will be necessary to make up a bed every eighteen or twenty days till the middle or end of March. Each successive bed may be made a little lighter; and less trouble will be required as the season advances." *Kal.* 347.

Forcing the Roots as they stand in the open Ground. Stir the surface of any bed or beds in full-bearing in the general plantation; then, having raked it fine as in the usual spring-dressing, cover three inches with the siftings of old tan, and on that lay a layer of fermenting dung, as in forcing rhubarb or sea-kale. This mode has been but seldom practised; but we consider it likely to succeed to a certain extent.

A. Melross "finds, that asparagus may be forced in a vinery, by planting the roots in the border behind the flue, where no vine roots are." *Caled. Hort. Mem.* iii. 164.

Sea-cale and rhubarb may be, and sometimes are, forced in the same manner as asparagus; but the most general mode is to excite them where they stand in the open garden, by the application of warm dung, with or without earth in pots, or other covers. See the *Horticultural Catalogue.*

Sect. X. *Forcing Kidney-Beans.*

1282. The kidney-bean may be successfully forced in pits, hot-houses or forcing-houses, and hot-beds. The more general mode is to force in the pine-stoves; the same heat which suits the pine-apple, suiting the kidney-bean, which is a native of India.

Nicol prefers a flued-pit, such as that used for nursing pines: and Abercrombie says, "Where there are no hot-houses, or where kidney-beans are to be raised in quantities for the market, the most economical and successful mode will be found a flued-pit prepared as directed for asparagus, but with a stronger bottom-heat.

Soil. Cover the bed with light vegetable earth.

Sorts. Abercrombie recommends the early speckled, early negro, and dun-colored dwarfs. Nicol says, the speckled dwarf is the best sort.

Sowing. Sow in flat boxes or pans of fine, light earth thickly, and cover to the depth of an inch. Let them be placed in a stove or hot-bed, and have moderate supplies of water, and they will be fit to plant when about three inches in height. Plant them in rows across the bed of the pit fifteen inches apart, and three inches distance in the line.

Culture. Water after planting, and afterwards, as required; give abundance of air every fine day, and earth-up the plants as they advance in growth in order to give them strength.

Time of beginning to Force. M'Phail says, "If you wish to endeavour to have kidney-beans green all the year, you should plant the seeds, and begin to force in August." Abercrombie observes, "Some forcers, quite in opposition to the season, raise kidney-beans in August, and thence till the 21st of December, which day may be regarded as the boundary between late and early forcing."

Temperature. The heat by fire in the night need not exceed 50°, according to Nicol; but Abercrombie recommends 60° for a minimum, and 75° for a maximum.

Successional Supplies are to be obtained by sowing every month or six weeks, for which purpose the pits may be divided by temporary partitions, as recommended under *Forcing Asparagus.* (1280.)

Forcing in a Hot-House. "The most early fruit in perfection," says Abercrombie, "is obtained by culture in a stove, sowing from midwinter till the end of March."

"Sow in pots, or oblong boxes, containing a mixture of light, fresh earth and vegetable mould, depositing the seeds either in a triangular or quincunx order, and full an inch deep. If the plants are to fruit where sown, the cradles should be ten inches deep; but, if they are to be transplanted, which admits a greater number in the same space, the seed-pots or boxes may be shallow. Do not fill the cradles with mould at first, to allow of gradually earthing-up. When the beans have germinated, sprinkle the earth with water; after the plants have risen, give moderate waterings every other day — the last crops may want water every day. Sprinkle also the leaves with water warmed by standing in the house. Those raised in shallow pans should be transplanted for fruiting when two or three inches high. It is sometimes proper to stop luxuriant runners. These incidental crops may stand in rows, on the flues or on shelves; but take care that they do not shade the pines and other principal plants. For succession, sow every fortnight or three weeks."

Insects. "Nicol observes, that the thrips often attack French-beans in the hot-house; and, therefore, the plants should be fumigated with tobacco, which destroys that insect."

Forcing in a Peach or Cherry House. Nicol observes, "French-beans may be successfully planted out in the borders of an early cherry-house or peach-house, so as that they may not be overmuch shaded by the trees; but they seldom do much good in a vinery, where they are shaded by the whole foliage of the vines."

Forcing in a common Hot-Bed. "Under the deficiency of a house, you may have recourse to a hot-bed and frame; but the culture will be attended with more trouble, the course will be longer, and the fruit is rarely so fine and plentiful; nor without fire-heat can the difficulties of late or very early forcing be so well contended with. From the middle of February to the beginning of April is the most successful period for forcing the kidney-bean in a hot-bed. The early white dwarf, from its low growth, is to be sown in preference to the kinds recommended for a stove, unless it be intended to fruit the plants in a deeper frame than ordinary. The early yellow and early black are next, as not growing very high. The temperature for the kidney-bean is 60° for the minimum, and 75° for the maximum of the fruiting-bed. In forcing soon in the spring, raise the plants on a smaller bed, earthed over with light rich compost six inches deep. Sow the beans thickly, covering them to the depth of an inch. The second hot-bed should be earthed over to the depth of eight or nine inches. Into this transplant the seedlings as soon as they are two or three inches high; setting them in cross rows twelve or fifteen inches asunder, by four or three inches in a line. Or when the season is so far advanced, that one bed with the help of linings will bring the plants well into fruit, you may sow at once, at the full distance, in a similar hot-bed, to continue for podding. Cover the glasses every night with garden mats; also partially in severe weather. Admit fresh air moderately every mild day, and give occasional gentle waterings. The plants raised in February will come into bearing in April and May, making moderate returns: a new crop every three weeks will keep up the succession: those sown at the beginning of April will last till the middle or end of June; when they will be succeeded by the early half-sheltered crops in the open garden."

Crop raised under Glass to fruit in the open Garden. "At the end of March, you may sow a small portion under glass, for transplanting into the open garden in the first or second week of May. It is not so well to sow in patches on the surface of the ground, as in small pots, because the plants can be turned out from the latter with less check to their growth when transplanted. Sow three beans in each pot. When the seedlings are two or three inches high, harden them by degrees to the full air; and plant them on a good open border as soon in May as the season will suit. They will yield fruit about a fortnight sooner than the earliest raised under exposure to the weather.

Crop raised on slight Heat. "A crop to fruit early in the open garden may be accelerated with more certainty by plunging the pots containing the seed-beans into a gentle hot-bed; or some sown in shallow pans or boxes may be set on the shelves of a stove. Just at the opening of April will be early enough to begin; as the plants will otherwise get too forward for the weather, to proceed well without a continuance of artificial heat. Having nursed them to the proper stage, plant out under a south fence, either three inches apart, if in a single line, and eighteen inches by three, if in two lines; or it may be better to set the plants in patches of nine or seven, to receive the temporary shelter of a hand-glass, lest the transition from a hot-bed, all at once, to the fluctuating air of spring be too violent." *Abercrombie.*

Sect. XI. *Forcing Potatoes.*

1283. The potatoe is forced in a great variety of ways; but, for a fair crop of roots, which shall be somewhat dry and flowery, and of the size of hens' eggs; plant sets of the *ash-leaved* variety in single pots, filled one-third part with light earth, in January. Place them in a hot-house or hot-bed, earth them up as they appear, and about the middle or end of February, transplant them with their balls entire into a pit prepared as for asparagus. Distance from plant to plant one foot each way. Give water occasionally, and admit as much air as possible at all times. Potatoes so managed will produce a fair crop the end of March or beginning of April.

Forcing Potatoes in Hot-Beds. Abercrombie says, "A young crop is easily obtained soon in spring, by planting the early dwarf, or the sort called mules, on a slight hot-bed. Put in the sets pretty thickly, at six or eight inches square distance, as the potatoes are not to grow large. If planted successively in January and February, they will produce young crops for use in April and May, to be taken up in small portions as wanted for present eating. During the growth of the plants, open the lights fully in the middle of fine dry days; but shut at night to guard against frost. Water attentively as the mould and weather may require."

Nicol says, "Plant some of the early sorts of potatoes thickly, on slight hot-beds, in February, to be covered with a frame and lights; or to be hooped over, and be covered with mats or canvasses at night, and in bad weather, which is a very good method of obtaining early potatoes, as they are not so much drawn, as if kept close under glass. A moderate dung-heat is sufficient for the purpose; and the plants, after they have come up, should be exposed from morning till night in good weather, but should be carefully covered at night for fear of frost. Even in using frames and lights, they should be fully exposed in good weather, and should not be kept so closely shut up as is commonly done; by which they are drawn entirely to tops, and do little good at root. In either case they should have moderate and regular supplies of water."

Hogg, a market-gardener, describes "a method of growing early forced potatoes," by using an old cucumber or melon-bed, in which the dung has long lost all its heat. The sets of a very early sort, a variety of Foxe's yellow seedling, known by the name of this grower, are cut a fortnight before they are planted, to prevent their damping, or being injured by worms. The bed is prepared by removing all the earth from the top of the dung, and covering it about one inch deep with fresh mould, on which the sets are planted, in rows six inches apart, and the same distance from each other in the rows; they are then covered four inches deep with mould, and the frames and glasses are placed upon the bed, which must be carefully protected from frost. The covering best adapted for this purpose, is the second crop of short hay, called Rowen, in the neighbourhood of London. At the end of the fifth day, the outsides of the old dung should be cut away, from near the edge of the frame to the bottom of the bed, in a slanting direction inwards, of about fifteen inches from the perpendicular; strong linings of hot dung must be applied to the space so made, and renewed, if necessary, at the end of three weeks. Air must be given to the plants, by sliding down the lights at noon every day that the weather will permit, and water in the mornings, leaving about one inch of the light open for the admission of air after watering. The potatoes will be fit for use in about seven weeks from the first planting of the sets, and the average crop to each light, if well managed, is usually about five pounds." (*Hort. Tr.* vol. ii. p. 144.)

Knight's mode of forcing potatoes in hot-beds is as follows: "The varieties of potatoes, which are well calculated for early forcing, begin to vegetate before Christmas; and it is of consequence to preserve the germs and roots first emitted from injury, where a crop of good potatoes is required before the end of May. I therefore plant my potatoes in pots of about six inches diameter in January (a single potatoe in each,) and the pots are then placed in the ground, and covered with litter, to protect them from frost; and in this situation they remain till the hot-bed is ready to receive them. In the mean time, the roots extend themselves through the mould within the pots, and the germs reach its surface; whilst the excitability of the plants is not at all expended on account of the low temperature in which they vegetate: and, therefore, when plunged into the hot-bed, they instantly shoot with excessive rapidity, and in a few days begin to generate tubers. One stem alone should be suffered to grow in each pot; for where more remain, the tubers are smaller, and the crop is not increased in weight. When the plants grow in small pots, the gardener will have apparently the advantage of being able to take out the largest potatoes by inverting the pots, without materially injuring the fibrous roots; but this practice will rarely be found eligible, because the plants, having the range of their roots confined to the limits of the pot, soon occupy the whole of their pasture, and therefore do not produce their tubers in succession as they will under common circumstances.

"The lights should be drawn off during the day, when the spring is far enough advanced to permit this to be done without injury to the plants; and early in May the pots may be taken out of the hot-bed, which may be employed for other purposes; and as it must necessarily have been kept very dry during the latter period of the growth of the potatoes, it will generally afford a strong heat on being well watered.

"I confine my plants (which are naturally of very dwarfish growth) to small pots, because under this mode of culture the tubers acquire maturity sooner, and are better; but the crop is not so heavy as when their fibrous roots are permitted to extend more widely: and therefore, where a larger, but rather later crop, is required, the best plan is to put the tubers to vegetate in small pots, and from these to remove them, with their roots and germs uninjured, to the hot-bed.

"I tried the effect of placing a few tubers (half a dozen only) on the floor of my cellar, disposing them just in contact with each other; and as soon as the germs were about four inches long, a hot-bed was made ready to receive them. This experiment succeeded perfectly; and as it is not attended with so much expense and trouble as either of the preceding methods, it will be found, in many cases, the most eligible. All that appears necessary to obtain an early crop, is to advance the growth of the plant, as much as convenient, under a low temperature, so as to avoid all unnecessary expenditure of its excitability; and, subsequently, to preserve its germs and roots as much as possible uninjured in transplantation."

1284. *Forcing Potatoes in Pots or Boxes.* This is sometimes attempted in stoves. One set is placed near the bottom of a large pot, and gradually earthed up. When nearly full grown, it is taken to the cherry or peach house for the sake of more air.

Another mode of planting in pans or boxes is thus described by Abercrombie: "Plant potatoes of the growth of the season before the last; that is, the produce of

1816 to be planted in December 1817, or January 1818. Potatoes so kept will appear surrounded by a brood of new potatoes in contact with the seed or parent potatoe. The leaf-buds are removed, and the potatoes planted in a circle and in layers, in earthen pans or wooden boxes, with alternations of fine loose earth. Such pans or boxes may be put into sheds, or on shelves in the kitchen, &c. By this treatment, no leaves will emerge above the soil, and young potatoes may be reared at any required period."

A similar mode is described by A. Sherbrook, Esq. (*Hort. Tr.* vol. i. 225.) The boxes, containing alternate layers of light earth and potatoes of the preceding year, are placed in a dry, covered place, free from frost; they receive no water, and produce "good, fine, young potatoes in December." For a succession, the process is to be repeated.

Incidental forcing of Potatoes. "Small, young spring potatoes are likewise obtained from some of the winter store of old potatoes, as they lie in the house; especially where these have been mixed with sand, and permitted to shoot as they lie, when they produce a few small button potatoes in spring; — some of which are occasionally brought to market, but are only proper for immediate use."

The following is the method practised by Ashworth to obtain early potatoes.

"In the beginning of April, a quantity of large potatoes are selected, and laid up in a dry, airy room; they are turned over four or five times during the summer, and all shoots which they make, are taken off as they appear. These are used for the seed, and are planted in succession from the beginning of September to the end of December, in boxes, in the following manner. In the bottom of each box, a layer of light vegetable mould, four inches deep, is placed, on which the potatoes are laid, two inches apart, and these are covered with another layer of the same mould, and of the same depth. On the surface of this second layer, potatoes are again laid, and then covered as before; this is repeated until the box is full. The boxes may be kept in any of the fire-houses, or in a warm back shed, and in three months from the time of planting, young potatoes fit for use will be formed. It is to be observed, that the young potatoes thus obtained, are much inferior in quality to those produced by vegetating plants; but as it is scarcely possible to bring forward potatoes in beds so soon, this plan is useful, when considered as a means of obtaining a luxury at so early a season." *Hort. Tr.* vol. iii. p. 122.

T. Moffat (*Hort. Trans.* vol. iii. p. 123.) thus grows early potatoes: — "A compost, consisting of equal quantities of loam, sand, and coal-ashes, with an addition of lime in powder, equal to about one-fifth of the whole, was formed into a bed, four feet wide, and four inches deep, on the floor of a dark fruit-room. Upon this bed, early in September, large potatoes, of the preceding year's growth, were laid, three inches apart every way, with their best eyes downwards: these produced young potatoes, which became fit for use about Christmas."

Forwarding to raise a Crop in the open Garden. For this purpose some spread a layer of sets, or hot dung, or in boxes placed in any warm situation, whether in the light or the dark. After they have sprung three or four inches, they are to be transplanted in the open ground, which should not be sooner than May, unless they have some protection at nights, such as fronds of fern, spruce fir branches, &c. But the best method is to plant the sets one in each pot, as directed for forcing in a pit, and to plant out with the balls entire.

1285. *Substitutes for forcing Potatoes.* Dr. Noehden describes the mode by leaves and layers of earth at length, and subjoins *a method of preserving young potatoes as such, for winter use,* which we subjoin, as it may possibly lead some ingenious horticulturist to make experiments on the subject.

"By *young potatoes,* I take for granted, are generally understood those tubers, which have not attained their full age and growth. In this stage, the substance is generally finer grained, and more cohesive, than when they are farther advanced: they are what is called waxy, and differ, in taste, from those which are full grown. If they could be preserved in this state, through the winter, for the use of the table, it would doubtless be an acquisition: and something of this kind I have seen attempted. When the general crop of potatoes was gathered, at the usual period of their harvest, in autumn, the small tubers, which are frequently disregarded and left to their chance, were picked out and collected. They were deposited in a box, between layers of sand, and thus kept till the month of December. At this time, the box being opened, they were found in perfect preservation, and fit to be dressed for the table. To give them all the appearance of young potatoes, in a side dish, the tender skin on them was to be preserved: for pealing them would have destroyed that effect. It was recommended, for that purpose, when they were to be used, previously to soak them, for a certain number of hours, in water, and then to toss or shake them in a piece of rough flannel or baize, between two persons, backwards and forwards, and rub them between the hands; by which operation, the coarse outer-covering is loosened, and the skin remains clean and delicate, so as to exhibit all the exterior of young grown potatoes. Upon trying them on the table, I found, that some had really the fine waxy taste of young potatoes; but that others, and perhaps the greater part, though resembling the former, in size and looks, had entirely the grain, and flavor of the old potatoes. That difference is undoubtedly to be ascribed to the different state of maturity, at which the one and the other had arrived. The mealy ones, though equally diminutive with the others, had, in fact, reached their full age, and possessed, accordingly, the qualities which that age would give. Those of a waxy texture were, unquestionably, much younger, and had not come to maturity, when they were taken from the ground. They were in that condition, which, by the taste, determines the name of young potatoes. If this be so (and every probability seems to attend the reasoning), it may be concluded, that it is feasible to preserve young potatoes, in the manner described, if they be gathered young: but to distinguish those, which are so, in the common harvest, in autumn, from those, which only appear so, would be difficult. The idea, therefore, presents itself, of planting potatoes expressly for that use; which must be done at a later period, than this vegetable is usually planted; let us say, two months later, in June, instead of April. When the general crop is matured, and gathered in October, those will be still in their young state; their grain will be still fine, and their texture close: and if thus taken up, and preserved, according to the method suggested, it can hardly be presumed, that when brought to the table, in winter, they will be different, in quality, from what they were, when they were reaped: they will, in every respect, be young potatoes, probably not much inferior, if at all, to those raised on a hot-bed. For it does not appear, that this mode of keeping them has any effect in promoting their maturity, at least, not to any perceptible degree. The sand employed should be of as barren a nature as may be, and, if possible, contain little or nothing of the vegetative stimulus. When the tubers are taken out of the ground, previous to their maturity, they will not readily sprout, or emit roots, which circumstance is a security for the success of the method in question." *Hort. Trans.* vol. iii. p. 48.

Sect. XII. *Forcing Peas.*

1286. "Peas," Nicol observes, "are often raised in forcing-houses, and are brought to perfection very early."

For forcing Peas in a Pit, sow as directed for French-beans in pots or boxes; and transplant them when an inch and a half or two inches high, into the pit, at nearly the same distances as those recommended for the kidney-bean.

The Temperature may be progressive, "beginning at 40° or 50°, and rising to 52° or 66° from the origin of the plant to the state of flowering, and after flowering increased from 55° to 70°; or, in a regular heat between the latter limits. For hot-beds, the standard temperature may be 50°—55° for the nursery-bed; and 55°—65° for fruiting."

The best Sort of Pea to Force, is the genuine early frame.

Forcing in a Peach or Cherry House. For the earliest crop, some of the true early frame sort may be sown in October in the borders of a cherry-house, peach-house, or vinery, intended to be forced from the beginning of the year. By the time the forcing commences, they will be fit for transplanting, which is to be done in the same borders, either in a single row, or in more rows, according to the room. The distance between the rows may be fifteen or eighteen inches; and two inches in the line.

"In forcing peas," Nicol observes, "they should always be transplanted. They become more prolific, and run less to straw by that management, than when they are sown where they are to remain. Indeed, it would be very worth while to transplant the earliest crops in the open ground." *Kal.* p. 29.

Beans may be forced in a similar manner, though this is seldom attempted.

Sect. XIII. *Forcing Salads, Pot-herbs, &c.*

1287. Various other culinary plants are, or may be forced; but the practice in Britain seldom extends beyond pot-herbs and salads; though some have forwarded cabbages, cauliflowers, turnips, carrots, &c. in this way, as is occasionally done in Russia and the north of Germany.

Cauliflower, Lettuce, Radishes, Carrot, and Onion, M'Phail observes, may be planted and sown in February, "on gentle hot-beds of dung or leaves, to bring them in before those in the open ground. They should have glass frames set over them in cold, frosty, or rainy nights; which may be taken off in fine days, or a great deal of air given to them."

Nicol says, "The early horn carrot may be sown in January on a slight hot-bed, or on a border, close by the parapet in front of a pinery, early grape-house, or peach-house. The seeds should be sown in fine light earth, in either case, and should not be covered more than to the depth of a quarter of an inch. If sown on a hot-bed, the seeds may be defended by a frame and lights, or by hoops and mats, from bad weather, and should be covered always at night. If sown on a border in front of a forcing-house of any kind, they may be covered with hand-glasses. When the plants come up in either situation, they should have plenty of free air, as they do no good if they be drawn; they should also have moderate supplies of water. A thin sprinkling of radish or lettuce may be thrown in along with the carrot."

Pot-herbs, such as mint, marjoram, chervil, &c. are planted or sown in pots or boxes, and placed in any house, pit, or frame, in a state of forcing, near the glass, and where they will receive abundance of air in fine weather. They require little or no farther attention, but occasional watering. They may also be planted in rows on hot-beds or pits.

Small Salading, such as cresses, mustard, rape, chiccory, &c. to be cropped, when young, may be treated as pot-herbs; the three first will thrive at a greater distance from the light, and may be sown as practised by the market-gardeners on the floors or borders of cherry and peach houses.

Radishes. Abercrombie says, "To obtain the earliest spring radishes, sow on a hot-bed of dung or leaves some early dwarf short-tops in December, January, or the beginning of February. Having made a hot-bed two feet, or two and a half high in dung, place on the frame. Earth the bed at top six inches deep; sow on the surface, covering the seed with fine mould, about half an inch thick; and put on the glasses. When the plants have come up, admit air every day, in mild or tolerably good weather, by tilting the upper end of the lights, or sometimes the front, one, two, or three inches, that the radishes may not draw-up weak and long-shanked. If they have risen very thick, thin them, in young growth, moderately at first, to about one or two inches apart. Be careful to cover the glasses at night with garden-mats or straw-litter. Give gentle waterings about noon on sunny days. If the heat of the bed declines much, apply a moderate lining of warm dung, or stable-litter, to the sides; which, by gently renewing the heat, will forward the radishes for drawing in February and March. Remember, as they advance in growth, to give more copious admissions of air daily; either by tilting the lights in front several inches, or, in fine mild days, by drawing the glasses mostly off; but be careful to draw them on again in proper time. Small turnip-radishes, of the white and red kinds, may be forced in the same manner. For raising early radishes on ground not accommodated with frames, a hot-bed, made in February, may be arched over with hoop-bends, or pliant rods, which should be covered with mats constantly at night; and during the day, in very cold weather. In moderate days, turn up the mats at the warmest side; and on a fine mild day, take them wholly off.

"Any sort of radish-seed may be sown occasionally for salad-herbs, to be taken while in the seed-leaves, to mix with cresses and mustard. Sow about once a week in spring, summer, or any season when radish-salad is required, managing it as other small-salad herbs."

SECT. XIV. *Culture of the Mushroom.*

1288. The edible mushroom has long been held in esteem in this country. Its peculiar habits, and the method of propagating it, are so unlike those of any other culinary vegetable, that gardeners, till lately, seem not to have generalized on its culture. For a long period back, it seems never to have been produced in any other way than on ridges of warm dung; no one appearing to advert to the circumstance of its being indigenous, and that it may be grown in the open ground in the warmer months.

"The cultivation of mushrooms," Nicol observes, "is a process in gardening, perhaps the most singular and curious of any. In the culture of any other vegetable, we either sow or plant something material, — a seed, slip, or root, which we both see and handle; but in the culture of the mushroom, we neither sow nor plant any thing visible, at least to the naked eye. Yet it is certain, that mushrooms are produced by seeds, which naturally vegetate in the fields at certain seasons, and which may be made to vegetate artificially at any season, by a certain process, and by a composition in which the dungs of certain animals form the chief ingredient.

"The droppings of horses are found to produce mushrooms more plentifully, and with greater certainty, than the dungs of other animals. Hence it would appear, that their stomachs have less power to hurt or to destroy the vegetative quality of these seeds, which being collected along with their food, must pass through their intestines, than the stomachs of other animals; or, that the dung of horses is a better nidus for the seeds than other dungs. The food of horses, consisting mostly of corn and hay, may, no doubt, be more replete with the seeds of mushrooms than that of cows and other stock, which consists chiefly of green vegetables; but even the droppings of horses while at grass, or on tares, produce few or no mushrooms, as more particularly noticed below. This fact would seem to prove, either that the seeds are collected in greater numbers, and are better preserved by hay or the straw and chaff of oats, than by green food; or, that green food may have the effect of destroying them by its moistness in the stomach, or after having passed through it.

"It may be further observed, that animal matter seems necessary to the vegetation of the seeds, or the spawn of mushrooms. Hence we find them produced plentifully in old pastures, and in cattle sheds, whether these be frequented by horses, cows, or sheep, or by all of them; but the eatable kinds are never found in woods or fields from which cattle are completely excluded, though the herbage be ever so old. From the stubs of cut or decayed trees, and about such as have fallen and are rotten, many species of fungi spring; most of which are nauseous, poisonous, or unwholesome. The seeds, too, may lie concealed and dormant in various other matter, till put into a state of active vegetation by a proper temperature, and a proper degree of moisture.

"This vegetable may be produced by first making lumps, or what are sometimes called cakes of spawn, and afterwards placing them on a slight dung hot-bed, where the spawn vegetates into complete mushrooms; in which process of making the spawn (as it is termed), different ingredients are used, but chiefly the dung of horses, as said above. This has so far become a branch of trade, as that mushroom-spawn may be had of most of the nursery and seedsmen about all the great towns in the kingdom."

1289. *What Spawn is.* Spawn is a white fibrous substance, running like broken threads, in such dry, reduced dung, or other nidus as is fitted to nourish it. These threads produce, when planted, tubercles in the manner of potatoes. The true sort has exactly the smell of a mushroom. Spawn, when once procured, may be extended or propagated as spawn, without producing mushrooms. *Neill and Abercrombie.*

Originating Mushrooms without planting Spawn. Nicol says, "I have formerly been in the practice of producing mushrooms, however, most successfully, without using spawn, and by a very simple process: I might rather say, without transplanting spawn in the common way, but by making the bed a whole mass of spawn at once, and never disturbing it till done bearing. Beds that are built in the common way, and spawned, seldom produce long; perhaps only for a few weeks or months. I have had them continue to yield large crops the year round, and sometimes for two years. But mushroom-beds, in whatever way made, are subject to many misfortunes; and the spawn is of a nature so delicate, that it is quickly destroyed either by too much wet or drought. By making up a bed in the ordinary way, that is, of stable-dung, moderately fermented, to the thickness of about a yard; spawning it over when the strong heat has subsided, and then covering it with light earth, mushrooms may be obtained sooner than by the process I shall recommend. But if this process be more slow, it has the advantage of being more sure; and the time of reaping may be reckoned upon with equal certainty. The difference of time, from first proceeding to make the beds to gathering mushrooms, will generally be three or four weeks. By the first method, you may reap in six or eight weeks; and by the latter, in ten or twelve. — Proceed thus:

"After having laid a floor, as hinted at above, of ashes, stone-chips, gravel, or brickbats, so as to keep the bed quite dry, and free from under-damp; lay a course of horse-droppings six inches thick. These should be new from the stable, and must not be broke; and the drier the better. They may be collected every day, until the whole floor or sole be covered to the above thickness; but they must not be allowed to ferment or heat. In the whole process of making up, the bed should be as much exposed to the air as possible; and it should be carefully defended from wet if out of doors. When this course is quite dry, and judged to be past a state of fermentation, cover it to the thickness of two inches with light dry earth; if sandy, so much the better. It is immaterial whether it be rich or not; the only use of earth here being for the spawn to run and mass in. Now lay another course of droppings, and earth them over as above, when past a state of fermentation; then a third course, which in like manner earth over. This finishes the bed, which will be a very strong and productive one, if properly managed afterwards. Observe, that in forming the bed it should be a little rounded, in order that the centre may not be more wet or moist than the sides. This may be done in forming the sole or floor at first, and the bed would then be of equal strength in all parts. If it be made up against a wall in a cellar, stable, or shed, it may have a slope of a few inches from the back to the front, less or more, according to its breadth. I have sometimes been contented with two courses, as above, instead of three; and often, when materials were scarce, have made them up slighter, thus: three four-inch courses of droppings, with one inch of earth between each, and a two-inch covering at top. Such a bed as this I have had produce for ten or twelve months together; but very much depends on the state of the materials, and on the care taken in making it up; also on the after-management.

"The droppings of hard-fed horses only are useful. Those of horses on green food will, of themselves, produce few or no mushrooms. This I have proved in more than one instance, much to my disappointment. And I have, moreover, found, that the richer the keep of the horses, the more productive are their droppings. I have made up beds from farm-horses, fed partly on hard, and partly on green food; and from carriage or saddle horses, fed entirely on corn and hay; treated them in the same way in every respect; and have found, not once, but always, those made from the latter most productive. Droppings from corn-fed horses may be procured at the public stables in towns, or at inns in the country, any time in the year; and if the supply be plentiful, a bed of considerable dimensions may be made and finished within five or six weeks. In as many more weeks, if in a stable, or dry cellar, or a flued shed, it will begin to produce, and often sooner; but if the situation of the bed be cold, it will sometimes be two or three months of producing mushrooms."

The same author adds, that though mushrooms are most speedily and certainly propagated by placing the germinating seeds, or rather the white fibrous radicles, which produce tubers in the manner of potatoes, called the spawn, in a situation proper for the development of the plants; yet "without at all abetting the doctrine of equivocal generation, we may assert our power to produce this spawn at pleasure. Some long stable dung which has not lain in a heap, or undergone any degree of fermentation, is mixed with strong earth, and put under cover from rain: the more the air is excluded, the sooner does the spawn appear: a layer of old thatch, or any kind of litter that has lain long abroad, and so is not apt to ferment, is proper for excluding the air. In about two months, the white threads of the spawn will be found penetrating the dung and earth."

1290. *Where Indigenous Spawn may be collected.* September is the month in which the mushroom comes to perfection in the open air; and this is the time to look for it in its native habitats. Downs and upland pastures are the primitive situations, whence the seeds seem to be carried by horses and cattle, to what are called secondary situations. Thus "it is found in strength and purity, in the path of a bark-mill worked by a horse, in any other horse-mill track under shelter, in covered rides for horses, in dry half-rotted dung-heaps, and in hot-beds. It is found in a less degree in various other situations." *Abercrombie.*

M'Phail says, "The best of mushroom spawn is frequently to be found in dunghills which have lain a long time without turning, and which had been formed of horse-dung, scrapings of roads, and turf cut up about the sides of roads or commons. The heat of the summer months having dried the dunghill, when rain comes about the latter end of August or in September, mushrooms of a good quality may often be seen beginning to form themselves on the surface, like large peas. When these are observed, it is time to take out the spawn, which is generally in hard dry lumps of dung, the spawn having the appearance of whitish coarse pieces of thread."

To preserve Indigenous Spawn. "Having found cakes of dung which contain the desired spawn, take them up as entire as possible, with the earth adhering, and lay them carefully in a basket or any other conveyance. These are to be stored till used as below, in a dry covered place; and if they were found in a damp state, should be dried in hollow piles, before they are laid together in a mass. The dry spawn may be preserved three or four years. To preserve alike from perishing, and from running before it is planted, a dry shed furnished with a current of air, is indispensable."

1291. *Procuring Spawn Artificially.* Wales thus procures spawn: "For this purpose, the month of March is the fittest time, the cattle not being then upon grass, but chiefly upon dry food of one sort or other. Take two barrow-loads of cow-dung, one load of sheep and one of horse dung; dry them well; then break them quite small, so as they may go easily through a coarse garden-sieve. When well mixed together, lay them up in a round heap, finishing at top in a point. It is to be understood, that the operation is to be conducted in a dry shed. Observe to tread the heap as it is put up, which will greatly save it from heating too much. If a stick were thrust into the heap as a proof, and when taken out, if it feels very slightly warm in the hand, the heat is doing well; for, in the whole mode of raising mushrooms, it should be particularly observed to take great care of the heat, as the mushrooms are impatient of either too much heat or cold: the best adapted, and most productive heat I have ever found, was from 55 to 60 degrees of Fahrenheit, and the nearer the beds are kept to this heat, the greater will be the success. The heap is to be covered with horse-litter, in a state of fermentation, to the thickness of four inches all over. If the shed be warm when the heap is put up, I would recommend old bass-mats rather than dung, as the least overheat would spoil the heap. In this state let it lie for one month; then throw the litter a little aside, thrust the hand into the heart of the heap, and take out a handful. If the spawn has begun to run, you will observe numerous small white fibres or threads through the dung. If not begun to run, let another covering be put on above the old one of the same thickness as the first; and after a month more, you will undoubtedly find the heap to abound with spawn. I have had it running in three weeks, and sometimes it has required ten weeks, much depending on the state of the dung. The spawn thus procured is of the very best quality, far exceeding what is got in fields or in old hot-beds. — I write from experience, and have not borrowed this mode of procuring spawn from any one. The spawn in this state is not fit for keeping long; and I shall next give directions how to form spawn-bricks, when as many can be made at one time as will serve for the season, or even for a number of years if required, provided the spawn be kept dry." *Mem. Caled. Hort. Soc.*

Preserving Artificial Spawn by forming Spawn-Bricks. The author last quoted says, "Take of horse-dung without litter, three barrow-loads; two barrow-loads of the mould of rotten tree-leaves; two barrow-loads of cow-dung; one barrow-load of old tan-bark, such as is thrown out of the pine-pit; with one barrow-load of sheep's-dung; mix all these well together, till the mixture seem to be one compost, and to be as fine and soft as common mortar, or as the clay used in grafting, as otherwise it would not come easily out of the mould. Then take a small frame, such as brick-makers use for moulding their bricks, — the size six inches long, four broad, and three deep. A portion of the mixture should then be forced into the mould or frame, and the sides of the mould being a little wetted beforehand, the spawn-brick will easily come out without breaking. After the bricks have stood two hours or so, take a blunt or rounded dibble, and make three holes in the middle of each brick, an inch from each other, and about half through the brick; these holes are for receiving the spawn. I find it is the best way to lay the bricks as they are made upon boards, that they may be carried out of doors in a good day to dry. The bricks should be rendered perfectly dry, as the least damp would spoil the spawn. They will often seem dry on the outside, while they continue wet in the inside. The best way to prove them, is to break a brick, and observe how dry it is in the inside. It is to be observed, that great care must be taken in the turning them upon the boards, for fear of breaking, they being very apt to go to pieces, till nearly fit for receiving spawn. When fit, they are firm, and quite dry on the outside: this happens in the course of three weeks, if the weather be dry and the bricks be rightly attended to. Now, take fresh horse-litter, which has been laid up in a heap to sweeten as when for hot-beds; lay a bottom course of this six inches thick, whereon to lay the bricks. The horse-litter which is to be prepared for covering the spawn-bricks ought to be rank, because the drier and sweeter the heat, the spawn will work the freer; and, as I stated before, if the weather be warm, the less covering will serve; also, if there be any heat in the old covering at the expiration of three weeks, add no more new covering, as the old will perfectly serve the end. Every hole in the bricks must next be filled quite close up with the spawn; and as the bricks are laid one upon another, the upper side of the brick when laid, must also be covered with spawn: at the same time observing, as the bricks are laid, to keep them as open between one another as possible, so as to let the heat and steam of the dung go through all parts of the heap. The heap is to be terminated at top by a single brick. When all are thus laid, place round the sides and top six inches of the hot dung, which will soon raise a fine moderate heat; observing, that all this must be done in a shed, or where rain cannot enter to cool the dung. After two weeks, add three inches thick of additional fresh dung upon the old; this will renew the heat, and make it work forcibly for the space of two weeks more, when the litter may be taken off, and cleared all out from the spawn-bricks. Before the cover is taken off, it will be proper to lay a little of it aside, and take out a few of the bricks, to see whether the spawn has run all through each brick or not; if not, replace the bricks again, and the cover, and let them remain for ten days longer, when they will be found to be every one, as it were, a solid mass of spawn. They may be allowed to stand and dry for a few days in the heap: they are then to be laid up in some dry place till wanted for use, where they will keep good for many years."

1292. *Propagation of Mushroom Spawn.* M'Phail offers two modes, as follows: "About the beginning of the month of May collect a heap of nearly equal quantities of cow, horse, and sheep dung; add to it some rotten fern leaves, or rotten dry dung, somewhat resembling spawn, from the linings of hot-beds; mix the whole well together, in the way a bricklayer's labourer makes mortar; spread it on a floor in a cool dry shed, where it cannot dry too hastily, making it about five or six inches thick; beat or tread it firm; and as soon as it is in a fit condition, cut it with a sharp spade into pieces in the form of bricks; set the pieces to dry till they can be conveniently handled; then with a knife make a hole in the middle of each, and put a little piece of good mushroom spawn into each hole, closing it up with a bit of that which was taken out; then pile the impregnated pieces up in a heap in a hollow manner, so that the air may pass through the heap freely among the pieces, to dry them gradually; and if the shed be light, cover the heap with mats, or any other light covering to keep it dark. When the spawn has extended itself through every part of the prepared pieces of the mixture, lay them out separately, that they may be perfectly dried, which will prevent mushrooms from growing out of them; which, if suffered, would exhaust the spawn so, that it would be much weakened. In a dry state, the spawn thus propagated, may lie till it be wanted in the autumn or following spring. If such pieces of spawn be continued in a dry state, the spawn will remain good for a long time.

"Another way, similar to the preceding, to make mushroom spawn, is as follows: some time in the month of May or June, collect about two cart-loads of dung from the fields, or take it from the stables; separate it entirely from the straw; add to it six barrows of fresh loam, two barrows of soil scraped from the road, and one barrow of coal-ashes sifted fine: mix these well together; then spread the mixture on the floor of a dry shed, give it a gentle watering, and spread over it a quantity of spawn from an old mushroom-bed; after this, tread it as firm as possible, and continue to do so two or three times a week. In this situation let it remain till it is turned into a solid mass of spawn, which generally is about the end of August; then cut it into lumps, and lay them up edgewise to dry."

Abercrombie says, "Pieces of it may be laid along the ridge of a cucumber-bed raised in spring. Plant them about a foot apart. In about two months, the surface of the spawn will assume a mouldy appearance; it is then to be taken up with the earth adhering thereto, broken into pieces, and laid upon the shelf of a dry shed."

Oldacre's mode of propagation is as follows: "Take any quantity of fresh horse droppings mixed with short litter (as recommended for the beds), add one-third of cows' dung, and a small portion of earth to cement it together; mash the whole into a thin compost, and then spread it on the floor of an open shed, and let it remain till it becomes firm enough to be formed into flat, square bricks, which being done, set them on edge, and frequently turn them until half dry; then, with a dibble make one or two holes in each brick, and insert in each hole a piece of good old spawn, the size of a common walnut; the bricks should then remain until they are dry. This being completed, level the surface of a piece of ground three feet wide, and of length sufficient to receive the bricks, on which lay a bottom of dry horse-dung six inches high; then form a pile, by placing the bricks in rows one upon another (the spawn-side uppermost) till the pile is three feet high; next cover it with a small portion of warm horse dung, sufficient in quantity to diffuse a gentle glow through the whole. When the spawn has spread itself through every part of the bricks, the process is ended, and they must be laid up in any dry place for use. Mushroom-spawn, made according to this receipt, will preserve its vegetative power many years, if well dried before it is laid up; if moist, it will grow, and soon exhaust itself."

Neill mentions an original method of propagating spawn, practised by John Hay, in Scotland. "A quantity of cow droppings is to be gathered from the pastures; some rotten wood, or spray from the bottom of a hedge, is to be collected, with a little strong loam. These are mixed, and formed into a moist ductile sort of mortar or paste, of such consistence that it can be cut into pieces like bricks. When these are so far dried that they can conveniently be lifted, a row is laid in some dry place under cover, perhaps in a shade at the back of a hot-house; a little spawn is placed upon the layer; then another layer of the spawn-bricks, and so on. In a few weeks the whole mass is penetrated by the spawn. The spawn-bricks may then be laid aside for use; they will keep many months; and the drier they are kept, the more certainly do they afford a crop of mushrooms when placed in favorable circumstances for doing so."

The importance of keeping spawn dry is attested by Miller, who found, that spawn which had lain for four months near the furnace of a stove, yielded a crop in less time, and in greater profusion, than any other.

1293. *The Methods of rearing Mushrooms* are still more various than those of propagating the spawn. They are most commonly grown in ridges in the open air, covered with litter and mats; and next in frequency in ridges of the same sort under cover, as in the open sheds of hot-houses, &c. They are also grown in close sheds behind hot-houses; in flued sheds built on purpose, or mushroom-houses; on shelves in flued mushroom-houses; in pots, boxes, hampers, baskets, &c. placed in any warm situation; in cucumber or melon beds; in old hot-beds of any sort; in pits with glass frames; and in dark frames or pits.

Ridges in the open Air. M'Phail says, "Some think that mushrooms do better in the open air than in covered sheds, which I have frequently experienced to be the case. In sheds, mushroom-beds are apt to become too dry; in the open ground, the humidity of the air, and a little wet sinking through the covering, keeps them in a damp state." *G. Rem.* 110.

Preparing the Dung. Provide good horse-dung, purged of its fiery heat by the usual preparation; with which some old linings from a melon-bed may be mixed, if it is not winter. *Abercrombie.*

M'Phail says, "Take two cart-loads of fresh stable-dung, to which add an equal quantity of old dry linings from melon or cucumber-beds, mixing them well together in a heap; and after letting it lie about a fortnight, it will be in a fit state to make into beds. To make a mushroom-bed of new dung, let the same be well prepared, by laying it together in a heap to ferment, and by turning and mixing it well, shaking the outside of the heap, which is cold, and the inside, that is hot, together, so that every part of it may be equally fermented, and deprived of its noxious quality."

1294. *Forming the Bed.* Abercrombie says, "Mark out the ground-line of a bed four feet wide at bottom, the length to be governed by the quantity to be raised; from this, work with an inward slope, so as to terminate with a narrow roof-shaped ridge along the centre, three feet or more in height. In building the bed, shake and mix the dung well together: beat it down with the fork, but do not tread it: leave it to settle, and to expend the first heat in vapor." "When the dung is in a fit state to make into a bed, which it will be in about three weeks or a month after it has been put together to ferment, let the bottom for it be marked out about seven feet wide, and as long as you choose to make it; let the foundation on which it is made be dry, and let it be worked up in a sloping manner, so as to terminate with a narrow roof-shaped ridge along the centre, about four feet or more in height. In making the bed, shake and mix the dung well together; beat it down well with the fork; and if the dung be long and dryish, tread it down as you proceed." *M'Phail.*

Moulding the Bed. "Having proved by trial-sticks left some days in the bed, that the heat is become moderate, you may cover two-thirds of the sloping bank with mould two inches thick, leaving the top of the ridge open for the steam to evaporate as it gradually rises. When the exhalation is finished, the top may also be earthed over;" or, earth round the bed four inches high, forming a ledge of mould two inches thick.

Planting the Spawn. "Divide the large cakes of spawn into small lumps. These may be planted in rows six or eight inches asunder. Place the lumps of spawn about six inches apart in the same row, inserting them through the mould close down to the surface of the dung: or, the dry spawn may be broken or scattered over the bed; being covered with earth to the depth specified above." *Abercrombie.*

M'Phail directs, "When the bed has been some time made, and the heat sufficiently declined, the spawn may be put into it; but, for fear of the heat being too great in the upper part of it, it had best be at first spawned only half-way up all round; take the spawn in small pieces, and stick it into the sides of the bed, in rows about three or four inches, piece from piece, so that the spawn and earth about to be laid on may meet. When the bed is spawned as high up as it is thought the heat of the bed will not injure it, take good, strong, rich earth, of a loamy quality, and cover the spawned part of the bed with it, about two inches thick, beginning to lay it at the bottom of the bed, beating it firm with the spade. The earth should be in a pliable state; not wet, nor over dry."

Covering the Ridges. "The inconvenience of a bed exposed to the weather, is, that it is sometimes necessary to cover it from wet, where there is danger of thus exciting a fermentation. When the bed is even under a shed, it is necessary to apply a covering from three to twelve inches thick, as the strength of the dung declines, or as the bed may be exposed, at the sides, to rain, snow, or frost. The covering may be either clean straw and long dry stable litter, or sweet hay and matting; the latter is to be preferred. Lay it thin at first, and increase it as circumstances demand."

Ridges in open Sheds are formed, and planted exactly in the same manner.

In rearing in close Sheds behind Hot-Houses, where the temperature approaches to 50 or 55 degrees in the winter months, from the heat arising from the hot-house furnaces, the ridge mode above may be adopted, or a flat bed similarly composed and planted.

In Flued-Sheds, or Mushroom-Houses on the common plan, the method of forming the dung-bed, earthing and planting, is the same as in the three last modes: sometimes, however, the beds are formed in a walled-pit, and flat, or sloping, on the surface, like a cucumber-bed.

1295. *The Culture of Mushrooms on Shelves,* in flued-sheds, or houses, is a German practice, introduced to this country by Oldacre. The plan of Oldacre's house has been already given (*figs.* 186. & 187.) M'Phail describes a similar one, "as a good method of propagation," (*Gard. Rem.* p. 108.) To either houses the following directions will apply.

Compost for the Beds. "Collect a quantity of fresh horse-dung, that has neither been exposed to wet nor fermentation, clearing it of the long straw, so as to leave one-fourth, in quantity, of the shortest litter, when incorporated with the horse-droppings; then add a fourth part of tolerable dry turf-mould, or rather maiden-earth, and mix it well with the dung before mentioned: the advantage derived from the mould or maiden-earth, is the union of the whole into one *compact solid substance,* so congenial to the growth of mushrooms. If dung from the rides of a livery-stable, or the round of a horse-mill, can be procured, and mixed with a fourth part of short litter, and added to as many fresh horse-droppings as will cause a gentle warmth, when made into beds, it will be found superior, for the production of mushrooms, to horse-dung that is gathered from the stables.

The Method of making the Beds. "Form the beds on the shelves and ground-floor by placing a layer about three inches thick of the prepared mixture. Then, with a flat mallet, beat it as close together as possible, next add another layer of the compost, repeating the same process as before, and so on until the beds are formed into a solid body, seven inches thick, making the surface of the beds as smooth and as even as possible. The reducing the beds into a very solid body is a most essential point; for without it, you cannot expect success: and the thickness of them must also be particularly attended to; for where there is a much greater body, the beds will be subjected to a strong fermentation, and will be prevented, by evaporation, from retaining that consistency in the dung, which is absolutely necessary for the production of a good and plentiful crop. On the contrary, if a much less quantity be laid together, the heat and fermentation will be insufficient to prepare the beds for the nourishment of the spawn; but the assistance of both, to the extent prescribed, cements the materials together, which, in addition to beating, increases greatly their solidity. The proper vegetation of the spawn, and the consequent crop of mushrooms, depend entirely upon a moderate genial heat and fermentation, neither too strong nor too slight. As soon as the degree of heat in the beds is a little more than that of milk from the cow, (say from eighty to ninety degrees of Fahrenheit's thermometer,) beat the beds a second time, to render them more solid, if possible; then make holes with a dibble, three inches in diameter, and nine inches asunder, through the compost in every part of the beds: these holes will be a means of cooling the beds, and preventing that excess of heat from taking place, which would produce rottenness, and render them unproductive. If the beds do not attain the heat required, in four or five days after they are put together, (which you will know by plunging a thermometer into one of the holes,) add another layer of the compost, two inches thick, which will probably increase the heat sufficiently; if not, a part of the bed should be taken away, and the remainder mixed with fresh horse-droppings, and wrought together in the same way as before, in order to produce the proper degree of heat. Beds made after this manner readily generate natural spawn in summer, and frequently in the winter months.

Of spawning the Beds. "In three or four days after the holes have been made, by observing the thermometer, it will be found that you have the desired degree of heat, and the inside of the holes will also have become dry; the beds are then in a good state for spawning, which should be done while the heat is on the decline. If this operation be deferred until the heat is quite exhausted, the crop will be late, and less plentiful. Fill every hole full of spawn, which must be well beaten into them, and then make the surface of the beds solid and level; it is of no consequence whether the spawn put into the holes, be in one lump or in several small pieces, it is only necessary that the holes should be well filled. About a fortnight after the spawn has been introduced, examine the holes, and if the spawn has suffered any damage from over heat, or too much moisture, in the beds, introduce fresh spawn in the same way as before. On the contrary, if the spawn be found good, and vegetating freely into the compost, such beds (if required for immediate production,) may be covered with mould agreeable to the rules hereafter laid down, and the beds intended for succession should remain unearthed in the summer, three weeks or a month before you wish them to produce, and in the winter a month or five weeks. If the spawn be introduced in hot weather, air must be admitted as freely as possible into the shed, till the spawn has spread itself through the beds; for if the place be kept too close, the beds will become soft and spongy, and then the crop will neither be abundant, nor of good quality.

Of earthing the Beds. "Such beds as are intended to be put into work, must be covered with a coat of rich maiden-earth, wherein its turf is well reduced. Then spread it regularly over the surface of each bed, two inches thick; and beat it as solid and level as possible. The earth used should be neither too dry, nor yet wet, but so as to become compact together, and take, when beaten, a smooth face. If too moist, it will chill the beds, and injure the spawn. On the contrary, if too dry, it will remain loose, and in a state by no means favorable to the growth of mushrooms; but when solid, it produces not only finer mushrooms, but in greater quantities, as the earth from soils of lighter texture invariably grows them weaker, and of inferior quality, and such beds cease bearing much earlier.

Of the subsequent Treatment. "From the time of covering with earth, the room or shed should be kept at fifty to fifty-five degrees of Fahrenheit's thermometer, and the light must be excluded. If the heat be suffered to exceed, to any considerable degree, it will cause the beds to ferment a second time, and weaken, if not totally destroy, the spawn; but should a much lower degree of temperature than the one prescribed be permitted to prevail, the mushrooms will advance slowly in their growth;

and if watered in that state, numbers of the small ones will be prevented from attaining perfection. In watering them, extreme caution is necessary, as well in the mode of application, as in the temperature of the water, which should be nearly as warm as new milk, and very lightly sprinkled with a syringe, or a small watering-pot; otherwise the mushrooms are sure to sustain damage. If cold water be used, and given plentifully at one time, it will not only destroy the existing crop, but the spawn also, and render the beds so treated of no further utility. If the beds have been suffered to become very dry, it is better to give them several light waterings than one heavy supply. In gathering the mushrooms, great care should be taken not to disturb the small ones that invariably, with good management, surround the stems of those which are more early matured. The best method is to twist them up, very gently, in all instances where you can. But where you are obliged to cut them, great care should be taken to divest the beds of the stems of those that are cut, as they would rot, to the great injury of those that surround them.

"If the preceding directions are properly attended to, in the management of the beds, they will continue to bear several months, and a constant supply may be kept by earthing one bed or more, every two or three months, according to the quantity of mushrooms required at one season. When the beds are in full bearing, if the mushrooms become long in their stems, and weak, it is certain the temperature of the building is too high; consequently, air must be admitted in proportion to the heat.

"*Of renovating the old Beds.* As your beds begin to decline in bearing, and produce but few mushrooms, take off the earth clean from the dung, and if you find the latter decayed, destroy the beds and replace them by new ones, being careful to select any good spawn that may present itself; but if, on taking away the earth, you find the beds dry, solid, and full of good spawn, add a layer of fresh compost, as before recommended, three or four inches thick, mixing it a little with the old, and beat it as before. By adhering to this mode of renovating the old beds, a continual supply may be kept up." *Oldacre in Hort. Trans.* vol. ii.

Neill observes, "In what particulars the advantage of Oldacre's plan over former modes chiefly consists, does not very clearly appear. Beds made up in the usual way are much less compact, and are more damp; compactness and dryness may therefore be considered as important." *Ed. Encyc.* art. *Hort.*

1296. *Growing Mushrooms in Pots, Boxes, &c. with Dung.* "Having given an account how to procure the spawn, which is the principal point, I shall next proceed to state how mushrooms are to be raised from the spawn with dung. I raise the mushrooms in boxes, hampers, or, in short, in any thing which will hold the dung and the soil together. These boxes or vessels are placed in the back sheds of the hot-houses, or in any house whatever, where no damp nor frost can enter. There should be several boxes, a part only being filled at a time, so as to keep a rotation of them, and have mushrooms at all times ready for the table. I shall suppose three boxes to be filled at one time. Each box may be three feet long, one and a half broad, and seven inches in depth. Let each box be half filled with horse-dung from the stables, (the fresher the better, and if wet, to be dried for three or four days before it be put in the boxes); the dung is to be well beat down in the boxes. After the second or third day, if any heat has risen amongst the dung, it is then a fit time to spawn: break each spawn-brick into three parts as equal as possible; then lay the pieces, about four inches apart, upon the surface of the dung in the box; here they are to lie for six days, when it will probably be found, that the side of the spawn next to the dung has begun to run in the dung below; then add one and a half inch of more fresh dung upon the top of the spawn in the box, and beat it down as formerly. In the course of a fortnight, the box will be ready to receive the mould on the top; this mould must be two and a half inches deep, well beat down with the back of a spade, and the surface made quite even. But before the box be earthed over, it will be proper to take up a little of the dung, as far down as near the bottom of the box, to see if the spawn has run through the dung; if not, let the box stand unearthed for some days longer, for, were it to be earthed before the spawn had run through the dung, there would be but a poor crop. In the space of five or six weeks the mushrooms will begin to come up; if then the mould seems dry, give a gentle watering, the water being slightly heated in any warm place before being applied. This watering will make the mushrooms start freely, and of a large size. I cut three myself, which weighed 18½ oz. from a box treated as above. The boxes will continue to produce for six weeks, and I have had them productive sometimes for two months, if duly attended to, by giving a little water when dry, for they need neither light nor free air. I have had thirty-two pretty well-sized mushrooms in one cluster. If cut as button-mushrooms, each box will yield from six to twelve Scots pints, (24 to 48 Eng. pints,) according to the season and other circumstances.

"The plan now described, I prefer for yielding numbers of mushroms, and where a great many are required; but when reared without dung, they are best flavored, They are not then to be distinguished from those which grow naturally in the fields, but comparatively few are in this way produced.

"I have lately found it very useful to add to every three barrow loads of horse-dung, one of perfectly dry *cow-dung*, beat down to powder as it were, and well mixed among the horse-dung, after the horse-dung has lain under cover for four or five days to dry. The reason I tried the cow-dung dry was, that I still found the horse-dung to have a strong damp, after having lain in the boxes for some time; but the cow-dung, when beat down to powder, has the effect to dry up this damp, and also to make the horse-dung lie in the box more compactly; and the more it is pressed down, the finer the spawn will run amongst it."

1297. *Growing Mushrooms in Pots, Boxes, &c. without Dung.* "Take a little straw, and lay it carefully in the bottom of the mushroom-box, about an inch thick, or rather more. Then take some of the spawn-bricks, and break them down, each brick into about ten pieces, and lay the fragments upon the straw, as close to each other as they will lie. Cover them up with mould, three and a half inches deep, and well pressed down. When the surface appears dry, give a little tepid water, as directed for the last way of raising them; but this method needs about double the quantity of water that the former does, owing to having no moisture in the bottom, while the other has the dung. The mushrooms will begin to start in a month or five weeks, sometimes sooner, sometimes later, according to the heat of the place where the boxes are situated. They do not rise so thick nor of so large a size, nor do they continue to be produced so long, as in the other plan with dung."

Compost or Mould for growing Mushrooms in Boxes. "Take a quantity of horse-dung from the stable-yard fresh, and for every layer of dung, six inches in depth, lay three inches of fine earth from any light soil; these alternate layers may be repeated till there be as much as will probably be wanted for the course of a year. After this mixture has lain about six months or so, the dung will be sufficiently rotten: it should then be well broken with a spade, and passed through a garden-sieve. Two inches of this compost laid upon the top of the box, and well pressed down with the back of a spade, will be found to answer. It is to be understood, that the same compost, made of the dung and earth, is used for going on the top of the beds formed with dung, as well as on those without it, observing to have it sifted fine, and well dried, for if it be damp, the spawn would not run freely amongst it."

1298. *Culture of the Mushroom in Melon-Beds.* The following mode has been practised by the Rev. W. Williamson, for several years, with great success. He considers it more economical and generally practicable than the plan of Oldacre.

"Having made my melon-bed in the usual manner, when the burning heat is over, and the bed is ready to be earthed to a sufficient thickness, I place spawn on the sides of the hills, and also on the surface of the bed, and then cover the whole with mould, as usual, managing the melons exactly in the same manner as if the spawn were not there, not omitting even to tread it, as I find that a compact loam is more congenial to the growth of the mushroom, than the light rich compost of the cucumber-bed. The heat will soon cause the spawn to run, and extend itself through the dung, to the surface of the ground. In September or October following, when the melon bine is decaying, the bed is carefully cleaned, the glasses are put on, and kept close; and when the mould becomes dry, it must be frequently watered, but not immoderately, as too much wet would destroy the spawn; advantage should also be taken of every gentle shower, for the same purpose. The moisture coming up on the dry earth produces a moderate heat, which soon causes the mushrooms to appear in every part of the bed, in such abundance as even to prevent each other's growth. I have frequently, at one time, gathered two bushels from a frame ten feet by six, and have produced individual mushrooms of nearly *two pounds'* weight. The mould being kept warm by the glasses, and properly watered, the mushrooms will continue to spring till the frost of winter prevents their further growth. I then leave the bed, frame, &c. just as they are, and early in spring, as soon as the frosts may be supposed to be over, I take off the frame and glasses, and cover the bed lightly with straw; when the warm, enlivening showers of spring cause the mushrooms to be again produced in every part, till the drought of summer renders it difficult to keep the bed sufficiently moist for their growth. Sometimes I suffer the bed to remain, in order to produce a crop in the second autumn, but more generally take the bed to pieces, for the sake of the dung, and also for the purpose of procuring and drying the spawn, against the return of spring.

"When I first thought of raising mushrooms in the manner above described, I was apprehensive, lest the spawn, by running among the roots of the melons, might injure their growth. I therefore planted it in one light only, but the result convinced me that it did no injury, as, on the only plant in that light I grew a melon, of the black rock kind, weighing eight and three quarters pounds, for the first crop, and another six and a half pounds for the second crop; both of which ripened well. Since that time I have always placed the spawn over the whole of the bed, and have never failed to produce a good crop of both melons and mushrooms. Should it be thought advisable to have a supply of mushrooms during the depth of winter, I am confident (though I have not tried the experiment,) that they might be obtained, at a trifling expence, by lining the bed with hot dung, and using other precautions to keep out the cold air." *Hort. Trans.* vol. iii.

Oldacre, at the end of his paper on growing mushrooms on shelves, &c. says, "They may be grown also plentifully, in hot-bed frames, by the same process as is recommended for the sheds. In this latter practice, as soon as the beds are earthed, they should be covered with hay or litter under the lights, until they are in full-bearing, then remove the covering to the outside of the lights, to exclude the sun and air as much as possible. In cold weather, if they advance slowly in their growth, the frames may be covered with hot dung, which will greatly encourage them. It must be recollected, that when these beds are made in hot weather, air must be admitted as freely as possible into the frames, during the time of spawning, as directed for the management of this part of the process, in cellars or sheds."

1299. *In old Hot-Beds.* A good crop of mushrooms is sometimes obtained without making a bed on purpose, by introducing lumps of spawn along the margin of late cucumber-ridges, just into the top of the mould. This may be done from March to May. *Abercrombie.*

In Pits. S. Jeeves has adopted this practice, and thus describes it. "To make my bed, the dung was placed in the bottom of the pit, and rammed tightly down, to about the thickness of eighteen inches; the dung itself producing sufficient heat to set the spawn running, after it had been introduced in the usual manner. The bed was made up last September, and came into bearing in six weeks; it has continued to produce regularly to the present time, and requires no more heat than is collected by the effect of the sun on the air within the house, except on frosty nights, when a little fire is put into the flue. The mushrooms come up uniformly over every part of the bed, which is covered very slightly with straw, (not sufficient to exclude the light,) for the purpose of preserving moisture on the surface."

In dark Frames. Nicol says, "If you have no mushroom-house, and yet are anxious to have mushrooms in winter, a cover or frame, capable of defending the bed from rain, snow, or frost, may be made at a small expence, thus: first, make a frame of inch-and-half deal, nine or ten inches deep, six feet wide, and of any convenient length, from ten to twenty feet. Then fit a roof to it, three feet in the pitch, made of thin boards, imbricated, which lay over with two or three coats of pitch or paint. The roof part to be fixed down to the wooden frame by hooks and eyes, or by bolts, so as that it may be removed at pleasure, and to have two moveable boards on each side, of about a foot square, to slip for the admission of air.

"This sort of frame being placed in a dry, warm situation, and being insulated by a drain or trench, would completely defend the bed from wet; and by being covered in severe weather, with straw or mats, from frost. If the ground be not perfectly dry, a sole or floor must be formed of ashes, gravel, or stone-chips, for the bed; a thing necessary in any situation which is the least damp, either within or out of doors."

In a Cellar. "Mushrooms may likewise be produced in a cellar, or any other vaulted place, with equal success, and not unfrequently to greater advantage as to crop, than in a shed, or other building, that is level with the surface of the earth. The same rules of management are to be observed as directed for the shed. The peculiar advantage of a cellar is, that no fire is necessary, and less water, the application of which so frequently proves injurious, is wanted."

1300. The following *details of culture are common to each of the above modes* of rearing the mushroom.

Season for Commencement. Mushroom-beds or boxes may be formed and planted at any time of the year; but the month of September is the most natural season; and the time next to be recommended, is early in spring. In June, July, and August, the weather is rather too warm; and in the depth of winter, it is not equally easy to excite and cherish the spawn. *Abercrombie.*

Nicol makes up a bed in March to last till September, and another at that time to last through the winter, till the bed to be again made in March comes into bearing. He adds, however, that there is no rule for making up these beds, as it may be done at any day of the year with nearly equal propriety. *Kalendar*, p. 50.

Time of Growth. In autumn and spring, common ridges will often begin to produce plentifully in four, five, or six weeks. In summer or winter they are much longer before they become productive. *Abercrombie.*

In Wales's method of growing in boxes, they come up in five weeks.

Abercrombie says, mushroom-beds have been known to lie dormant for five or six months, and yet afterwards produce abundant crops.

Where a bed is cold, Nicol observes, it will be sometimes two or three months of producing mushrooms.

Symptoms of Progress. Nicol says, when you would know whether the spawn has begun to run, thrust your hand a few inches deep into different parts of the bed, and examine what you bring up. If it smells exactly of mushrooms, and has the appearance of bits of thread, then the spawn is in action. "But generally you will be forewarned of the spawn's running, by a previous crop of spurious fungi, which rise more or less abundantly, according to the fineness or grossness of the materials of which the bed is composed. These fungi generally are either what are called pipes or balls; and sometimes a kind of mushroom, of a very bad sort, thin, flat, with white or pale yellow gills. They have all, however, a nauseous, sickly smell, and may readily be distinguished from the true mushroom, which is thick, hemispherical, with brown or reddish gills."

Duration of Crop. Six months is the ordinary duration of a common bed or ridge, made in the open air or in a flued shed. Oldacre says, his beds will continue to produce for several months. To have a succession, he earths a bed every two or three months.

Wales's boxes continue to produce for six weeks, and sometimes two months.

Temperature. Nicol says, if the bed be placed in a flued shed, the temperature in winter should be kept steadily to about 55 degrees. This is also Oldacre's temperature.

Wales says, "I have ever found the best adapted and most productive heat to be from 55 to 65 degrees, and the nearer the beds are kept to this heat the greater will be the success."

Air is essentially necessary to the flavor of mushrooms. Oldacre says, air must be admitted in proportion to the heat, otherwise the mushrooms become long in their stems, and weak. The same thing takes place in ridges when the coverings are too thick.

Water. Abercrombie and Nicol agree in recommending no water to be given till the spawn begins to run.

Abercrombie says, "In autumn, the bed will want no water until the first crop is gathered. Then a sprinkling will help to excite a fresh vegetation. In spring, should a drying air long prevail, it may be necessary to moisten the bed a little. In summer, the bed may be now and then exposed to gentle showers, or otherwise watered according to the dryness and heat of the season. In order to give water, without wetting the bed excessively or unequally, scatter a thin layer of short hay over the ridge; and let a small quantity of water be gently distributed, to all parts alike, from a rose-pan. Leave it to filter through the hay, and cover the bed up with litter. In winter, the substitute for watering must be some warm mulch from a dung heap, laid over the dry litter; the moisture evaporating from this will promote the growth of the mushrooms. Excessive moisture is not only apt to destroy the spawn, but it debases the flower of such fungi as can be produced under it. It is also supposed to render the salutary sorts less so, and to make the unwholesome kinds more acrimonious."

Nicol says, "When the spawn is fully formed, give the bed two or three hearty waterings, in order to set it a growing; for, otherwise, it will lie dormant, and show no symptom of vegetation. Give just as much water (but by no means at once) as will fairly reach to the bottom of all the materials, and afterwards keep the bed in a state neither wet nor dry, but rather inclining to the latter, this being the safe side to err on, as it is more easy to make it damp than to dry it."

When a bed has been, as it were, tired of producing, I have sometimes desisted from watering for several months; then by examination I have found a new net of spawn formed all over the surface, the threads being deep-rooted, even to the bottom. By a hearty watering, as above, a most plentiful and lasting supply has been obtained. The idea of treating my beds so, arose by observation of the manner in which field-mushrooms are often produced. We frequently see the crop suddenly disappear, and as suddenly appear again, according to the state of the weather, with respect to wet or drought; and that, too, in the same field."

Oldacre waters with extreme caution, using water nearly as warm as new milk, sprinkling very lightly with a syringe, or a small watering-pot. Cold water destroys the bed and the spawn, and thus renders the whole useless.

Some old authors advise to take a few full-grown mushrooms, and breaking them down in the watering-pot, to water the beds with the infusion. This, Neill observes, is plainly nothing else than sowing mushroom-seed.

Light. Abercrombie, Nicol, and most gardeners and authors, consider light as quite unnecessary for the production of the mushroom. It is very probable, however, that it contributes in some way to their perfection, since in their natural situation, they enjoy a considerable portion of it. Our opinion is, that it should not be entirely excluded from mushroom houses or beds on whatever plan they may be constructed.

Gathering the Crop. When the bed is in full production, and the season fine, mushrooms may be gathered two or three times a week. Turn off the straw covering, and return it carefully at each gathering. *Abercrombie.*

"In gathering mushrooms," Nicol observes, "they should always be cut, and never be pulled; as by pulling, many young ones might be destroyed. There are always a number of these forming or clustering about the roots of the old ones, which should not be disturbed. If the spawn be deeply situated in these beds, mushrooms will often form and come to full maturity, entirely under ground. They may easily be recognised, however, as they are generally large, and push up small hills above their heads. They ought to be uncovered with care, that the spawn about them may be as little disturbed as possible."

Oldacre says, in gathering mushrooms, avoid disturbing the small ones, that invariably, with good management, surround the stems of those which are more early matured. Twist them up very gently in all instances where you can; and when obliged to cut them, take care to divest the beds of those that are cut, as they would rot and injure those around them.

For the characters of the true mushroom, *Agaricus campestris*, and the other species and varieties, edible and deleterious, see the following chapter. Their duration is too fugitive to admit of their being much injured by *insects*.

Chap. VIII.

Horticultural Catalogue. — Hardy Herbaceous Culinary Vegetables.

1301. Having treated generally on the cultivation of the kitchen-garden, and its different departments of culinary vegetables, fruit-trees, and forcing, we now proceed to enumerate the different plants and trees grown in these departments, and to give some account of the history, use, and particular cultivation of each species or noted variety, commencing with the *Hardy Herbaceous Culinary Vegetables.*

The most suitable arrangement for this class of plants seems to be, that arising from a combined view of their habits, culture, and uses, in domestic economy. Though no such arrangement can be absolutely perfect, from the circumstance of many of the plants being used for different purposes, yet, by bringing together such as present most points of union, something better than a mere alphabetical catalogue is formed, of which the following is the outline.

The Cabbage Tribe; comprehending the white and red cabbage, cabbage colewort, Savoy, Brussels' sprouts, borecoles or winter greens, cauliflowers, and broccolis.

Leguminous Plants; comprehending the pea, bean, and kidney-bean.

Esculent Roots; comprehending the potatoe, Jerusalum artichoke, turnip, carrot, parsnip, red beet, skirret, scorzonera, salsify, and radish.

Spinaceous Plants; comprehending the garden spinach, white beet, orache, wild spinach, sorrel, and herb patience.

Alliaceous Plants; comprehending the common onion, Welch onion, leek, chives, garlick, shallot, and rocambole.

Asparaginous Plants; comprehending asparagus, sea-kale, artichoke, cardoon, rampion, alisanders, hop, bladder campion, cotton thistle, and milk thistle.

Acetarious Plants or Salads; comprehending small salads, lettuce, endive, succory, dandilion, celery, mustard, rape, corn-salad, garden-cress, American-cress, winter-cress, water-cress, brook-lime, scurvy-grass, garden-rocket, Burnet, buckshorn, plantain, ox-eye daisy, and some of those included in other sections, as the sorrel, tarragon, Indian-cress, &c.

Pot-Herbs and Garnishings; comprehending parsley, purslane, tarragon, fennel, dill, chervil, horse-radish, Indian-cress, marigold, borage, and some others included in other sections.

Sweet Herbs; comprehending thyme, sage, clary, mint, balm, marjoram, savory, basil, rosemary, lavender, tansey, costmary, and some of those in the preceding section.

Plants used in Tarts, Confectionary, and Domestic Medicine; comprehending rhubarb, gourd, angelica, anise, coriander, carraway, rue, hyssop, chamomile, elecampane, liquorice, blessed-thistle, wormwood, and some others.

Plants used as Preserves and Pickles; comprehending love-apple, egg-plant, capsicum, caper, samphire, and the red cabbage, Indian-cress, radish, kidney-bean, marsh marygold, &c. included in other sections.

Edible indigenous Plants neglected, or not in Cultivation; comprehending the sea-beet, nettle, sea-peas, and a variety of other natives.

Edible British Fungi; comprehending the mushroom, truffle, and morel.

Edible British Fuci; comprehending the dulse, tangle, &c.

Sect. I. *The Brassica,* or *Cabbage Tribe.*

Of all the classes of cultivated culinary vegetables, the cabbage tribe is the most ancient as well as the most extensive. The *Brassica oleracea,* Tetrad. siliq. Linn., and *Cruciferæ,* Juss., figured in *Eng. Bot.* t. 637, being extremely liable to sport, or run into varieties and monstrosities, has, in the course of time, become the parent of a numerous race of culinary productions, so very various in their habit and appearance, that to many it may appear not a little extravagant to refer them to the same origin. Besides the different sorts of white and red cabbage, and savoys, which form the leaves into a head, there are various sorts of borecoles, which grow with their leaves loose in the natural way, and there are several kinds of cauliflower and broccoli, which form their stalks or flower-buds into a head. All of these, with the turnip-rooted cabbage, and the Brussels' sprouts, claim a common origin from the single species of brassica above mentioned.

Cabbage of some sort, White in his "*History of Selborne,*" informs us, must have been known to the Saxons; for they named the month of February *Sprout kale.* Being a favorite with the Romans, it is probable the Italian cabbage would be introduced at an early period into South Britain. To the inhabitants of the north of Scotland, cabbages were first made known by the soldiers of the enterprising Cromwell, when quartered at Inverness. *Edin. Encyc.* art. *Hort.*

The original cabbage plant grows naturally on the sea-shores in different parts of England, but it has not been observed in Scotland. It is a biennial plant; the stem-leaves are much waved and variously indented; the color is sea-green, with occasionally a tinge of purple. Early in the spring, the wild cabbage or colewort, from the sea-coast, is said to be excellent, but it must be boiled in two waters to remove the saltness. The roots may also be eaten, but they are not very tender. *Neill and Martyn in Mill. Dict.*

The space occupied by this tribe in most kitchen-gardens may be estimated at one-eighth part of the open quarters, taking the whole year round; and in cottage-gardens, the heading cabbages and borecoles generally occupy one-half of the whole space.

We shall take the varieties in the order of white cabbage, red cabbage, Savoy, Brussels' sprouts, borecole, cauliflower, and brocoli.

Subsect. 1. *White Cabbage.* — *Brassica oleracea, var. α capitata. Chou pommé,* or *cabus,* Fr.; *Kopfkohl,* Ger.; and *Cavolo,* Ital.

1302. This variety is too well known, and its uses too universal, to require any description. It produces firm, compact heads, glaucous, green, or greenish-yellow, externally, but blanched within and varying, in different sorts, from three to twelve or fifteen inches diameter, and from two to fifteen or twenty pounds' weight.

Varieties. These are very numerous: the sorts chiefly cultivated are,

Small early dwarf
Early dwarf York
Large early York
Early dwarf sugar-loaf
Large sugar-loaf
East Ham
Early Battersea
Early Imperial.

Pentonville. Large round head; leaves white and fleshy, wrinkled like the savoy, very delicate and fine: in perfection during the latter summer months, when other cabbages are of strong flavor.

Antwerp
Russian
Early London hollow
Large hollow sugar-loaf
Large oblong hollow
Large round winter (white)

Great drum-head flat topped
Great round Scotch, or white Strasbourg: from which the German sour krout is chiefly made.

Estimate of Sorts. The first five or six sorts are suitable for the earliest and secondary summer crops; and the middle-sized and large kinds for the principal summer, autumn, and winter supplies. Thus, 1. For the earliest crops, allot some of the small early dwarf York, East Ham, and sugar-loaf, for cabbaging in April, May, and June, 2. Raise more considerable quantities of the middle-sized kinds, particularly the large York, and large sugar-loaf, or the Battersea, Penton, Imperial, Antwerp, Russian, &c. for general summer-crops. 3. Choose the larger later sorts for succession, summer, and general autumn cabbages. The large hollow sugar-loaf, oblong hollow, long-sided hollow, and large round winter (white), are excellent for full cabbaging in August, September, and October, till Christmas: or any of the middle-sized varieties may be eligibly sown for latter succession-crops in summer and autumn, to cut in light young growth; also to cultivate for cabbage-coleworts, either with small hearts, or as open greens for family and market supply in autumn, winter, spring, and returning summer. 4. The large round winter cabbage. Great drum Scotch and American kinds, all reaching a very expanded bulk in autumn and winter, are not usually so well fitted for family consumption as the foregoing, being more commonly adopted for field-culture, to feed cattle in winter, &c.

Propagation. All the kinds are raised from seed annually, of which, according to Abercrombie's seed-estimate, "for a seed-bed to raise the early York, and similar varieties, four feet wide by twenty in length, two ounces" will be required. For a seed-bed to raise the large sugar-loaf, and other luxuriant growers, four feet by thirty-six in length, two ounces. Sow at three different seasons, that is, spring, summer, and autumn, and cover from an eighth to a quarter of an inch. Under a deficiency of winter, standing young plants, for final transplanting in spring, or, in order to have some spring-sown plants as forward as possible, a moderate portion of some best early sorts may be sown between the middle of February and the middle of March, in a slight hot-bed or frame, to nurture the plants till the leaves are an inch or two in length. Then prick them into intermediate beds in the open garden, there to gain strength for final transplanting. *Abercrombie.*

Soil and Situation. The soil for seedlings should be light, and, excepting for early sowings, not rich. Where market-gardeners raise great quantities of seedling-cabbages to stand the winter, and to be sold for transplanting in spring, they choose, in general, the poorest and stiffest piece of land they have got, more especially in Scotland, where large autumnal sowings of winter drum head and round Scotch, are annually made, and where the stiffness of the soil gives a peculiar firmness of texture and hardness of constitution to the plants, and prevents their being thrown out of the soil during the thaws which succeed a frosty winter. Transplanted cabbages require a rich mould, rather clayey than sandy; and as Neill and Nicol observe, it can scarcely be too much manured, as they are an exhausting crop. Autumnal plantations, intended to stand the winter, should have a dry soil, well dug and manured, and of a favorable aspect.

The cabbage tribe, whether in the seed-bed, or final plantation, ever require an open *situation*. Under the drip of trees, or in the shade, seedlings are drawn up weak, and grown crops are meagre, worm-eaten and ill-flavored.

Early and main Summer Crops. The cabbage being a biennial, the largest crops are obtained by sowing the year previously to that in which you expect to reap. Sow, therefore, at the beginning of August, to raise plants to stand over the winter in young open growth, for cabbaging early, and in succession the following year. A nice attention should be paid to the time for sowing this crop, which is the first or second week in August, being that most conducive to ultimate success, though some sow at the close of July, to have the plants stronger before the approach of winter; but of a crop so forward, many generally run for seed in the spring; therefore be careful to make the principal sowing neither sooner than about the fifth, nor later than the twelfth, of that month. For, if sown earlier, many of the plants are apt to run in the spring, as just stated; and, if sown later, they would not acquire sufficient strength before winter, to enable them to stand severe weather so effectually as those a little advanced in firmer growth.

Sow each sort separately in an open, free situation, in beds of rich mellow earth, broad cast, moderately thick, and rake in the seed evenly, lengthwise each bed. Give occasional watering, if dry hot weather; or sometimes shade with mats, in hot sunny days, till the plants come up fully; after which, continue necessary moderate watering, if a dry season, to forward and strengthen the crop.

When the plants have two or three leaves an inch or two broad in September, or beginning of October, lift some considerable portion from the seed-beds, and prick into beds of good earth, about four inches apart, giving water: all these are to remain in the intermediate bed during winter, to gain strength for transplanting in the spring. Those left in the seed-beds will thus have more room to advance equally for transplanting the most forward of the early sorts in the same year, towards the end of October, or in November and December, and the principal supply in the spring, the last fortnight of February, or in March and April.

In transplanting, continue to keep each sort separate, allotting the whole good ground; and, if dunged, it will be repaid in the crop. Plant some of the dwarf early in rows, from a foot and a half to two feet asunder, to admit of thinning for use in a young cabbaged state: those of the middle-sized, intended for main crops, plant at two feet, or two and a half distance. The large autumnal kinds plant at least from two feet and a half to a yard asunder, giving water at planting in dry, warm weather.

In their subsequent growth, if any fail or run to seed, be careful to pull them up directly, and supply the deficiencies with fresh plants. As the crop proceeds, give it two or more timely hoeings, both to cut down all rising weeds, and to loosen the ground between the plants, drawing some earth round the stems, which will strengthen and forward them considerably.

The different sorts will cabbage in succession from April till October. Some may be forwarded in cabbaging by tying the leaves together, moderately close, with osier twigs, or strings of bass. The succeeding main crops will not need that assistance, but will head spontaneously in due time. Of the earlier dwarf kinds, some probably will be fit for cutting, in small cabbagy heads, at the close of April or beginning of May; and the others in full growth from May till July; and the succeeding main crops in full heads from July till October.

Early Spring-sown Crop. To succeed the crops of the preceding autumn-sowing, it is requisite to sow in the spring, to raise plants for use the same year, partly as young summer cabbages, and partly with full heads, in autumn and winter. For this purpose, sow at the close of February, or in March, and the beginning of April. A few for early summer use may be sown in the third week of February on a slight hot-bed, or on a warm border under glass. In case no plants were raised the preceding autumn, or if the young crop which has stood the winter be much cut by severe weather, there is an additional motive for sowing a competent portion in the spring, of dwarf middle-sized, and large kinds, according to the above estimate of sorts. Sow the different kinds separately, and in the same method as directed for the crop to stand the winter. Manage the plants in the seed-bed, and prick a proportion into an intermediate bed in the same manner. When of suitable growth for final transplanting, in May, June, or July (taking opportunity of moist weather, if it occurs), plant them out in rows traced from one to two feet asunder for the dwarf and middle-sized, and for the larger kinds from two feet and a half to a yard distant. Give water at planting. In their subsequent growth, give occasional hoeing to kill weeds, and to draw earth round the stems, as advised for the August-sown plants.

Late Spring or Summer sown Crop. For late young summer and autumn cabbages and winter plants, you may sow small portions at any time from May to July, principally of the quick-hearting kinds; plant out finally in summer and autumn to produce young heads, and small cabbage-hearted coleworts in August, September, October, and thence till midwinter. The large, late family cabbages which make returns for autumn, winter, and early spring: also the largest kinds usually adopted for field-culture are to be excluded from this sowing, as they are only properly raised as part of the principal crops sown in August and early in spring. *Abercrombie.*

1303. *Cabbage Coleworts.* The original variety of cabbage called colewort is, or seems to be, lost, and is now succeeded by what are called cabbage coleworts. These, Abercrombie observes, are valuable family-plants, useful in three stages: as young open greens, as greens with closing hearts, and as greens forming a cabbage growth.

Sorts proper for Coleworts. Procure seed of some middle-sized early variety of the cabbage, quick-hearting, and of close growth; such as the early and large York, East Ham, and large sugar-loaf. Occasionally, for larger coleworts, you may adopt some Battersea, imperial, Antwerp sorts, or early London hollow; but avoid the larger late kinds of cabbage, which, in a colewort state, are too spreading and open; the others grow close, stocky, and full in the heart, and boil most tender and sweet for the table.

Times of Sowing. To have a good supply of coleworts for autumn, winter, spring, and returning summer, it is proper to make three or four sowings in summer and autumn: that is, one sowing toward the middle of June, a second about the same time in July, with a third in the last week. These supplementary crops are for transplanting in August, September, and October, and will amount to a continued provision of autumn, winter, and early spring coleworts, from September till March or April. At this time the plants of these sowings will mostly start for seeding. To succeed these, effect a very considerable sowing in the beginning from about the third to the sixth of August. Having been transplanted in autumn, the forwardest of the August-raised plants will be fit for gathering in the course of winter, if the weather be mild; but the principal supply should be set apart for a continuing spring crop to increase in growth from March till June, without running to seed, as would generally be the case, if sown before the time just specified. What are not used in their colewort state in spring, will advance in cabbaging, to be cut either with small hearts, or with middling, or full heads, in the early part of summer and autumn. If it be required to have coleworts in a younger state in summer and autumn, you may sow at the time of raising the spring-sown crop of cabbages.

Sowing, Thinning, and Transplanting. Sow in some open compartment of light, mellow ground, in one or more beds, distributing the seed evenly on the surface; and rake it regularly into beds lengthwise. If the weather be dry, give occasional waterings, both before and after the plants are up. When the young plants have two or three leaves, if thick in the seed-bed, prick out a portion into intermediate beds, to increase in growth three or four weeks. When these and those in the seed-beds have several leaves two or three inches broad, transplant them finally into open compartments of ground, in rows twelve or fifteen inches asunder, by eight or twelve inches in the lines, as it may be intended to gather them in smaller or larger growth. If the weather be dry and warm, a watering at planting would be of much advantage. In their subsequent growth, keep them clear from large weeds by occasional hoeing; at the same time, loosen the ground about the plants, drawing a little earth to the stems, which will forward and strengthen their growth; the hoe will also wound and kill many of the slugs which sometimes annoy these plants in their young state, about the end of autumn and beginning of winter. *Abercrombie.*

Taking the Crop. After cutting off the head, never neglect immediately to pull up the stalk, and carry it off with all the refuse leaves to the compost heap. This practice is enjoined as well to prevent the stem from pushing out shoots, and needlessly exhausting the ground, as to promote neatness and order. It is necessary, however, to make an exception in favor of the practice of some, who, instead of removing the roots and stems of the main summer-crop, leave them in the ground deprived of their injured leaves, and with the intervals between the rows stirred and perhaps manured, allow them to stand till spring. Thus treated, they push out in autumn, and in January or February abound in fine cabbage sprouts, not much inferior to young cabbages. Sometimes this practice is applied to the earliest spring or summer crop in which case the sprout cabbages come into use the following autumn. *Cabbage Coleworts* are gathered when the leaves are as broad as a man's hand. The largest are drawn up by the root, which is generally allowed to remain attached to those taken to public markets, as it retains the sap, and tends to preserve them succulent a longer period, than if they were wounded close to the succulent leaves.

Preserving Cabbages. Where this is thought necessary, the plants are laid down on their sides, and the stems covered with earth close to the head, the outer part of the more exposed side of which may be sometimes injured, but the inside remains sound.

To save Cabbage-seed. The raising of the seed of the different sorts of cabbage, Neill observes, affords employment to many persons in various parts of England. It is well known that no plants are more liable to be spoiled by cross breeds than the cabbage tribe, unless the plants of any particular variety, when in flower, be kept at a very considerable distance from any other; also, in flower, bees are extremely apt to carry the pollen of the one to the other, and produce confusion in the progeny. Market-gardeners, and many private individuals, raise seed for their own use. Some of the handsomest cabbages of the different sorts are dug up in autumn, and sunk in the ground to the head; early next summer a flower-stem appears, which is followed by abundance of seed. A few of the soundest and healthiest cabbage-stalks, furnished with sprouts, answer the same end. When the seed has been well ripened and dried, it will keep for six or eight years. It is mentioned by Bastien, that the seed growers of Aubervilliers have learned by experience, that seed gathered from the middle flower-stem produces plants which will be fit for use a fortnight earlier than those from the seed of the lateral flower-stems: this may deserve the attention of the watchful gardener, and assist him in regulating his successive crops of the same kind of cabbage.

Subsect. 2. *Red Cabbage.* — *Brassica Oleracea, var.* β *rubra.* *Chou pommé rouge,* Fr.; *Roth Kopfkohl,* Ger.; and *Cavolo rosso,* Ital.

1304. This variety is similar in form to the white, but of a purple or brownish-red color.

Use. The red cabbage is chiefly used for pickling; and the dwarf red variety, Neill observes, "certainly does make one of the most beautiful pickles that can be presented at table." Both the dwarf and large sorts are sometimes shredded down in winter, in sallads, like red beet-root; and the Germans prepare sour krout from all or any of the varieties.

Varieties. There are three principal varieties of red cabbage, viz.

The large red, or red Dutch, with a large, firm, round head, usually cultivated in market-gardens

The dwarf red, with a small, round, firm, delicate head, less common than the other

The Aberdeen red, with an open, leafy head, chiefly found in cottage-gardens in the north of Scotland.

The *propagation, sowing,* and *culture,* are in all respects the same as for of the white cabbage; excepting that the heads are not used when imperfectly formed, or as coleworts; but the plants should, in all cases, be allowed to stand till they have formed close, firm heads. Sow in August for a crop to stand the winter, and to come in at the close of next summer, and thence till the end of autumn. Sow early in spring for returns in the following winter and spring.

Subsect. 3. *The Savoy.* — *Brassica Obracia, var.* γ. *saubauda.* *Chou pommé frisé,* Fr.

1305. This variety is distinguished from the other close or hearted cabbages by the rugosity of its leaves; and from the Brussels' sprouts, by its cabbaging in large full heads. The Brussels' sprouts is considered a sub-variety.

Use. The Savoy is in use as a table-vegetable from November till spring, unless destroyed by frost, in which case, it is succeeded by the borecoles or winter-greens. These two classes of the cabbage tribe generally supply the table from November to May.

Varieties. There are

The green
The dwarf, and
The yellow savoy, and of each of these are,
The round
The oblong, and
The conical, or sugar-loaf heading sub-varieties.

Estimate of Sorts. The green Savoy is the least hardy, and must be used first. The London market is generally supplied with it through the month of November, and until the plants are injured by frost.

The dwarf Savoy is hardier than the preceding, bearing well the attack of the first winter frosts, by which the delicacy of its flavor is materially improved; and from its small size, it is better adapted to the tables of private families. Where the whole class is cultivated, this must be considered the second sort in succession. The best plants grow close to the ground, not exceeding a foot in height. The yellow-Savoy, by its hardiness, enables us to continue the use of Savoys till mid-winter. It does not yield to any of the others in goodness, and by many persons it is preferred, being considered much sweeter. *Hort. Trans.* vol. ii. p. 309.

Propagation. The Savoy is always raised from seed, and for a seed-bed four feet and a half by eight feet, half an ounce of seed will be sufficient.

Soil and Situation. This esculent answers best on a light rich soil: poor or exhausted ground should be manured according to the defects of it. Allot an open compartment in the full air, that the seedlings and advancing plants may grow stocky, and not draw up weak and long-stemmed, as they are liable to do in close situations, or narrow borders, under walls.

Times of Sowing. A sufficient succession is obtained by three, or at most, four sowings, made from the last week of February till the second week in May: for planting out, from May till September. A small crop may be sown at the end of February, or the beginning of March, to plant out for early autumn Savoys, to cabbage in August or September. Sow a larger portion in the last fortnight of March for a first considerable autumn and winter crop. Nor omit to sow a full supply in the second or third week of April, for a main crop to be planted out in June, July, and the beginning of August, to attain a full cabbaged growth late in Autumn, and to stand partly over the winter. Furthermore, it would be eligible to make a moderate sowing at the beginning, or towards the middle of May, in order to plant out the seedlings in July, August, or September, for smaller heading, to come in towards the spring, and to stand longer before they run; or, some to use occasionally in winter, as Savoy-coleworts.

Culture. The ground should have been previously trenched to a good depth. Four feet is a convenient width for the beds. Sow broad-cast; and rake in a quarter of an inch deep. As soon as the plants have two or three leaves, an inch or two in width, if they stand too crowded, thin the seed-beds, by drawing out a quantity regularly; and prick them into other beds four inches asunder. Should the weather be dry, water those left, as well as those removed. Permit both divisions to remain three, four, or five weeks, to gain a good stocky size for final transplanting. When the plants, both in seed-beds and those pricked out, are advanced with several leaves, two or three inches broad, or more, transplant them finally into the most open quarters of ground, where they will be less annoyed by caterpillars, that they may cabbage with large full heads; planting them at different times as ground become vacant. Remove the most forward in May or June, for early autumn heading in August or September. But plant the principal crops in June or July, and from the beginning to the middle of August; taking all possible advantage of showery weather. In drawing the plants, observe if any are clubbed or knotty at the root, and cut off the protuberances close. Plant in rows those removed in May, June, or July, two feet and a half, or not less than two feet asunder, by the same distance in the rows; others late planted in August and September, two feet by eighteen inches. In scarcity of vacant ground, some Savoys may be occasionally planted between wide rows of previous standing crops, such as beans, cauliflowers, and early cabbage, that are sufficiently forward to be gathered off by the time the Savoys will want the entire ground. Before and after plantings made in dry weather, watering would be of essential service.

As the plants of the different successions advance, keep them from weeds by occasional broad hoeing. At the same time, loosen the surface of the earth, and draw some about the stems of the plants: let this be done twice or oftener, to forward them in a free enlarging growth. They will gradually heart, fully cabbaging in September, October, November, December, &c. as they are the crops of the forward, or later sowings: they may be cut for use accordingly, and during the winter. The Savoys left standing will continue good till the middle or end of February, when, or in the course of March, they open and send up seed-stalks.

To save Seed. See *Cabbage.*

Subsect. 4. *The Brussels' Sprouts.* — *Brassica oleracea, a sub-variety of var. γ sabauda. Chou de Bruxelles ou à jet,* Fr.

1906. This plant produces an elongated stem, often four feet high, from the alæ of the leaves of which sprout out shoots which form small green heads like cabbages in miniature, each being from one to two inches in diameter, and the whole ranged spirally along the stem, the main leaves of which drop off early. The top of the plant resembles that of a Savoy planted late in the season; it is small, and with a green heart of little value.

J. B. Van Mons says, (*Hort. Trans.* vol. iii.) "If this vegetable be compared with any other which occupies as little space, lasts as long, and grows as well in situations generally considered unfavorable, such as between rows of potatoes, scarlet-runners, or among young trees, it must be esteemed superior in utility to most others." Nicol considers it as deserving more general culture in Scotland; and Morgan (*Hort. Trans.* vol. ii.) says, it is an excellent sort of winter-green for the table, but not sufficiently hardy to last through the winter in England.

Use. The sprouts are used as winter-greens; and at Brussels they are sometimes served at table with a sauce composed of vinegar, butter, and nutmeg, poured upon them hot after they have been boiled. The top, Van Mons says, is very delicate when dressed, and quite different in flavor from the sprouts.

Culture. The plants are raised from seed, of which an ounce may be requisite for a seed-bed, four feet by ten feet. Van Mons, in the paper already referred to, says, "The seed is sown in spring under a frame, so as to bring the plants forward; they are then transplanted into an open border with a good aspect." By thus beginning early and sowing successively till late in the season, he says, "we contrive to supply ourselves, in Belgium, with this delicious vegetable, full ten months in the year; that is, from the end of July to the end of May." The plants need not be placed at more than eighteen inches each way, as the head does not spread wide, and the side leaves drop off. In this, as in every other respect, the culture is the same as that of the borecole.

Gathering the Crop. Morgan says, the sprouts must have some frost before gathered; but this Van Mons assures us is an erroneous opinion. In Belgium, the small cabbages are not esteemed if of more than half an inch in diameter. It is usual to cut off the top about ten or fifteen days before gathering from the stem. In spring, when the sprouts are disposed to run to flower, their growth is checked by taking up the plants, and laying them in the ground in any shaded spot.

To save Seed. Van Mons says, it is usual to save the seeds indiscriminately from plants which have or have not been topped; but that he intends to save from the tops only, hoping thereby to improve the progeny. Whatever mode be adopted, the grand object is to place the plants where they will be in no danger of receiving the farina of any other of the Brassica tribe.

Subsect. 5. *The Borecole.* — *Brassica oleracea, var. δ. sabellica. Chou vert, or non pommé,* Fr.; *Kale,* Sax.; *Green Kale,* Scotch.

1907. This variety contains several sub-varieties, the common characteristic of all, which is an open head, sometimes large, of curled or wrinkled leaves, and a peculiar hardy constitution, which enables them to resist the winter, and remain green and fresh during the season.

1. *Green Borecole,* otherwise *Scotch Kale,* or *Siberian Borecole,* the *Chou Pancalier* of the French. The leaves are of a bright light-green, deeply lobed, and not very wide, slightly rugose on the upper surface, having indentations on the under surface, corresponding to the projections above, with veins of a greenish-white. The margins of the leaves are plaited so closely as to widen the margin of the leaf, three times as much as it would measure if a quarter of an inch of plaiting were taken away all round. The younger leaves in consequence look completely fringed.

The part used is the crown or centre of the plant, cut off so as to include the leaves which do not exceed nine inches in length. It boils well, and is most tender, sweet, and delicate, provided it has been duly exposed to frost. Morgan says, it is impossible to find a plant of more excellence for the table, or more easily cultivated.

2. *Purple Borecole,* or *Brown Kale,* of the Germans, differs from the other, in having the leaves and entire plant of a deep purple color, becoming somewhat green as the leaves enlarge, but the veins and ribs still remaining purple. It is a more hardy plant than the green borecole, but of less delicate flavor. When boiled, the purple color, in a great degree, disappears.

3. *German Kale.* This is a variety of the green borecole, known in Scotland under the names of German greens, German kale, curled kale, and curlies. It is cultivated in the royal gardens of Kew and Kensington, under the name of German kale, and is a green, Morgan says, "of singular merit." Its leaves are more pointed, and grow much longer than those of the other; their margins are not so plaited, but being still considerably so, give the plant a fringed appearance, but not so richly and beautifully

so as the true Scotch kale. The chief difference consists in its furnishing abundance of side shoots or sprouts for the table, after the crown has been gathered. It grows tall, and this disposition ought to be encouraged by early planting; for the supply of shoots is nearly in proportion to the length of the stem. It is rather more hardy than the Scotch kale; in taste it is the same; but when not mellowed by frost, has something of a bitter flavor.

3. *Variegated Borecole*, of each of the three preceding varieties, is a sub-variety blotched or striped with white, and chiefly cultivated for ornament or curiosity.

4. *The Thousand-headed Cabbage* grows to the height of four feet and upwards; sending out from its main-stem, branches in the manner of a tree, from the ends and sides of which proceed shoots, which appear as if actually in growth the whole winter. The leaves are of a pale-green, very numerous, tongue-shaped, and entire, being narrower than those of any other green. The whole plant has the appearance of a thick bush of green leaves. It is chiefly extolled as an agricultural plant, but may be occasionally planted in gardens, because it will survive the severest frost, and be useful when every other plant of the cabbage tribe has been destroyed. In flavor it is inferior to all the other winter-greens.

5. *Chou de Milan* is the latest of the winter-greens, which grow with elongated stems; it is something like the Brussels' sprouts in general habit, except that the side shoots, instead of forming little cabbages with small hearts, are sprouts. The principal leaves of this plant are not very large; they are rugose, like the Savoy, and form a small crown on the top of the plant, which remains open, and does not cabbage: this top may be cut off and used for the table in February. Even if not wanted for use, the head should be taken off at that period, to forward the growth of the shoots, which come into full use early in March, when those of the German kale are too far advanced. When dressed, they are particularly rich and delicate. *Hort. Trans.* vol. ii. p. 315.

Abercrombie says, this plant, to admit of its full growth, requires a yard square; but that it continues the longest in spring of any of the tall greens, without running to seed.

The varieties following are all dwarfs, producing their supply of greens from shoots formed in the spring.

6. *Egyptian Kale, Rabi Kale*, or *Cole*, or *Kohl rübe*, (Ger.) resembles a Swedish turnip which has shot into a head. The stalk is very thick, and extends about ten inches above the ground, the leaves are narrow, without crenatures, but generally have, at the lower part, one strong indentation on each side: they are of a dark green, like those of the Swedish turnip, and much resemble them in flavor. It is chiefly grown in cottage gardens. From the German appellation of *Kohl rübe*, this plant might appear to be the turnip cabbage, hereafter mentioned, which, however, is a different plant. Some, as Neill (*Encyc. Brit. art. Hort.*) assert, that it has a bulb under ground, as sweet as the Swedish turnip; others, as Morgan, (*Hort. Trans.* vol. ii.) affirm, that it has no bulb whatever.

7. *Ragged Jack* also grows short on the ground, and in the spring shoots up strongly from the crown and sides. The leaves are very glaucous, and much cut or divided; the edges are marked with small obtuse senatures; the under side is neither paler than the upper, which has a peculiarity observable in some varieties of variegated Scotch kale, viz. that, from several points on the surface of each leaf, and particularly on the large ones, arise small pieces of leaf of similar texture and appearance with the main leaf. This plant is almost entirely confined to cottage and farm gardens.

8. *The Jerusalem Kale* agrees with the preceding in habit and growth. The leaves are long, with several deep indentations on each side; these edges are serrated, but not deeply so, the upper surface having a purplish hue, the under being a pale green, and the veins are purple, inclining to a pink color. The whole plant, when growing, appears of a dingy purple, and is extremely hardy: when the taller winter-greens have ceased to be good by running to flower, the shoots of this are ready to take their place at table.

9. The *Buda Kale, Russian Kale, Prussian Kale*, and by some called the *Manchester Kale*, like the preceding, is a dwarf in its habit; but more close and compact, with leaves like the German kale, and the same sort of fringe on its margin. Before the plant begins to shoot in the spring, it appears purple, the back and edges of the leaves being tinged with that color, which of course are more in view in their growing state than when expanded. It is equal in value to any variety of borecole, sweet and well-flavored, perfectly hardy, and remains till late in the spring before it comes into flower. As this variety is expected to furnish a supply much longer than most of the others, and until late in the spring, a greater breadth of ground should be allowed for it, and a second plantation made in August for the late gathering.

10. The *Palm Kale*, or *Chou Palmier*. This variety of borecole is described by Delaunay, in "*Le bon Jardinier*," as rising to the height of six feet, with a straight bare stem, the leaves displaying themselves only at top, and thus producing the appearance of a little palm-tree. The leaves are much puckered, and so much rolled inwards at

the edges, that they appear narrow, while at the same time they hang in a curved manner, thus aiding the illusion. It is almost peculiar to Italy, and not very hardy.

11. *Turnip Cabbage*, or *Turnip Kale; Chou navet*, Fr.; *Kohl rübe*, Ger.; and *Cavolo rapa*, It.; is the *Brassica oleracea*, var. η. *Napo-brassica*, and distinguished by an oval or round gibbosity in the stem, two or three inches from the ground, from which the leaves proceed much in the same way as the pips or floral leaves of the pine-apple on the sides of the fruit. The heart at top is open, and not cabbaged as the name would import. This plant has not been many years introduced, and has been chiefly cultivated here as food for cattle. It is very common, however, in the north of Europe, and especially in Sweden and Poland, where it is to be found in every cottage-garden. The gibbous, or turnip part, pared and sliced down, is used in soups, like the turnip, and sometimes also served whole. The leaves are used like those of other greens; but, as Abercrombie remarks, unless when very young, are "disagreeably and rank tasted." There is a green and red leaved variety.

Propagation. All the sorts are propagated by seed, which is sold by weight; and for a seed-bed four feet by ten, Abercrombie says, one ounce of seed is necessary. Sow in the last fortnight of March, in April, in the beginning of May, and in August. The first week in April for the principal crop of German kale; and the first week in August for the latest spring crop of Buda kale, and which will be ready to transplant in September.

Subsequent Culture. "When the plants have leaves one or two inches broad, take out some from the seed-bed, and prick into other open beds, six inches apart, giving water: in which let them have four or five weeks' growth. Those left in the seed-bed, as well as these, will all acquire proper strength for final transplanting in May, or thence till August. Taking the opportunity of rain, if possible, plant them in an open compartment, in rows two feet and a half asunder, for the first forward plantings in summer; the others two feet; allotting the whole similar distances in the rows. Give occasional water, if dry weather, till they have struck root. In their advancing growth, hoe the plants once or twice, to cut down rising weeds, and to draw earth about the bottom of the stems, to encourage their growth in the production of large full heads in proper season, September, October, &c." At the approach of winter, the stems should be earthed up, especially of the taller sorts. When the distances between the plants are such as have been recommended, the hills round each plant will be of such a size and breadth as to cherish the roots of the dwarf varieties, and serve as a protection to the tall sorts in stormy weather.

Gathering. The heart is to be gathered of all the tall sorts, after which, with the exception of the German kale, and the choux de Milan, the stalks should be pulled up, and taken to the compost heap or dunghill; but the stems of the two sorts excepted are to be left for the sake of their side-shoots or sprouts. Of the dwarf sorts, the heart may either be cut off, for which the Buda kale and coleworts are well suited; or the leaves gathered when the plant begins to grow, which corresponds with the habits of the Egyptian and Jerusalem kale.

To save seed. This can seldom be done of more than one or two sorts in the same garden, on account of the risk of promiscuous impregnation by bees, the wind, &c. As the seed, however, will keep for several years, good specimens of one or two sorts may be selected every year in rotation, and placed in spots distant from each other, in autumn, or early in spring. Trench the root and stem into the ground, at nearly double the distance at which they stood in the plantation. This will allow abundance of air to circulate round the blossoms and seed-pods. They will be ripe in August, when they may be gathered, and threshed out; and the seed, after being exposed to the dry air in the shade for a few days, put up in bags till wanted for use.

SUBSECT. 6. *The Cauliflower.* — *Brassica Oleracea*, var. ε. *botrytis*, L. *Chou-fleur*, Fr.; *Blumenkohl*, Ger.; and *Cavoli fiori*, Ital.

1308. This is one of the most delicate and curious of the whole of the *Brassica* tribe, the flower-buds forming a close, firm cluster or head, white and delicate, and for the sake of which the plant is cultivated. "These heads or flowers being boiled, wrapped generally in a clean linen cloth, are served up as a most delicate vegetable dish. Cauliflower is a particular favorite in this country. 'Of all the flowers in the garden,' Dr. Johnson used to say, 'I like the cauliflower.' Its culture, however, had been little attended to till about the close of the 17th century; since that time it has been greatly improved, insomuch that cauliflower may now fairly be claimed as peculiarly an English product. Till the time of the French Revolution, quantities of English cauliflower were regularly sent to Holland; and the Low Countries, and even France, depended on us for cauliflower-seed. Even now, English seed is preferred to any other." For the early supply of the London market, very great quantities of cauliflower are fostered under hand-glasses during winter and the first part of spring; and to behold some acres overspread with such glasses, gives a stranger a forcible idea of the riches and luxury of the capital. *Neill.*

The Varieties in cultivation are:

Early, for the first early crops
Later, or large, for principal early, and main crops
Red cauliflower, having the stalks of the head of a reddish or purple color, esteemed more hardy than the others, and good for an early crop.

Propagation and Soil. The cauliflower is raised from seed, of which half an ounce is sufficient for a seed-bed, four feet and a half wide, by ten in length. The soil for the seed-bed may be light; but for final transplanting, it can hardly be too rich, the cauliflower, like the vine, being reputed a "rough feeder." Cleanings of streets, stables, cess-pools, &c. ought therefore to be liberally supplied during the growth of the plants, when very large heads are desired.

Times of Sowing. "The early and main superior crop, brought to fruit by the longest nursery attendance; the late summer succession crop, raised by the shortest course; and the Michaelmas crop, obtained at the least expense; are sown respectively at three different seasons. The principal sowing is made about the end of the third week in August, or a day or two before or after the twenty-first, to raise plants to stand over the winter, under frames, hand-glasses, or half sheltered in warm borders, for the early and main superior crops next summer. A secondary sowing in February or March, for succession and late inferior crops the same year in summer and autumn. A final sowing near the close of May, for ordinary crops, to yield fruit the following autumn and winter."

W. Ball finds, that if cauliflower-seed is not sown till the last week in August, and that if the seedlings are not transplanted till the middle or near the end of November, before the hard weather sets in, no sort of covering is necessary, nor any other protection than that afforded by a wall having a south aspect. "In such a border, and without any covering, young cauliflower-plants have uniformly stood well for many successive winters, and have always proved better and sounder plants for spring planting than such as have had additional shelter. The seedlings protected with glass-frames generally grow too gross in the stems, which become partly blackened; and the plants being thus unhealthy, are not fit for planting out. Late raised seedlings, which spend the winter in the open border, uniformly become the largest and finest table cauliflowers during the summer, though they certainly do not come in quite so early. Cauliflower plants, it is probable, are often killed with too much attention. Seedlings raised late in autumn, seem to be very tenacious of life." *Caled. Hort. Mem.* iii. 192.

"A method of producing cauliflower pretty early, and with great certainty, is this: the plants are set in small pots in the winter season, and kept in any convenient part of the floor of a vinery or other glazed house. In the beginning of March, they are taken out of the pots, with the ball of earth attached, and planted in the open ground. If they be here protected against severe frosts with bell-glass covers, they come into head in the course of April, if the weather prove favorable." *Neill.*

Crop to stand the Winter. "*Time of Sowing and first Culture.* For the early and general crops next summer, make a considerable sowing in August, about the eighteenth, and thence to the twenty-fourth day of that month; or two different sowings between those extremes, at three or four days' interval, to raise young plants to stand the winter under protection; some being planted out finally the same year in October or November, under hand-glasses; and the others pricked into frames and warm borders, for planting out finally in the spring, into the open ground, to succeed the hand-glass fruit, or for the general summer crop.

"Sow in a bed of rich, light, mellow earth. After sowing, give occasional light waterings in dry weather, and shade in hot sunny days, till the plants come up. When these have leaves an inch or an inch and a half broad, in September, prick them into intermediate beds, three or four inches apart; watering, and occasionally shading from the mid-day sun, till they have taken root; to remain in such beds to gain strength till October.

Hand-glass Division. "Then, towards the close of October, transplant a quantity finally, into rich ground, which has been well dunged, under hand-glasses, in rows three feet and a half or four feet asunder (with intervening alleys a foot wide), and three feet apart in the row. Set three or four plants centrally under each glass, about four inches apart, with the design of retaining only one or two of the best in the spring. Give a moderate watering at planting, and put on the glasses close till the plants take root, discoverable in a week or ten days by their showing a renewed growth: then raise the glasses on the warmest side, one or two inches in mild days, to admit free air to the plants. Continue the glasses all winter; but in all temperate weather, tilt up the south side daily, two or three inches, to give the requisite admission of free air, in order to strengthen and harden the plants; and sometimes, in fine, mild, dry days, you may occasionally take the glasses off, especially if the plants appear to draw, or get on too fast in growth, as they are sometimes apt to run into small button heads in their nursery state, useless for future culture; but put on the glasses early towards evening; and always keep them on at night, and during cold rain, snow, and frost, shutting them close down in all inclement weather; and during rigorous frosts it would be advisable to give some protection, with long, dry, stable-litter, round the glasses, or to cover with mats, removing the covering when settled mild weather occurs.

"Thus conforming to the vicissitudes of the season, continue the glasses till the close of April or beginning of May; giving larger admissions of free air as the warmer season of spring advances; and sometimes in fine, mild weather, admit a moderate warm shower of rain.

"Meanwhile, in March, if all or most of the plants under the glasses have stood the winter, be careful to leave only one or two of the strongest under each glass; transplanting the superabundant into the open garden, in a quarter of rich mellow earth, improved with rotten dung digged in a spade deep: setting the plants two feet and a half asunder, and giving water. In thinning the plants, be careful to take out those with black shanks; but do not take the trouble to transplant them, for they will prove abortive.

"At the same time, to assist those remaining under the glasses, draw a little earth about the stem of each. To these continue the glasses till the period mentioned above, to forward them in full growth for the most early production; but as they expand in the herb, raise each glass upon three props, three or four inches high, to admit air freely, and to give a larger scope of room above, for the free growth of the plants; or, when further advanced, you may draw a small ledge of earth round the bottom of each glass, both to raise the props higher, for an additional upward space, and to contain water, when occasionally given in dry weather. Towards the end of April, or the beginning of May, when the plants will, in a manner, have filled the glasses, remove these from the most forward, but continue the aid of glass as long as practicable, to accelerate the plants into early heading in May. Thus the most early crop will produce a supply of flower-heads for gathering in succession in May and June.

Frame Division. "The other plants of the same sowing, designed for wintering in frames, may, in young growth, at the end of September, or beginning of October, be either pricked at once into the winter beds, or be, at that time, removed into a preparatory bed in the open garden, to have a month's growth; in order to be transplanted into the frame-beds at the end of October or beginning of November; in rows crosswise the bed, four by three inches apart. Give a light watering, and put on the lights of the frame close till the plants have taken root; then prop up the lights behind, two or three inches, or draw them off occasionally to the back of the frame in mild, dry days, but keep on when very cold, and in rain, snow, frost, and always at night; and in severe frost cover the glasses and round the frames with dry, long, strawy litter and mats; but in all mild, dry weather, admit the air fully, as in managing the hand-glasses. Then in March or beginning of April, transplant the whole into the open garden, in rows two feet and a half asunder; and they will come into full production in July and August.

Half-sheltered Portion. "In want of frames or hand-glasses, you may, in October, either prick some plants into a warm south border, close under the fence, three inches apart, to be protected in rigorous frosts, with mats, dry litter, or reed pannels; or you may prick some into a bed arched over with hoops, to receive a covering of mats during cold nights, or heavy rain, snow, and frosts, in the day-time in winter. Give the full air in all moderate weather, till March or April: then all to be transplanted finally as above.

Secondary Sowing, or first Spring-raised Crop. "For late succession summer cauliflowers, to succeed the autumn raised early and main summer crops; or, if none were raised to stand the winter — sow in the spring, February, or beginning of March, in a moderate hot-bed, or, where that cannot be had, in a warm border under a frame or hand-glass; and when the young plants have leaves an inch broad, prick them into other beds of the same description, three inches apart, to gain strength by three or four weeks' growth, in order to be planted out in the open garden, at the end of April or beginning of May; where they will produce tolerable heads in July or August. Sow also in the open garden during the last fortnight in March, and the first in April for a later succession, with small flower-heads in August and throughout autumn. Plants of the last crop, removed as late as May, for fruiting the same year, should be planted in a shady border.

Second Spring-raised Crop. "The next and last sowing is for the late autumn and winter crop, commonly called the Michaelmas crop; to be made towards the twenty-fourth of May, in a bed of light earth. Prick out the young plants in June, to remain in the intermediate bed till about the middle of July; then to be transplanted two feet and a half asunder. Give occasional watering till they have taken good root.

They will begin to produce heads in October, but the fruit will be of superior size in November and December, if temperate weather follow.

Final Culture of the three Crops. "With respect to the culture of the different crops after being finally transplanted, it is, to hoe the ground occasionally, in order to cut down weeds, and as well to loosen the earth, and draw some round the stems of the plants. When the early crops are nearly advanced to full growth, in May and June, one or two good waterings to the roots will contribute to their producing large heads. In the dry weather of meridian summer, water those not in flower twice a week; and those in flower, every second day. As the flower-heads show themselves, turn down some of the larger leaves, to defend them from sun and rain, and to preserve them white and close, in perfection." *Abercrombie.*

Insects. Cauliflower-plants, when first planted out, are frequently infested with flies, or their *larvæ*, to attract which, it is not uncommon to sow a little radish-seed on the cauliflower ground a fortnight before transplanting; the flies preferring the tender leaves of the radish to those of the cauliflower, the latter are thus suffered to escape.

Preserving during Winter. For this purpose it is usual to pull up the plant entire, and hang it up in a shed or cellar; or to lay the plants in sand in cellars or sheds, covering the flower with the leaves, and being careful to remove every decayed part as it appears. When a shed or cellar is not at hand for this purpose, a mode may be resorted to which has been adopted by Smith, and described by him in the *Caled. Hort. Mem.* vol. i. p. 129., and which consists in burying the entire plant in a pit about eighteen inches deep, dug along the bottom of a wall. On a dry day he takes up the plant, and wrapping the leaves round the head or flower, deposits them in the trench, the heads sloping downwards, and the roots extending upwards, so that the roots of one layer cover the tops of another. Next, he covers up the whole closely with earth, sloping it from the wall, and beating it smooth with the back of the spade, so that rain may run off. In this way he preserves it in a good state from November to January. The best mode, however, of prolonging the cauliflower season, is by raising the plants with balls, and trench-planting them in frames, or the borders of peach or grape houses not in action, taking care to keep the soil dry, and to remove decaying leaves; or, where frames are in sufficient quantity, to place a few over the plants as they stand in the quarter.

To save Seed. "Mark and leave some of the prime plants of the thoroughly-nursed early and main crops, in May and June, when the flower-heads are in highest perfection; as those of late production will not ripen seed effectually. The stools will afford ripe seed in September; when be careful to watch the chaffinches, green-birds, &c. and to gather the branches as the seed upon them ripens. Lay them elevated from the ground, in some sunny, airy situation, to dry and harden to full maturity: after which let the seed be beaten and rubbed out, cleaned and sifted from the husky parts, spread on a cloth to dry the whole equally; and then put up for sowing the following year." *Abercrombie.*

Subsect. 7. *The Brocoli. Brassica Oleracea, a sub-variety of var. ε. botrytis. Broccoli,* Fr.; *Italienesche Kohl,* Ger.; and *Broccoli,* Ital.

1309. In Miller's *Dictionary*, under the article *Brassica*, the few brocolis that were then known are supposed to have proceeded from the cauliflower, which was originally imported from the Isle of Cyprus, about the middle of the 16th century. Miller mentions the white and purple brocoli as coming from Italy; and it is conjectured, that from these two sorts all the subsequent kinds have arisen, either by accidental or premeditated impregnation.

Neill observes, that "no culinary plant is so liable to sport as brocoli; so that new kinds, slightly different, are continually coming into notice or favor, and as speedily sinking into neglect." The common characteristic of brocoli, as distinguished from cauliflower, is *color* in the flower and leaves, and a comparatively hardy constitution to stand the winter. Maber observes, (*Hort. Trans.* vol. i. p. 116.), that as all plants of the Brassica tribe become less alkalescent, and more palatable in proportion as they approach to a pale or white color, such varieties of brocoli will undoubtedly be preferable to purple ones, if they turn out equally hardy.

An able writer on this subject, H. Ronalds, of Brentford, has given, (*Hort. Trans.* vol. iii.) a *Description of the different Varieties of Brocoli, with an Account of the Method of cultivating them*, from which we shall chiefly compose this article. The sorts which follow are placed in the order in which they come to perfection to table.

1. *Purple Cape*, or *Autumnal Brocoli.* This has a close, compact head, of a beautiful purple color; the leaves are nearly entire, erect, concave, lobed at bottom, and much waved, short, and regularly surrounding the head; the veins and mid-rib are stained with purple, which stain is a test of its being true; the head is exposed to the

view in growing; in general it is not very large; as it enlarges, the projecting parts of the flower show a greenish-white, mixed with the purple color. When boiled, the whole flower becomes green. If the season is showery, and this variety is planted in good ground, it comes as large as cauliflower.

Culture. Sown about the middle of May, and beginning and end of June, it will produce in regular succession from August to December, or until frost destroy the heads. Sown in July and August, if the winter is mild, it will bring good heads in spring. When sown in the beginning of September, and the plants preserved in frames as cauliflowers, fine heads may be expected in the months of June and July. Thus, by good management, this kind may be in use during the greater part of the year; but it is not hardy enough to be depended on for the winter months. The plants grow from one foot to one foot and a half high, and should be placed about two feet apart in every direction.

Maher's mode of treating the purple brocoli is as follows: "Three crops are sown annually: the *first* between the 12th and 18th of April; a *second* between the 18th and 24th of May; the *third* between the 19th and 25th of August: these successive crops supply the family from September till the end of May.

The seeds are scattered exceedingly thin, in a border of very rich light earth. Not a weed is suffered to appear, and when the young plants have from eight to ten leaves, which is in about a month, they are finally planted out, at the distance of two feet every way, in a piece of sandy loam, which has been well prepared for the purpose by digging, and enriching it with a large proportion of very rotten dung, frequently turned over to pick out every sort of grub, or insect deposited in it. The ground is kept constantly clean by hoeing whenever a seed-leaf of any weed springs up, and the loose surface is drawn together into a heap round the stem of each plant.

The second crop is treated exactly as the first, but the weaker plants left in the seed-bed are permitted to remain eight or ten days longer to gain more strength. They are then transplanted into pots of the size called *sixteens*, filled with very rich compost, placing them close to each other in the shade, and duly watering the plants, till they begin to grow freely. After this, the pots are plunged in the open ground at two feet distance from each other every way, and about three inches under the general level, leaving a hollow or basin round each plant, to retain any water given to them when necessary. By the time the pots are filled with roots, and that autumnal rains render watering unnecessary, the basins are filled up by drawing the earth round each plant, at the same time pressing it firmly down, to prevent the wind from shaking them. A few of these plants in pots sometimes show flowers too soon; and to guard them from early frost, a leaf or two is broken down over them. On the approach of settled frost in December and January, all the pots are taken up and removed to a frame, pit, or shed, where they can be sheltered from the extreme severity of the winter, but have air when it is milder, and by this method a supply is preserved for the table in the hardest winters. To make brocoli succeed in pots, I find, by experience, that it should be potted immediately from the seed-bed. If it is transplanted oftener, the head or flower is both less in size, and runs much sooner after it forms. For the same reason, I never prick out or transplant the general crops; and as the temperature of our climate does not suffer vegetation to go on briskly from October to March, by following this method, the heads of flower will remain a long time in a state of rest after they are formed, without bursting, and heads from six to seven inches diameter are the ordinary produce of our plants.

The seeds of the third crop are sown in a frame, or under hand-glasses, and about the third week in October, the plants become strong enough to remove, as in the two former crops."

2. *Green Cape*, or *Autumnal Brocoli.* This sort differs but little from the preceding, except in color, and in the heads, as well as the plant, proving in general larger. The leaves are long and narrow, much like those of a cauliflower, they are very little waved, and, consequently, have a general appearance of smoothness; the veins and mid-rib are green. The head, which has some resemblance to a cauliflower, is of a greenish-white color, and is usually somewhat covered by the leaves. These two sorts are very sportive, running much into each other, and have a strong tendency to degenerate, yet are quite distinct, and when so, very beautiful. The greatest care should be taken in saving the seeds from plants which are perfectly true. This remark applies generally to all the sorts.

3. *Grange's Early Cauliflower Brocoli.* If this sort is sown at three different times, from the beginning of May until the end of June, it will bear its heads in succession from Michaelmas to Christmas, if the weather is not severe. The leaves covering the head, defend it from slight attacks of frost, they have long naked foot-stalks, are wider and shorter than those of the green cape, are lobed at bottom, but not much

waved; the veins and mid-rib are whitish-green; the head is large and quite white. It should be planted at about two feet apart."

4. *Green close-headed Winter Brocoli.* This is a new and good sort, apparently a seedling from the green cape, which it closely succeeds in coming into use. The plants are dwarf; leaves spreading, and moderately indented, they are numerous, much waved and large; the veins are white; the flower grows exposed, nearly resembling that of the green cape in appearance, and does not attain a great size.

Culture. The peculiarity of this variety is, that it continues to bear during the whole of the winter, if the weather is mild. A single plantation, from seeds sown in May, Ronalds found to yield heads fit for use, through the months of November, December, January, and February. Plant from one foot and a half to two feet distance.

5. *Early Purple Brocoli.* This is a very excellent kind, of a deep purple color; if the true sort, it is close-headed at first; afterwards it branches, but it is apt to come green, and too much branched, especially in rich ground. The plants are from two to three feet high, growing strong and tall; the leaves are much indented, of a purplish green color, they spread out wide, but not long, though the stalks are so; the head is quite open from the leaves; small leaves are sometimes intermixed with the head: the plants produce sprouts of flowers from the alæ of the leaves.

Culture. When sown in April, it begins to produce in November, and continues bearing heads and sprouts throughout the winter, in mild seasons; if sown in June, it produces abundance of sprouts in March and April. It should be planted three feet apart in rich ground.

6. *Early White Brocoli.* The heads of this sort are of a close texture, and of a pure white color. It grows to about three feet in height; with erect, concave, light green, and nearly entire leaves.

Culture. To obtain heads fine and early, the seed should be sown in February, or beginning of March, on a slight hot-bed. The plants, when about three or four inches high, must be transplanted into beds of light, rich earth, three or four inches apart, and defended from the frost and cold nights by a mat covering; they will be strong enough to plant out at two or three feet distance by the end of April: under this treatment, they will produce beautiful heads in November, and continue to do so until Christmas, if the weather is tolerably mild. This sort, as well as several others, is sometimes cut in considerable quantities by the market-gardeners, previous to an expected frost, and kept in sheds or cellars for the supply of the market.

7. *Dwarf Brown close-headed Brocoli.* From its resemblance, I take this to have sprung from the sulphur-colored brocoli, from which, however, it differs, by coming in earlier, as well as in the shape and color of its head; the leaves are also shorter and broader than those of the sulphur-colored; they are small, not much waved, dark-green, with white veins; they grow upright, and do not cover the head at all. Most of the crowns are green on their first appearance, but soon change to large, handsome, brown heads.

Culture. If sown about the middle of April, it is in use through March and April. Two feet distance is sufficient for the plants, when put out.

8. *Tall large-headed Purple Brocoli.* This sort produces large, tall, purple heads, at two and three feet in height.

Culture. If sown towards the end of March, it will prove a useful kind in March and April. The plants should be three feet asunder, in good ground.

9. *Cream-colored,* or *Portsmouth Brocoli.* This is a very noble sort, exceeding all the others in size. It is of a buff or cream-color, and has a very compact, firm head; its leaves are large and broad, with white veins; they spread out widely, but the small centre leaves cover the flower. A head, sent by Oldacre from the garden of Sir Joseph Banks, to the Horticultural Society, on the 5th of May, 1819, measured more than two feet in circumference, although it was quite close.

Culture. Seeds sown in the middle of April will be in perfection during the following February, March, and April. It bears near the ground. The plants should be planted three feet asunder.

10. *Sulphur-colored Brocoli.* A hardy and valuable sort; if sown in April, it produces in the following April, and beginning of May, fine, compact, conical, sulphur-colored heads, some of them slightly dotted with purple. The leaves have long footstalks, are much indented, and of a bluish-grey color.

Culture. Two feet distance will be sufficient for the plants to grow well.

11. *Spring White,* or *Cauliflower Brocoli.* This sort grows very robust, with large leaves, flat and narrow, with thick veins; the leaves encompass and compress the head, so as to render it generally invisible when fit to cut, which is a great preservative from the frosty mornings common in the spring months.

Culture. Sow in March, and plant out at three feet distance. When in good ground, it will produce very fine heads, perfectly white, throughout the months of April and May of the following year.

12. *Late Dwarf close-headed Purple Brocoli.* This is the latest purple brocoli, being in perfection throughout April and the greatest part of May. The plants seldom rise above a foot in height; the flower at first shows small and green, but soon enlarges, and changes to a close conical purple head; the leaves are short and small, dark green, with white veins, much sinuated, deeply indented, and forming a regular radius round the flower, giving the whole plant a singular and beautiful appearance.

Culture. The seed should be sown in April, and the plants must stand from one foot and a half to two feet apart.

13. *Latest Green*, or *Siberian*, or *Danish Brocoli.* This is the latest and hardiest of all the brocolis, for the severest winters will not destroy it. The leaves are much undulated and indented, narrow and long, with a tinge of purple color in the stems.

Culture. If sown towards the end of April, it will produce large, compact, green heads during the whole succeeding May. Two feet distance is sufficient for the plants.

General Observations on the Culture of Brocoli. All the sorts are raised from seed; and for a bed four feet in width by ten feet, Abercrombie says, *one ounce of seed* is sufficient.

Ronalds, in the paper above quoted, directs the seed-beds to be prepared of "rich mould, well dug, and if dry, watered the evening before sowing. The seeds must be thinly sown, and the beds should be covered with mats or litter till the plants appear, the covering may then be removed, and the plants watered occasionally as the state of the weather requires; should that continue very dry, the best method is to transplant, when the plants are about two or three inches high, into other beds about four inches asunder. Being several times refreshed by sprinklings of water, they will, in a fortnight or three weeks, be sufficiently strong for a second remove. This mode offers some advantage in giving time to clear off any crops of peas, &c. thereby obtaining ground which could not otherwise be conveniently had at the first season of planting out. The four first sorts on the list, which I consider as congeners, should be only once transplanted, as the check their removal occasions is apt to produce the heads prematurely, which, in that case, will be small, and indifferent in quality. If the season is showery, it will be needful to cover the beds as soon as sown with netting, to keep off the birds, also to sprinkle the plants when they appear with lime-water, or to strew on them fresh slaked lime, to destroy the slugs. In this case, when the plants are six or eight inches high, they may be planted at once at the distances recommended for each sort.

"In old gardens, infested, as is often the case, with an insect which in summer insinuates itself into the roots of all the Brassica tribe, and causes a disease usually called the club, trenching the ground deep enough to bring up four or six inches of fresh undisturbed loam or earth, will probably bury the insects too deep for mischief, and provide fresh ground for the benefit of the plants. In gardens much exhausted by reiterated cropping, if this mode cannot be adopted, a good quantity of fresh loam from a common or field, dug in, would materially improve the brocoli, and be of lasting use to future crops.

"Brocoli, in general, succeeds best in a fresh loamy soil, where it comes, I think, more true in kind, and is hardier, without dung; but if this situation cannot be had, deep digging, with plenty of manure, is the only remaining alternative to procure good crops.

"I believe soap-ashes, dug into the ground in considerable quantities, to be a good preservative from the club; and if the roots of the plants, just previously to planting, are dipped and stirred well about in mud of soap-ashes with water, its adherence will, in a great measure, preserve them from attack; perhaps a mixture of stronger ingredients, such as soot, sulphur-vivum, tobacco, &c. would be still better." *Hort. Trans.* vol. iii.

W. Wood, a writer in the *Caledonian Horticultural Memoirs*, says he has paid a considerable degree of attention to the culture of brocoli for forty years, and has made considerable progress therein. He finds that manuring with a compound of sea-weed and horse-dung produced the largest and finest heads he had seen during a practice of fifty-four years.

Preserving Brocoli during Winter. Ronalds observes, that, though brocolis come larger and finer on the spot where they are planted, yet it is prudent to take up a part of the later "sorts in the beginning of November, disturbing the roots as little as possible, and lay them in slopingly, with their heads towards the north, only a few inches above the ground, and about eighteen inches asunder. By this means, the crown of the plant lying low, is soon covered and protected by the snow, which generally falls previously to long and severe frosts; the plant is also rendered tougher in fibre, and hardier, by the check received in this last removal."

T. A. Knight, having practised laying in his brocoli plants in November in the usual way, found but small heads produced from them in the succeeding spring; till he tried trenching or laying them in in the month of September, and "so low as that the centre of the stem at the top of each plant was level with the surface of the ground." The plants are watered, roots are properly emitted, and the earth drawn round each plant before snow is apprehended. The consequence of this treatment is, that the plants are fresh and vigorous in spring, and produce large heads. *Hort. Trans.* vol. i. p. 305.

Nicol takes up the most forward crops of brocoli in the end of October, and lays them on their sides, so as the heads may not touch each other. In a dry soil and open situation, the plants will thus resist the severest winters.

Gathering. In gathering brocoli, five or six inches of the stem are retained along with the head; and in dressing, the stalks are peeled before boiling. Some of the sorts produce sprouts from the sides of the stems, with small heads, that should be gathered when ready, and are very good when boiled.

To save Seed. W. Wood, already mentioned, selects the largest, best formed, and finest heads, taking particular care that no foliage appears on the surface of the heads; these he marks, and in April lays them in by the heels in a compound of cleanings of old ditches, tree-leaves, and dung. When the head begins to open or expand, he cuts out the centre, leaving only four or five of the outside shoots to come to seed. Lifting, he says, prevents them from producing *proud seed*, as it is called, or *degenerating*. The above method produces seed the most genuine of all the others he has tried. The sulphur brocoli he finds the most difficult to procure seed from. *Caled. Hort. Mem.* vol. ii. p. 267.

Abercrombie says, brocoli-seeds degenerate in this country, and that the best seed is obtained from Italy.

1310. *Insects.* The whole of the *Brassica* tribe are liable to the attacks of the larvæ of the *Tipula oleracea*, L. on their roots, and of the caterpillars of butterflies (*fig.* 321.) and moths (*fig.* 322.) on their leaves, as well as of aphides, or cabbage-lice, snails, and slugs. There is no remedy for the first, excepting that of taking up, cleaning, and transplanting in fresh soil, in a different part of the garden; and it is in general easier to plant afresh from the seed-bed. With respect to caterpillars, snails, and slugs, they can only be gathered by hand, and the way to do this effectually is to begin as soon as they appear, employing women or children to look them over daily early in the morning. Poultry, and especially ducks and sea-gulls, are sometimes of use in keeping these and other insects under; a hen and chickens will devour caterpillars and aphides greedily, but are apt to scratch the soil afterwards, if not timely removed; turkey fowls are better. Nature has furnished a remarkable insect, which assists man in the destruction of the caterpillar, the *Ichneumon Manifestator*, L. (*fig.* 323.) "The insects of this genus," Samouelle observes, "lay their

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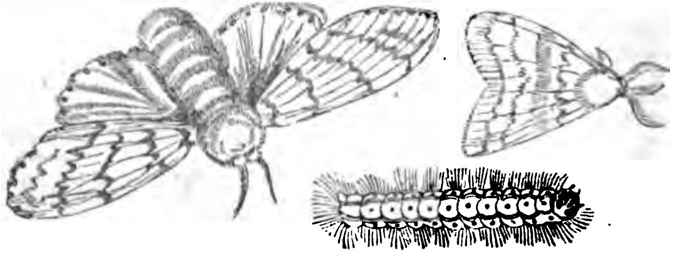

eggs in the bodies of caterpillars or pupæ, which are there hatched; the larvæ have no feet; they are soft and cylindrical, and feed on the substance of the caterpillar, which never turns to a perfect insect, while the larvæ of the ichneumon spin themselves a silky web, and change into a *pupa incompleta*, and in a few days the fly appears." *Entomologist's Companion*, 68.

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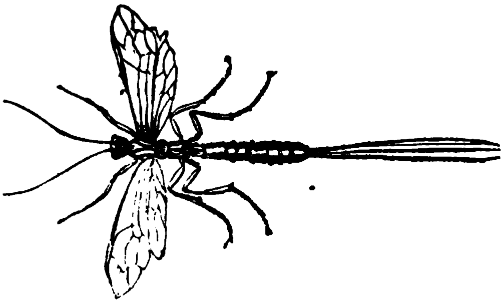

Sect. II. *Leguminous Plants.*

This tribe of plants is of great antiquity as culinary vegetables; the British islands are supposed to be less favorable to them, than to most others, all the *Diadelphous* plants of Linnæus, or *Leguminosæ* of Jussieu, thriving best in a dry atmosphere, and comparatively arenaceous soil. These, it must be allowed, are more common in other countries than in ours. The space occupied by this tribe in the kitchen-garden, during the spring and summer months, is very considerable; probably amounting to an eighth part of the open quarters, and warm borders; but towards autumn, as the crops ripen, it is given up to be succeeded by other crops, chiefly of the cabbage and turnip tribe. These, independently of other circumstances, having fibrous or surface-roots, succeed well to the tap roots of the bean and pea. In cottage-gardens, the bean is very profitably grown among cabbages and potatoes; and the pea and kidney-bean may occupy a space to be filled up in October with winter greens. We shall take them in the order of the pea, bean, and kidney-bean.

Subsect. 1. *The Pea.* — *Pisum sativum*, L. (*Lam. Ill.* i. 163.); *Diad. Decan.* L.; and *Leguminosæ*, J. *Pois*, Fr.; *Erbse*, Ger.; and *Pisello*, Ital.

1311. The pea is a hardy annual, a native of the south of Europe, and cultivated in this country from time immemorial. It was not very common, however, in Elizabeth's time, when, as Fuller informs us, peas were brought from Holland, and were "fit dainties for ladies, they came so far, and cost so dear." It is a climbing plant, with the legumes or pods, commonly produced in pairs, the seeds contained in which are the part of the plant used.

The *Use* of the pea is familiar in cookery. In one variety called the sugar-pea, the inner tough film of the pods is wanting; and such pods, when young, are frequently boiled with the seeds or peas within them, and eaten in the manner of kidney-beans. This variety is comparatively new, having been introduced about the middle of the 17th century.

The *Varieties* of the pea are numerous: the principal are,

"Early Charlton, an excellent early sort, nearly equal to the genuine frame
Early golden Charlton
Early Nichol's golden Charlton
Common Charlton
Early single-blossomed
Reading Hotspur; long pods
Dwarf marrowfat; large, long pods
Tall marrowfat; most large, long pods
Green marrowfat, Patagonian
Knight's wrinkled, or marrow, a white-blossomed, tall luxuriant grower; the fruit of excellent flavor, cream-colored, and shrivelled when ripe and dried
Spanish moratto; largish
Prussian blue; great bearer
Egg; largish
White rouncival; large, fine pods
Green rouncival; ditto
Grey rouncival; ditto
Tall sugar; large, crooked pods
Dwarf sugar
Crown, or rose; of tall, strong growth; producing its blossom and fruit in a bunchy tuft at top
Leadman's dwarf; a great bearer, but of small pods; good for a latter crop, or as required for succession
Spanish dwarf; of low growth, small pod
Early dwarf frame; for forcing.

Estimate of Sorts. "The varieties, besides differing in the color of the blossoms, height of the stalks, and modes of growth, are found to have some material differences in hardiness to stand the winter, time of coming in, and flavor of the fruit. The Charltons are not only very early, but great bearers, and excellent peas for the table; and are therefore equally well-fitted for the early crop, and forward succession crops, and inferior to few even for the main summer crops. The frame-pea may, indeed, be raised without the assistance of heat for a forward crop; and, if a genuine sort, will fruit a few days sooner than the Charlton: but it grows low, and bears scantily. The Hotspur is hardy and prolific, and makes returns nearly as quick as the Charlton, and about a fortnight before the marrowfat. The sorts already specified, therefore, embrace the best for sowings made from the end of October till the middle of January, and for late crops raised between the middle of June and the beginning of August.

"The fine flavor of the marrowfat is well known. A few dwarf marrowfats may be sown in December and January, as mild weather may occur: but the time for sowing full crops of the larger kinds of peas, is from the beginning of February till the end of April. Knight's pea, one of the newest varieties, is very prolific, and retains its fine, sweet flavor when full grown. The egg, the moratto, the Prussian blue, and the rouncivals, the large sugar, and the crown, are all very fine eating peas in young growth; and, like the marrowfat, may be sown freely, according to the demand, from the third week of February, till the close of April, and, in smaller crops, until the middle of June. For late crops, in addition to the early sorts already mentioned, the dwarf sugar, Leadman's dwarf, and Spanish dwarf, are very suitable. The Leadman's dwarf is a small delicious pea, a great bearer, and in high request at genteel tables: but as the fruit is long in coming in, it is not advisable to sow it after the third week in June; rather sow it in March, April, and May, and then it will be later than the Charltons raised five weeks afterwards. The Charltons and Hotspurs may be sown in May, for late full crops; in June for a smaller supply; and in July, along with the frame, for the last returns.

Times of Sowing. " Much that relates to this has been incidentally mentioned in the ' Estimate of Sorts.' To try for a crop as early as possible, sow, of the sort preferred as hardy and forward, a small portion on a sheltered south border, or other favorable situation, at the close of October, or rather in the course of November. Follow with another sowing in December, that, if the former should be casually cut off in winter, this coming up later, may have a better chance to stand; and if both survive the frost, they will succeed each other in fruit in May and June. For more considerable, and less uncertain returns, either in succession to the above, or as first early and intermediate crops, sow larger portions in December or January, if open temperate weather.

" To provide for main crops, make successive sowings of the suitable sorts from February till the end of May. It frequently proves, that the fruit from a sowing at the beginning of February, is not a week later than that from a crop raised in November; nay, the February-sown plants sometimes surpass all that have stood the winter, in forward returns as well as quantity. From the middle of February make successive sowings every three weeks in the course of March, April, and May; or twice a month in summer, when a continued succession is to be provided till the latest period. At the close of the sowing season, July and the first week of August, sow a reduced quantity each time; because the returns will depend on a fine, mild autumn following, and whatever fruit is obtained will be small and scanty.

Quantity of Seed. Of the small early kinds, one pint will sow a row of twenty yards; for the larger sorts for main crops, the same measure will sow a row of thirty-three yards.

Process in Sowing. " For early sorts, make the drills one inch and a half deep; and let parallel drills be two feet and a half, three, or four feet asunder. Peas that are to grow without sticks require the least room. For summer crops and large sorts, make the drills two inches deep, and four, five, or six feet asunder. As to the distances along the drill, distribute the peas according to their size and the season: the frame, three in the space of an inch; the Charltons, Hotspur, and dwarf marrowfat, two in an inch; the Prussian blue and middle-sized sorts, three in two inches; the large marrowfat and Knight's, a full inch apart; the moratto, rouncivals, and most larger sorts, an inch and a half apart; and the Patagonian, two inches.

Soil and Situation. " The soil should be moderately rich, and the deeper and stronger for the lofty growers. Peas are not assisted, but hurt, by unreduced dung recently turned in. A fresh sandy loam, or road-stuff, and a little decomposed vegetable matter, is the best manure. The soil for the early crops should be very dry, and rendered so where the ground is moist, by mixing sand with the earth of the drills. For early crops, put in from October till the end of January, let the situation be sheltered, and the aspect sunny. Before the end of December, every one or two rows should stand close under a south or south-eastern fence. In January, several parallel rows nay be extended under a good aspect farther from the fence. After January, till the end of May, sow in an open situation. For the late crops, return again to a sheltered sunny border.

Subsequent Culture. " As the plants rise from half an inch high to two or three inches, begin to draw earth to the stems, doing this when the ground is in a dry state; and earthing gradually higher as the stems ascend. At the same time, with the hoe loosen the ground between the young plants; and cut down rising weeds. Early crops should be protected during hard frosts by dry straw or other light litter, laid upon sticks or brushwood; but remove the covering as soon as the weather turns mild. If in April, May, and the course of summer, continued dry weather occurs, watering will be necessary, especially to plants in blossom and swelling the fruit; and this trouble will be repaid in the produce. Rows partly cut off may be made up by transplanting. This is best done in March. In dry weather, water, and in hot days, shade, until the plants strike.

" All peas fruit better for sticking, and continue longer productive, especially the larger sorts. Stick the plants when from six to twelve inches high, as soon as they begin to vine. Provide branchy sticks of such a height as the sort will require: for the frame and Leadman's dwarf, three feet high; for the Charlton and middle-sized, four or five feet; for the marrowfat and larger kinds, six or eight feet; for the rouncival, and for Knight's marrow pea, nine or ten feet. Place a row of sticks to each line of peas, on the most sunny side, east or south, that the attraction of the sun may incline the plants towards the sticks. Place about half the number on the opposite side, and let both rows stand rather wider at top than at the ground. Some gardeners stop the leading shoot of the most early crop when in blossom; a device which accelerates the setting and maturity of the fruit.

To forward an early Crop. Sow or plant in lines from east to west, and stick a row of spruce-fir branches along the north side of every row, and sloping so as to bend over the plants, at one foot or eighteen inches from the ground. As the plants advance in height, vary the position of the branches, so as they may always protect them from perpendicular colds or rain, and yet leave them open to the full influence of the winter and spring sun. Some cover during nights and in severe weather, with two boards nailed together lengthwise, at right angles, which forms a very secure and easily managed covering, but excludes light. A better plan would be to glaze one of the sides, to be kept to the south, and to manage such *row-glasses* (*fig.* 324.) as they might be called, when, over peas, beans, spinach, &c. as hand-glasses are managed when over cauliflower; that is, to take them off in fine weather, or raise them constantly or occasionally by brick-bats or other props, as the weather and the state of the crop might require.

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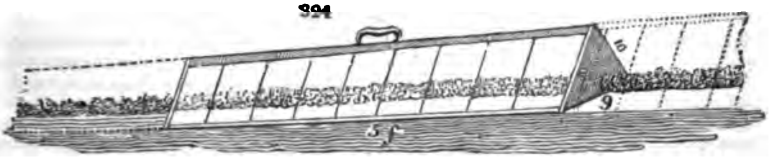

Management of a late Crop. The best variety for this purpose is Knight's marrow-pea, which may be sown at intervals of ten days from the beginning to the end of June. "The ground is dug over in the usual way, and the spaces to be occupied by the future rows of peas are well soaked with water. The mould upon each side is then collected, so as to form ridges seven or eight inches above the previous level of the ground, and these ridges are well watered. The seeds are now sown in single rows along the tops of the ridges. The plants grow vigorously, owing to the depth of soil and abundant moisture. If dry weather at any time set in, water is supplied profusely once a week. In this way the plants continue green and vigorous, resisting mildew, and yielding fruit till subdued by frost." *Hort. Trans.* ii.

Taking the Crop. "The early crops are generally gathered in very young growth, often too young, when the pods are thin and the peas small, for the sake of presenting some at table as soon as possible. In the main crops there is no cause for precipitation: take them as they become pretty plump, while the peas are yet green and tender. Leave none on to grow old; the young pods will then fill in greater perfection, and the plants will continue longer in bearing."

To save Seed. "Either sow approved sorts in the spring, for plants, to stand wholly for seed, to have the pods ripen in full perfection; or occasionally leave some rows of any main crop; let all the early-podded ripen, and gather the late-formed only for the table, as the last gleanings of a crop seldom afford good full seed. For public supply, extensive crops are commonly raised in fields. Let the seed attain full maturity, indicated by the pods changing brown, and the peas hardening: then to be hooked up, and prepared for threshing-out in due time, cleaned, and housed."

For the method of *Forcing Peas,* see Chap. VII. sect. 12.

Subsect. 2. *The Garden-Bean.* *Vicia Faba,* L.; *Diad. Dec.* L.; and *Leguminosæ,* J. *Fève de marais,* Fr.; *Bohn,* Ger.; and *Fava,* Ital.

1312. This is an annual plant, rising from two to four feet high, with a thick angular stem, the leaves divided, and without tendrils; the flowers white, with a black spot in the middle of the wing; seed-pods thick, long, woolly within, and enclosing the large ovate flatted seeds, for the sake of which the plant is cultivated in gardens. It is a native of the east, and particularly of Egypt, but has been known in this country from time immemorial, having, in all probability, been introduced by the Romans. "Crops of beans," Neill observes, "are very ornamental to the kitchen-garden, and render it a pleasant walk, the flowers having a fragrance not unlike those of the orange."

Use. The seeds are the only part used in cookery; and are either put in soups, or sent up in dishes apart.

Varieties. The following are the principal sorts planted in British gardens.

Early small Mazagan
Early long-pod
Early small Lisbon
Large long-pod
Larger sword long-pod
Broad Spanish
Windsor broad
Large Kentish Windsor
Largest Taylor's Windsor
Sandwich, largish
Toker, middling large
White blossomed, smallish middling
Green nonpareil, smallish
Mumford, smallish middling
Dwarf cluster, or fan, smallest.

Estimate of Sorts. "The Mazagan is one of the hardiest and best flavored of the small and early sorts. Mazagan is a Portuguese settlement on the coast of Africa, near the Straits of Gibraltar; and it is said that seeds brought from thence afford plants that are more early and more fruitful than those which spring from home-saved seed. The Lisbon is next, in point of earliness and fruitfulness; some, indeed, consider it as merely the Mazagan ripened in Portugal. The dwarf-fan or cluster-bean is likewise an early variety, but it is planted chiefly for curiosity: it rises only six or eight inches high; the branches spread out like a fan, and the pods are produced in small clusters. The Sandwich bean has been long noted for its fruitfulness; the Toker and the broad Spanish are likewise great bearers. Of all the large kinds, the Windsor-bean is preferred for the table. When gathered young, the seeds are sweet and very agreeable; when the plants are allowed room and time, they produce very large seeds, and in tolerable plenty, though they are not accounted liberal bearers. There are several sub-varieties, such as the broad Windsor, Taylor's Windsor, and the Kentish Windsor. The long-podded bean rises about three feet high, and is a great bearer, the pods being long and narrow, and closely filled with oblong middle-sized seeds. This sort is now very much cultivated; and there are several subordinate varieties of it, as the early, the large, and the sword long-pod. The white-blossomed bean is so called, because the black mark on the wing of the blossom is wanting. The seed is semi-transparent; when young it has little of the peculiar bean flavor, and is on this account much esteemed; it is at the same time a copious bearer, and proper for a late crop. It may be mentioned, that Delaunay, in *Le bon Jardinier*, describes as excellent a new variety cultivated at Paris, which he calls the green bean from China; it is late, but very productive; and the fruit remains green even when ripe and dried."

Times of Sowing for Early and Successional Crops. "For the earliest crop, plant some Mazagans in October, November, or December, in a warm border, under an exposure to the full sun. Set them in rows two feet, or two and a half asunder, about an inch and a half or two inches deep, and two or three inches apart in the rows; or some may also be sown in a single drill, under a south wall."

"The most successful plan for nurturing a crop over the winter, is to sow the beans thickly together in a bed of light earth, under a warm aspect, for the intermediate object of protecting the infant plants the better from rigorous weather; and with the view of transplanting them at the approach of spring, or when the size of the plants (two or three inches in height) require it, into warm borders, at the distances at which the plants are to fruit. For this object, the width of a garden-frame is a convenient width for the bed, which should slope a little to the south. Sow two inches deep, either in drills, or by drawing off that depth of the earth with a hoe or spade, scattering in the beans at the distance of about a square inch. At the approach of frost, protect the rising plants with a frame, hand-glasses, or the half-shelter of an awning of matting. In February or March, as soon as mild weather offers, transplant them into a warm south border, placing one row close under a protecting-fence as far as that advantage can be given. Ease them out of the seed-bed with their full roots, and with as much mould as will adhere: pull off the old beans at bottom, and prune the end of the tap-root. Then plant them at the proper final distances, closing the earth rather high about the stems. Besides the benefit of previous protection, the fruiting of the beans is accelerated about a week by transplanting. Further, if severe frosts kill the early-advanced plants, or if it was omitted to sow an early crop at the general season, a quantity may be sown thick in a moderate hot-bed, in January or February, or in large pots placed therein, or in a stove, to raise some plants quickly, for transplanting as above; previously hardening them by degrees to the full air. In all cases, as the young plants come up, give occasional protection in the severity of winter; and hoe up a little earth to the stems. Plants which can have no other shelter should be covered lightly with dry haulm or straw; but such a covering must be carefully removed as often as the weather turns mild. To succeed the above, plant more of the same sort, or some of the early long-pod or small Lisbon, in December or January, when mild weather, for larger supplies, in more open exposures. And in order to obtain either a more full succession, or a first general crop, plant some early and large long-pods, and broad Spanish, at the end of January, if open weather, in some warmest quarter of good mellow ground. Some of the larger sword long-pod, Sandwich, and Toker-beans, may also be planted in fuller crops in February, if the weather permit, both for succession and principal supplies. You may likewise plant any of the preceding kinds, as well as Windsors and other sorts, in full and succession crops in February, March, and April.

"For the main summer-crops, adopt principally the Windsor, Sandwich, and Toker, large long-pod, and broad Spanish; all to be assigned under a free exposure, in the main quarters. The Windsor ranks first in regard to flavor; but proves, on common soils, not so plentiful a bearer as the other late sorts. Plant also full succession-crops, in March and April, and smaller portions in May and June, for late production, especially the long-pod, broad Spanish, and Toker; also any of the early sorts, which are more successful in late planting, than the larger broad varieties. The white-blossomed bean, though the smallest of the middle-sized, is a very desirable sort to plant as secondary crops, both in the general and late planting seasons, from March till June and July; being a great bearer, and a tender and sweet-eating bean, if gathered young. Any of the other sorts named in the above list may also be planted occasionally, to increase the variety. For sowings in June and July, the small or early kinds again become the most proper, as their constitution fits them for standing late as well as early. Thus regular supplies may be provided for in succession, from June till September." *Abercrombie.*

Quantity of Seed. For early crops, one pint of seed will be requisite for every eighty feet of row; for main crops, two quarts for every 240 feet of row; and for late crops, nearly the same as the early. For the main crops, the quantity cultivated in proportion to that for early or late crops, is generally treble or quadruple, as to the extent of ground: but a less quantity of seed is requisite for the same space.

Method of Sowing. "Plant all the sorts in rows, two feet and a half apart, for the smaller, or very early, or very late kinds; and three feet for the larger: the smaller beans two inches deep, and three inches distant in the row; the larger three inches deep, and four inches distant in the row.

Transplanting. Speechly constantly transplants his early bean-crops, and considers that this plant may be as easily transplanted as cabbage, or any other vegetable. It is a practice with him to plant beans alternately with potatoes in the same row; the rows three feet apart, and the potatoes eighteen inches apart in the row, so that the beans are nine inches from the potatoes. The beans are transplanted, by which means they have the start and advantage of the potatoes and weeds, and, as they come in early, may be gathered before they can possibly incommode or injure the potatoes. *Practical Hints*, &c. p. 17.

Manual Process. "The work of sowing is most generally effected by a dibble, having a thick, blunt end, to make a wide aperture for each bean, to admit it clean to the bottom, without any narrow hollow part below: strike the earth fully and regularly into the holes, over the inserted beans. Or the planting may be performed occasionally in drills drawn with an hoe the proper depth and distance as above: place the beans at intervals along the bottom of each drill, and earth them over evenly; which method, though suitable to any kinds, may be more particularly adopted in sowing the early and other small sorts.

Soaking Seed in Summer. "In planting late crops in June and July, if the weather be dry, it is eligible to give the beans a previous soaking for several hours in soft water; or, if they are to be sown in drills, water the drills beforehand, then directly put in the beans, and earth them in while the ground remains moist.

Subsequent Culture. "As the plants come up, and advance from two to four or six inches high, hoe up some earth to the stems on both sides of each row, cutting down all weeds. Repeat the hoeing as future weeds arise, both to keep the ground about the plants clean, and to loosen the earth to encourage their growth. In earthing-up, great care must be taken that the earth do not fall on the centre of the plant so as to bury it; for this occasions it to rot or fail. After earthing-up, stir between the rows with a three-pronged fork.

"As the different crops come into full blossom, pinch or cut off the tops, in order to promote their fruiting sooner, in a more plentiful production of well-filled pods." *Abercrombie.*

Nicol says, "Topping is unnecessary for any but the early crops; being practised to render them more early." Most gardeners, however, are of opinion, that topping improves the crop both in quantity and quality. It might be worth an ingenious young gardener's while to try the effect of ringing at the bottom of the stalk, against cutting off the top.

To forward an early Crop, see this article under *Pea.*

To produce a very late Crop. Neill mentions an expedient sometimes resorted to to produce a late crop. A quarter of beans is fixed on; and when the flowers appear, the plants are entirely cut over, a few inches from the surface of the ground. New stems spring from the stools, and these produce a very late crop of beans.

Gathering. For table use, gather only such as are tender, the seeds decreasing in delicacy after they attain about half the size which they should possess at maturity. When they become black-eyed, they are tough, and strong tasted, and much inferior for eating.

To save Seed. "Either plant some of the approved sorts, in February or March, wholly for that purpose; or leave some rows of the different crops ungathered, in preference to the gleanings of gathered crops. The pods will ripen in August, becoming brown and dry, and the beans dry and hard: then pulling up the stalks, place them in the sun, to harden the seed thoroughly, after which thresh out each sort separately." *Abercrombie.*

To force the Bean, see Chap. VII. sect. 12.

SUBSECT 3. *The Kidney-Bean.* — *Phaseolus,* L.; *Diadel. Decan.* L.; and *Leguminosæ,* J. *Haricot,* Fr.; *Schminkbohne,* Ger.; and *Fagiuolo,* Ital.

1313. The common dwarf kidney-bean, the *haricot* of the French, and erroneously termed French-bean, is the *P. vulgaris,* L. (*Lob.* ic. 2. p. 59.) It is a tender annual, a native of India, and introduced in 1597, or earlier. Flowers from June to September.

The species called the *runner* is the *P. multiflorus,* Willd. (*Schk. Han.* 2. 7. 199. a.) a half hardy, annual, and a native of South America, introduced in 1633. It is rather more tender than the other; produces flowers from July to September.

Common Character. The stem of both species is more or less twining, though little of this propensity is shown in the dwarfish kinds. The leaves are ternate, on long foot-stalks; the flowers on axillary racemes; the corolla generally white, sometimes yellow, red, or purple. The pods are oblong, swelling slightly over the seeds, which are generally kidney-shaped, smooth, and shining, when ripe, varying in color according to the variety, and either white, black, blue, red, or spotted. The fruit of both sorts may be had in perfection from the open garden, by successive crops from June to October. Speechly suggests, (*Practical Hints on Domestic Œconomy,* p. 15.,) that the culture of the kidney-bean might become an object of national or field culture in this country, and be particularly useful in times of scarcity; "more especially, as on good land it will flourish and grow luxuriantly, even in a dry, parching season; in which respect it differs from most other culinary vegetables." It is an article of field-culture in most warm countries, especially France and America.

Use. The unripe pods are chiefly used in Britain as a legume, for which they are in great estimation throughout the year; being produced by forcing when they cannot be grown in the natural ground. They are also used as a pickle. On the continent, the ripe seeds are much used in cookery; forming what are called *haricots,* of different kinds, and entering into some sorts of soups. In the end of the season, when frost is expected, the haulm of the kidney-bean crop is gathered and dried like that of the pea in this country, and the ripe beans afterwards threshed out, and preserved for use through the winter.

Varieties of the Dwarf Species:

Early yellow dwarf
Early red-speckled
Early black, or negro
Early white
Battersea white
Canterbury white
Black-speckled
Brown-speckled
Dun-colored
Streaked, or striped
Tawney
Large white dwarf.

Varieties of the Runner or Climbing Kinds:

Scarlet runner; the most plentiful and lasting bearer, preferable for the main crop of runners.

Large white runner; a variety of the scarlet. The seed and blossom white, but the pods similar to the scarlet kind.

White Dutch runner; bears very long smooth pods, but does not continue so long in flower as the two former.

Canterbury and Battersea small white runner.

Variable runner.

Constitution and Habits. "Both the above classes of kidney-beans, dwarfs, and runners, are tender in their nature, unable to grow freely in the open garden before April or May; the seed being liable to rot in the ground from the effects of wet, if planted before the beginning of the former month, even in a dry soil. The plants are also affected by sharp cold, and make but little progress till settled warm weather. However, when sown in the proper season, from April or May through the course of summer, till the beginning of August, they succeed well, making liberal returns of fruit from June or July till October. The dwarfs require no support; but the runners, ascending eight or ten feet high or more, require tall sticks or poles to climb upon, or lines suspended from a contiguous building or fence. They produce pods their whole length. It deserves notice, that in their voluble habit of growth, the tendrils turn to the right, or in a direction contrary to the apparent diurnal course of the sun: this aberration from the common habits of plants has been accounted for by supposing that the native climate of the scarlet runner will be found to lie south of the equator, and that the plant, although removed to the northern hemisphere, is still obedient to the course originally assigned to it, turning in a direction which, in its native climate, would be towards the sun.

Estimate of Sorts. "The dwarfs bear sowing a little sooner, and make returns quicker than the runners. They are, besides, more convenient to cultivate on a large scale; and the smaller pods which they produce, are esteemed by many to have more delicacy of flavor. On these accounts, it is usual to raise the larger supply from the dwarf species. The early yellow, early black, and early red-speckled, are among the most hardy and most forward; the early white comes in a few days later, but is of superior flavor. The Canterbury, Battersea, black-speckled, brown-speckled, dun-colored, striped, and tawney, are plentiful lasting bearers. Growers for sale, in general, depend on the Canterbury and Battersea for main crops; but the others just named are also profitable sorts, and acceptable to the consumer. The dwarf kidney-bean continues to produce young pods in abundance, and in perfection only about three weeks or a month.

"The runners yield a succession of fruit from the same sowing a much longer time than the dwarfs. The scarlet runner ranks first for its prolific property and long continuance in fruit; the pods are thick, fleshy, tender, and good, if gathered while moderately young. The white variety is equally eligible for a principal crop. The Dutch runner is also a great bearer, in fine long pods, but not so lasting as the former. As to the smaller runner kinds: these are rather degenerate varieties of the Canterbury and Battersea white dwarfs; casually shooting into runners: they bear, in tolerable abundance, slender neat pods, which are very good and tender eating; though not so eligible for a principal crop of runners as the scarlets.

Quantity of Seed. Half a pint will sow a row eighty feet in length, the beans being placed from two and a half to three inches apart.

Soil. "The soil for both species should be light and mellow, inclining to a dry sand for the early sowings, and to a moist loam for the sowings in summer.

Separate Culture of Dwarfs. "About the beginning of April, if the weather be temperate, fair, and settled, make the first sowing, or in a dry south border, or other sheltered compartment with a good aspect, or sow in a single row close under a south fence; beginning with a small proportion of the most hardy early sorts. It is a good method to follow in a week with a second sowing in case the former should fail. You may sow for a larger crop about the middle, or twentieth of April. For the early crops, make the drills two feet asunder. The common depth is an inch and a half for the smaller-sized beans. Drop the beans in each row at this season pretty close together, as many may fail; from one to two inches apart. Cover them in evenly the full depth of the drill.

"For the main crops, you may sow more fully towards the end of April; and in full crops in May and June; a portion once every fortnight or three weeks, of the Canterbury and other sorts, approved for a main supply. Draw drills, two feet or two and a half asunder, an inch and a half or two inches deep. Drop the beans therein, three inches apart, and earth in the full depth of the drills. For supplies in succession, sow in July once or twice; and make a moderate sowing at the beginning of August, for a late and last crop. In the drought of high summer, it is advisable to accelerate the germination of the seed, by laying it in damp mould, till it begins to sprout, or by soaking it in soft water for six or eight hours previous to sowing; and by watering the drills to receive it. Crops sown after the middle of July should be favored in situation, or the time of their bearing will be much shortened by the decline of summer. From this course of sowings, a regular succession of young green pods will be produced from June and July till October. As the plants of the different crops advance in growth, occasionally hoe and stir the ground between the rows. Cut down all weeds as they spring. Draw some earth to the stems of the plants as they rise in height, which will strengthen and forward them considerably. When advanced to full bearing, it is advisable to gather the pods in moderately young or medium growth."

Culture of Runners. "The runner kidney-beans may be sown in a small portion, towards the end of April, if tolerably warm dry weather: but as these beans are rather more tender than the dwarf sorts, more liable to rot in the ground by wet and cold, especially the scarlets, the beginning or middle of May will be time enough to sow a considerable crop; and you may sow a full crop about the beginning of June. Allot principally the scarlet and large white runners. Some Dutch runners are very eligible as a secondary crop. The first crops should have the assistance of a south wall. Intermediate crops may be sown in any open compartment, or against any fence not looking north. The latest sown will continue bearing the longer under a good aspect and shelter. In sowing, draw drills about an inch and a half, or not more than two inches deep. Let parallel rows be at least four feet asunder, to admit in the intervals tall sticks or poles for the plants to climb upon. Place the beans in the drills four inches apart, and earth them in evenly, the depth of the drills. A row contiguous to a fence or building may ascend upon lines. Some may be sown in a single row along a border, or on each side of a walk; and have the support of a slight trellis of laths and lines; or they might be arched over with similar materials, to form a shady walk or bower.

" In a cold wet season, or when requisite to have a few plants more forward than the general crop, some scarlets may be sown in April, either in a slight hot-bed, or in pots, under frames or hand-glasses, to raise and forward the plants till two or three inches high: then, at the end of May, transplant them into the open garden.

" As the plants come up, and advance from three to six inches in growth, hoe some earth to the stems, cutting down all weeds. When they begin to send forth runners, place suitable supports to each row; and conduct the tendrils to the sticks or lines, turning them in a contrary direction to the sun. The ascending plants will soon come into flower, podding at the joints in long succession. They are so prolific that the returns from three sowings, in May, June, and July, will last from July till October.'

Taking the Crop. " Gather the pods, both from dwarfs and runners, while they are young, fleshy, brittle, and tender; for then are they in highest perfection for the table; and the plants will bear more fully, and last longer in fruit, under a course of clean gathering, not leaving any superabundant pods to grow old.

To save Seed. " Either sow a portion for that object, or leave rows wholly ungathered of the main crops, or preserve a sufficiency of good pods promiscuously. The beans saved should be the first-fruits of a crop sown at a period which throws the entire course of growth into the finest part of summer. Let them hang on the stalks till they ripen fully in August and September; then let the haulm be pulled up, and placed in the sun, to dry and harden the seed, which should be afterwards cleared out of the husks, bagged up, and housed."

The kidney-bean is often partially *forced in hot-houses or frames*, with a view to its fruiting in the open garden; and supplies of green pods are also kept up throughout the winter and spring months, by forcing in hot-houses and pits; for the details of both practices, see Ch. VII. sect. 10.

1314. *Insects.* The pea and bean are liable to the attacks of various insects, especially the aphides in dry seasons. The *Bruchus Pisi* (*fig.* 325.) is particularly destructive to the pea, and its larva (a) is often found in the ripe pod. In gardens, the only mode of keeping them under, is to cut off the part infested, and remove it with the insects attached. When early crops are newly sown or planted, mice will burrow for and eat the seed, and when it begins to penetrate the soil, it is attacked by snails and slugs, and sometimes by birds. The usual means of defeating the attacks of these and other enemies, must always be early resorted to by the gardener.

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Sect. III. *Esculent Roots.*

This tribe delight in a light, rather sandy, deep, and well stirred soil. It must be dry at bottom; but a moist atmosphere and moderate temperature are greatly favorable to the growth of almost the whole of the plants we have included in this section. Hence the excellence of the potatoe crop in Ireland, and the size to which turnips, carrots, parsnips, &c. attain in Britain and Holland, compared to what they do in France and Germany. The space occupied in the kitchen-garden by this class of vegetables is considerable; but as it is regulated in some degree by the quantity of the more common roots grown in the farm for culinary use, it is less subject to estimation. In most gardens, however, the esculent roots taken together may occupy as much space as the legumes. In cottage gardens, they may be considered as occupying one-half of the whole, to be in part succeeded by winter-greens.

Subsect. 1. *The Potatoe.* — *Solanum tuberosum*, L. (*Bauh. Prod.* 89. t. 89.); *Pent. Dig.* L.; and *Solaneæ*, B. P. *Pomme de Terre*, Fr.; *Cartoffel*, Ger.; and *Pomo di Terra*, Ital.

1315. This is a perennial plant, well-known for its tuberous root. The stem rises generally from two to three feet in height, with long and weak branches, furnished with leaves interruptedly pinnate. The flowers are white or tinged with purple. The fruit is a berry of the size of a plum, green at first, but black when ripe, and containing many small, flat, roundish, white seeds. It is supposed to be a native of South America; but Humboldt is very doubtful if that can be proved: he admits, however, that it is naturalized there in some situations.

Sir Joseph Banks (*Hort. Trans.* i. 8.) considers that the potatoe was first brought into Europe from the mountainous parts of South America, in the neighbourhood of Quito, where they were called *papas*, to Spain, in the early part of the sixteenth century. From Spain, where they were called *battatas*, they appear to have found their way first to Italy, where they received the same name with the truffle, *taratoufli*. The potatoe was received by Clusius, at Vienna, in 1598, from the governor of Mons, in Hainault, who had procured it the year before from one of the attendants of the Pope's legate, under the name of *taratoufli*, and learned from him, that it was then in use in Italy." In Germany it received the name of *cartoffel*, and spread rapidly even in Clusius's time.

To England the potatoe found its way by a different route, being brought from Virginia by the colonists sent out by Sir Walter Raleigh in 1584, and which returned in July 1586, and "probably," according to Sir Joseph Banks, "brought with them the potatoe." Thomas Herriot, in a report on the country, published in De Bry's *Collection of Voyages*, (vol. i. p. 17.) describes a plant called *openawk*, with "roots as large as a walnut, and others much larger; they grow in damp soil, many hanging together, as if fixed on ropes; they are good food, either boiled or roasted."

Gerrarde, in his Herbal, published in 1597, gives a figure of the potatoe, under the name of the *potatoe of Virginia*, whence, he says, he received the roots; and this appellation it appears to have retained, in order to distinguish it from the battatas, or sweet potatoe, (*convolvulus battatas*) till the year 1640, if not longer. "The sweet potatoe," Sir Joseph Banks observes, "was used in England as a delicacy long before the introduction of our potatoes: it was imported in considerable quantities from Spain and the Canaries, and was supposed to possess the power of restoring decayed vigor. The kissing comfits of Falstaff, and other confections of similar imaginary qualities, with which our ancestors were duped, were principally made of these and of eringo roots."

It appears from Gough's edition of Camden's Britannia, that the potatoe was first planted by Sir Walter Raleigh on his estate of Youghall, near Cork, and that it was "cherished and cultivated for food" in that country before its value was known in England; for, though they were soon carried over from Ireland into Lancashire, Gerard, who had this plant in his garden in 1597, under the name of *Battata Virginiana*, recommends the roots to be eaten as a delicate dish, not as common food. Parkinson mentions, that the tubers were sometimes roasted, and steeped in sack and sugar, or baked with marrow and spices, and even preserved and candied by the comfit-makers.

In 1663, the Royal Society took some measures for encouraging the cultivation of potatoes, with the view of preventing famine. Still, however, although their utility as an article of food was better known, no high character was bestowed on them. In books of gardening, published towards the end of the seventeenth century, a hundred years after their introduction, they are spoken of rather slightingly. "They are much used in Ireland and America as bread," says one author, "and may be propagated with advantage to poor people." "I do not hear that it hath been yet essayed," are the words of another, "whether they may not be propagated in great quantities, for food for swine or other cattle." Even the enlightened Evelyn seems to have entertained a prejudice against them: "Plant potatoes," he says, writing in 1699, "in your worst ground. Take them up in November for winter spending; there will enough remain for a stock, though ever so exactly gathered." The famous nurserymen, London and Wise, did not consider the potatoe as worthy of notice in their Complete Gardener, published in 1719; and Bradley, who, about the same time, wrote so extensively on horticultural subjects, speaks of them as inferior to skirrets and radishes.

But the use of potatoes gradually spread, as their excellent qualities became better understood. It was near the middle of the eighteenth century, however, before they were generally known over the country: since that time they have been most extensively cultivated. In 1796, it was found, that in the county of Essex alone, about 1700 acres were planted with potatoes for the supply of the London market. This must form, no doubt, the principal supply; but many fields of potatoes are to be seen in the other counties bordering on the capital, and many ship-loads are annually imported from a distance. In every country in England, it is now more or less an object of field culture.

The cultivation of potatoes in gardens in Scotland was very little understood till about the year 1740; and it was not practised in fields till about twenty years after that period. It is stated in the *General Report* of Scotland, (vol. ii. p. 111.) as a well ascertained fact, that in the year 1725-6, the few potatoe plants then existing in gardens about Edinburgh, were left in the same spot of ground from year to year, as recommended by Evelyn; a few tubers were perhaps removed for use in the autumn, and the parent plants were then well covered with litter to save them from the winter's frost. Since the middle of the eighteenth century, the cultivation of potatoes has made rapid progress in that country; so that they are now to be seen in almost every cottage garden.

"The potatoe is now considered as the most useful esculent that is cultivated; and who," Neill asks, "could *à priori* have expected to have found the most useful among the natural family of the *Luridæ*, L., several of which are deleterious, and all of which are forbidding in their aspect."

Use. The tubers of the potatoe, from having no peculiarity of taste, and consisting chiefly of starch, approach nearer to the nature of the flower, or farina of grain, than any vegetable root production; and for this reason it is the most universally liked, and can be used longer in constant succession by the same individual without becoming unpalatable, than any other vegetable, the seeds of the grasses excepted. "So generally is it relished, and so nutritious is it accounted," Neill observes, "that on many tables it now appears almost every day in the year. It is commonly eaten plainly boiled, and in this way it is excellent. When potatoes have been long kept, or in the spring months, the best parts of each tuber are selected, and mashed before going to table. Potatoes are also baked, roasted, and fried. With the flour of potatoes, puddings are made nearly equal in flavor to those of millet; with a moderate proportion of wheat-flour, bread of excellent quality may be formed of it; and potatoe starch, independently of its use in the laundry, is considered an equally delicate food as sago or arrow-root.

1316. *Varieties.* These are very numerous, not only from the facility of procuring new sorts by raising from seed; but because any variety cultivated for a few years in the same soil and situation, as in the same garden or farm, acquires a peculiarity of character or habit, which distinguishes it from the same variety in a different soil and situation. The varieties in general cultivation may be distinguished in regard to *precocity*, *tardity*, *form*, *size*, *color*, and *quality*.

Precocity. The earliest varieties are:

Hog's early frame, a small watery potatoe, fit only for very early forcing
Royal dwarf, a mealy potatoe, much grown at Perth
Early Manchester, waxy and red
Common early frame, waxy
Foxes yellow seedling, similar, but rather larger, waxy
American early, much esteemed at Edinburgh
Early dwarf, waxy
Early ash-leaved, dry
Early champion, large
M'Cree's early, dry.

None of the above sorts, when true, produce blossoms: they are roundish in form, small-sized, white, and not of the best quality.

Tardity. The latest sorts are:

The round purple
The oblong purple
The speckled purple, or tartan, commonly grown in mossy soils in Scotland.

The *form* of potatoes is either round, oblong, or kidney-shaped.

Of the *round*, the most esteemed are:

The champion, late and early varieties.
The oxnoble, very large, and of a peculiar flavor not generally esteemed.
Round red, middle-sized smooth.
Round rough red, or Lancashire.

The *oblong* are:

The red-nosed oval; often confounded with the red kidney.
The oblong-red; varied with white.
The oblong white.
The American-red; long and not thick
The Irish-red, or pink; oblong and entirely red with hollow eyes
The bright-red, blood-red, or apple potatoe; ovate, with small full eyes, much grown in Cheshire and Lancashire.

The *kidney shaped* are:

The common white kidney, of a peculiar flavor esteemed by many
The red kidney; reckoned somewhat more hardy.

In *size*, the early sorts are the least, and the oxnoble and late champions the largest.

In *color*, the early sorts are in general white, the oblong sorts red, and the latest sorts purple.

In *quality*, potatoes are either *watery*, as the very early sorts; *waxy*, as the American and Irish reds; or, *mealy*, as the ash-leaved early, the champion, the kidney, &c.

The following list is recommended by the principal London seedsmen at the present time:

For Forcing in Frames, or for the first Crop in the open Garden:

Foxe's seedling.
Early manley.
Early mule.
Broughton dwarf.

For General Cultivation in the open Garden or Field.

Early kidney, good flavor, and very early; keeps well.
Nonsuch, early, prolific.
Early shaw, good early sort for general use

For Main Crops, the following Sorts are arranged in the Order of their ripening.

Early champion, very generally cultivated, prolific, and mealy.
Red-nose kidney.
Large kidney.
Bread-fruit, originated about 1810, prolific, white, and mealy.
Lancashire pink-eye, good.
Black skin, mealy, white, and good.
Purple, very mealy, productive, and keeps well.
Red-apple, mealy, keeps the longest of any.

In general every town and district has its peculiar and favorite varieties, so that, excepting as to the best early kinds, and the best for a general crop in all soils, any list, however extended, could be of little use. Dr. Hunter, in his Georgical Essays, has limited the duration of a variety to fourteen years; and Knight (*Hort. Trans.* vol. i.) concurs with him in opinion. There are some excellent sorts of party colored potatoes in Scotland, which degenerate when removed from one district to another; and most of the Scotch and Irish varieties degenerate in England. The best mode, therefore, to order potatoes for seed is to give a general description of the size, color, form, and quality wanted, and whether for an early or late crop.

1317. *Propagation.* The potatoe may be propagated from seed, cuttings or layers of the green shoots, sprouts from the eyes of the tubers, or portions of the tubers containing a bud or eye. The object of the first method is, to procure new or improved varieties; of the second, little more than curiosity, or to multiply as quickly as possible a rare sort; and of the third, to save the tubers for food. The method by portions of the tubers is the best, and that almost universally practised for the general purposes, both of field and garden culture.

By Seed. Gather some of the ripest apples in September or October, take out and preserve the seed till spring, and then sow it thinly in small drills. When the plants are up two or three inches, thin them to five or six inches' distance, and suffer them to grow to the end of October, when the roots will furnish a supply of small potatoes, which must then be taken up, and a portion of the best reserved for planting next spring in the usual way. Plant these, and let them have the ensuing summer's full growth till October, at which time the tubers will be of a proper size to determine their properties. Having considered not merely the flavor of each new variety, but the size, shape, and color, the comparative fertility and healthiness, earliness or lateness, reject or retain it for permanent culture accordingly. *Abercrombie.*

The earliest varieties of potatoes, it has been already remarked, do not produce flowers or seed. T. A. Knight, desirous of saving seed from one of these sorts, took a very ingenious method of inducing the plants to produce flowers. "I suspected the cause," he says, "of the constant failure of the early potatoe to produce seeds, to be the preternaturally early formation of the tuberous root; which draws off for its support that portion of the sap which, in other plants of the same species, affords nutriment to the blossoms and seeds: and experiment soon satisfied me that my conjectures were perfectly well founded. I took several methods of placing the plants to grow, in such a situation, as enabled me readily to prevent the formation of tuberous roots; but the following appearing the best, it is unnecessary to trouble the Society with an account of any other. Having fixed strong stakes in the ground, I raised the mould in a heap round the bases of them, and in contact with the stakes: on their south sides I planted the potatoes from which I wished to obtain seeds. When the young plants were about four inches high, they were secured to the stakes with shreds and nails, and the mould was then washed away, by a strong current of water, from the bases of their stems, so that the fibrous roots only of the plants entered into the soil. The fibrous roots of this plant are perfectly distinct organs from the runners, which give existence, and subsequently convey nutriment to the tuberous roots; and as the runners spring from the stems only of the plants, which are, in the mode of culture I have described, placed wholly out of the soil, the formation of tuberous roots is easily prevented; and whenever this is done, numerous blossoms will soon appear, and almost every blossom will afford fruit and seeds."

Knight, considering that the above facts, which are more fully explained in the Philosophical Transactions for 1806, were sufficient to prove, that the same fluid or sap gives existence alike to the tuber, and the blossom, and seeds, and that, whenever a plant of the potatoe affords either seeds or blossoms, a diminution of the crop of tubers, or an increased expenditure of the riches of the soil, must necessarily take place, succeeded in producing varieties of sufficiently luxuriant growth, and large produce for general culture which never produced blossoms. *Hort. Trans.* vol. i. 188.

Much importance is very properly annexed by this eminent horticulturist to the improvement of our most useful plants, "because, whatever increased value is thus added to the produce of the soil, is obtained without any increased expense or labor, and, therefore, is just so much added to individual and national wealth." The paper from which we quote, is concluded by some excellent observations on this subject, chiefly relative to field culture, and which ought to be studied carefully by whoever intends to attempt producing new varieties from seed.

By Cuttings, or Layers of the Stalks, or Suckers. Make cuttings of the young stalks or branches, of five or six inches in length, in May or June; attending to the general directions for forming cuttings. Choose, if possible, showery weather; or strike them under a hand-glass, or in a half empty pot covered with a pane of glass, as in striking cucumber-cuttings. (1251.)

Layers. In June or July, when the potatoe-stalks are advanced one or two feet long, choose such plants as stand somewhat detached, and lay down the shoots on the ground with or without cutting, in the common mode of layering. Cover them with earth about three inches, leaving the points of the shoots exposed. These shoots will emit roots at every leaf, and produce full-grown potatoes the same year, attaining perfection in autumn.

Suckers. Remove, in June, off-set sucker shoots, with a few roots to each; plant them carefully, and they will produce a late crop like the layers.

By Sprouts or Shoots from the Tubers. In default of genuine early sorts; or, to save the tubers for use in seasons of scarcity, the sprouts which are generally found on store-potatoes in spring, and picked off and thrown away as useless, will, when carefully planted in loose well-prepared soil, yield a crop; and this crop will be fit for use a little sooner than one produced from cuttings or sections of the same tubers, in which the buds are not advanced. Almost every thing, however, depends on the fine tilth, and good state of the ground.

By Portions of the Tubers. This is the only method fit for general purposes. In making the sets or sections, reject the extreme or watery end of the tuber, as apt to run too much to haulm, and having the eyes small, and in a cluster; reject also the root or dry end, as more likely to be tardy in growth, and produce the curl. Then divide the middle of the potatoe, so as to have not more than one good eye in each set.

Where the potatoe scoop is used, take care to apply it so as the eye or bud may be in the centre of each set, which this instrument produces, of a semi-globular form. The larger the portion of tuber left to each eye, so much the greater will be the progress of the young plant. The scoop is only to be used in seasons of scarcity, when the portion of tuber saved by it, may be used for soups for the poor, or for feeding cattle.

Quantity of Sets. In respect to proportioning the quantity of sets to the space to be planted, Abercrombie directs, "For a plot of the *early and secondary crops*, eight feet wide by sixteen in length; planted in rows fifteen inches asunder by nine inches in the row, a quarter of a peck of roots or cuttings. For *full-timed sorts and main crops*, a compartment, twelve feet wide by thirty-two in length, planted in rows two feet distant by twelve inches in the row, half a peck of roots or cuttings will be required."

1318. *Soil and Manure.* The best soil for the potatoe is a light, fresh, unmixed loam, where they can be grown without manure. Here they have always the best flavor. In a wet soil, they grow sickly, and produce watery tubers, infected with worms and other vermin. To a poor soil, dung must be applied; littery dung will produce the earliest and largest crop; but mellow dung, rotten leaves, or vegetable earth, will least affect the flavor of the tubers.

Season for Planting. "The last fortnight of March, and first fortnight of April, is the most proper time for planting the main crops; a little earlier or later, as the spring may be forward or late, the ground dry or wet. Occasional plantings may be made in May, or even the beginning of June." *Abercrombie.*

Methods of Planting. The sets of whatever kind, or the plants forwarded in pots, to be turned out with their balls entire for producing an early crop in the open air, should always be inserted in regular rows; the object of which is to admit with greater facility the stirring the earth between, and the earthing up of the plants. The rows may be fifteen inches apart for the small early sorts; and for the larger, twenty inches or two feet, according to the poorness or richness of the soil. In the lines traced, make holes for the sets at eight, twelve, or fifteen inches' distance, letting their depth not be less than three, nor exceed five inches.

"1. Planting on a level surface will answer on a light soil. In small gardens, the planting may be performed by a common large dibble with a blunt end. For planting considerable crops, a strong larger dibble, about a yard long, is used, with a cross handle at top for both hands, the lower end being generally shod with iron, and having a short-cross iron shoulder about four or five inches from the bottom, as a guide to make the holes of an equal depth: one person striking the holes, and a boy directly dropping a set into each hole. Strike the earth in upon them fully with a dibble, hoe, or rake, either as each row is planted, or when the whole planting is finished.

"Sometimes the process is to open a small hole with the spade, and to drop in a set, which set is covered in by the opening of the next hole.

"On strong heavy land, the planting ought to be on raised beds with alleys, or in drills on the crown of parallel ridges. The beds may either be raised by previous digging, throwing on good earth till the terrace rise to the desired height, or in the different method described below. To plant in drills, trace them at the medium distance above specified: form them to the proper depth with a narrow spade or large hoe: in these place the sets a foot or fifteen inches apart, and earth over.

"To avoid the inconveniences of low wettish ground, whether it be arable or grass-land, or a cultivated garden, potatoes are planted in raised beds four feet wide, with alleys half that width between. The beds are thus raised: without digging the surface, lay some long loose litter upon the intended beds. Upon this litter place the sets about a foot apart; and upon the sets apply more litter, equally distributed over the whole: then digging the alleys, turn the earth thereof upon the beds five or six inches deep; or, if grass, turn the sward downward, levelling in the top-spit to the same depth. The plants will produce very good crops.

Subsequent Culture. "From the March or April planting, the stems generally rise fully in May. After the plants have appeared, give an effectual hoeing on dry days, cutting up all the weeds, and stir the ground about the rising stalks of the plants. When advanced from six to twelve inches high, hoe up some earth to the bottom of the stems, to strengthen their growth, and promote the increase below: continue occasional hoeing to eradicate weeds, till the plants cover the ground, when but little further care will be required. Permit the stalks to run in full growth, and by no means cut down, as is sometimes practised; the leaves being the organs for transmitting the beneficial influence of the sun and air to the roots, which is most necessary to the free and perfect growth of the tubers." *Abercrombie.*

It is now generally admitted, that a certain advantage, in point of produce, is obtained by pinching off the blossoms as they appear on the plants. The fact has been repeatedly proved, and satisfactorily accounted for by Knight, who imagines, that it may add an ounce in weight to the tubers of each plant, or considerably above a ton per acre. *Hort. Trans.* vol. i. 190.

Taking the Crop. "Clusters of roots in the early-planted crop will sometimes by June or July be advanced to a sufficient size for present eating, though still small. Only a small portion should be taken up at a time, as wanted for immediate use, as they will not keep good above a day or two. In August and September, however, they will be grown to a tolerably good size, and may be taken up in larger supplies, though not in quantities for keeping a length of time. Permit the main winter crops to continue in growth till towards the end of October or beginning of November, when the stalks will begin to decay — an indication that the potatoes are fully grown: then wholly dig them up, and house for winter and spring.

"Let them then be taken up, before any severe frost sets in; having, for large crops, a proper potatoe-fork of three or four short flat tines, fixed on a spade-handle. Cut down the haulm close, and clear off forward: then fork up the potatoes, turning them clean out of the ground, large and small; and collect every forking into baskets."

1319. *Housing and Preserving the Crop.* Abercrombie recommends "housing potatoes in a close, dry, subterranean apartment, laid thickly together, and covered well with straw so as to exclude damps and frost." There they are to be looked over occasionally, and any that decay picked out. In spring, when they begin to shoot, turn them over, and break off the sprouts or shoots from each tuber, perfectly close, in order to retard their future shooting as much as possible. Potatoes so stored, will continue good all the winter and spring, till May and June.

Pying (as it is called in some places) is a good method of preserving potatoes in winter. They are piled on the surface of the ground, in a ridged form, of a width and length at pleasure, according to the quantity, but commonly about five or six feet wide. This is done by digging a spit of earth, and laying it round the edge, a foot wide, (if turf the better) filling the space up with straw, and then laying on a course of potatoes, dig earth from the outside, and lay upon the first earth. Put straw a few inches along the inside edge, then put in more potatoes, and so on, keeping a good coat of straw all the way up between the potatoes and the mould, which should be about six inches thick all over; beat it close together, and the form it lies in, with the trench all round, will preserve the potatoes dry; and the sharpest frost will hardly affect them; in a severe time of which, the whole may be covered thickly with straw. In the spring, look over the stock, and break off the shoots of those designed for the table, and repeat this business to preserve the potatoes the longer good."

The Rev. Dr. Dow's mode of keeping potatoes has been already given (1036).

1320. *Curl Disease.* "The disease called curl, has in many places proved extremely troublesome and injurious. It has given rise to much discussion, and to detail all the various opinions would be a useless task. It may, however, be remarked, that the experiments of T. Dickson (*Caled. Hort. Mem.* i. 55.) show, that it arises from the vegetative powers in the tuber planted, having been exhausted by over-ripening. That excellent horticulturist observed, in 1808 and 1809, that cuts taken from the waxy, wet, or least ripened end of a long flat potatoe, that is, the end nearest the roots, produced healthy plants; while those from the dry and best ripened end, farthest from the roots, either did not vegetate at all, or produced curled plants. This view is supported by the observations of a very good practical gardener, Daniel Crichton, at Minto, who, from many years' experience, found (*Id.* p. 440.) that tubers preserved as much as possible in the wet and immature state, and not exposed to the air, were not subject to curl. And Knight, (*Hort. Trans.* 1814,) has clearly shown the beneficial results of using, as seed-stock, potatoes which have grown late, or been imperfectly ripened in the preceding year. Dickson lays down some rules, attention to which, he thinks, would prevent the many disappointments occasioned by the curl. He recommends, 1. The procuring of a sound healthy seed-stock of tubers for planting from a high part of the country, where the tubers are never over-ripened. 2. The planting of such potatoes as are intended to supply seed-stock for the ensuing season, at least a fortnight later than those planted for a crop, and to take them up whenever the stems become of a yellow-green color, at which time the cuticle of the tubers may be easily rubbed off between the finger and thumb. 3. The preventing those plants that are destined to yield seed-stock for the ensuing year, from producing flowers or berries, by cutting off the flower-buds; an operation easily performed by children, at a trifling expence.

John Shirreff (*Caled. Hort. Mem.* vol. i. p. 60.) takes a general and philosophical view of the subject, applying to the potatoe the doctrine by which Knight had accounted for the disappearance of the fine cider fruits of the seventeenth century. " The maximum of the duration of the life of every individual, vegetable as well as animal, is predetermined by nature, under whatever circumstances the individual may be placed: the minimum, on the other hand, is determined by these very circumstances. Admitting, then, that a potatoe might reproduce itself from tubers for a great number of years in the shady woods of Peru, it seems destined sooner to become abortive in the cultivated champaign of Britain; insomuch, that not a single healthy plant of any sort of potatoe that yields berries, and which was in culture twenty years ago, can now be produced." Shirreff concludes, therefore, that the potatoe is to be considered as a short-lived plant, and that, though its health or vigor may be prolonged, by rearing it in elevated or in shady situations, or by cropping the flowers, and thus preventing the plants from exhausting themselves, the only sure way to obtain vigorous plants, and to ensure productive crops, is to have frequent recourse to new varieties raised from the seed. The same view, it may be remarked, had occurred to Dr. Hunter.

A fact ascertained by Knight deserves to be particularly noticed: it is this; that by planting late in the season, perhaps in June, or even in July, an exhausted good variety may in a great measure be restored; that is, the tubers resulting from the late planting, when again planted at the ordinary season, produce the kind in its pristine vigor, and of its former size.

D. Crichton, who has made a variety of experiments on the effects of exposure to the air in hampers and open floors, and on exclusion of the air by covering with earth, (*Caled. Mem.* vol. i. 440.) concludes, " That the curl in the potatoe may often be occasioned by the way the potatoes are treated that are intended for seed. I have observed, that wherever the seed-stock is carefully pitted, and not exposed to the air in the spring, the crop has seldom any curl; but where the seed-stock is put into barns and out-houses for months together, such crop seldom escapes turning out, in a great measure, curled; and if but few curl the first year, if they are planted again, it is more than probable the half of them will curl next season."

For *Forcing Potatoes*, see Ch. VII. sect. 11.

Subsect. 2. *The Jerusalem Artichoke.* — *Helianthus tuberosus*, L. (*Jac. Vind.* 2. t. 161.); *Syng. Polyg. Frust.* L.; and *Corymbiferæ*, J. *Poire de Terre*, Fr.; *Erde Apfel*, Ger.; and *Girasole*, Ital.

1321. This plant is a hardy perennial, a native of Brazil, and introduced in 1617. It has the habit of a common sun-flower, but grows much taller, often rising ten or twelve feet high. The season of its flowering is September and October; but though its roots endure our hardest winters, the plant seldom flowers with us, and it never ripens its seed. The roots are creeping, and are furnished with many red tubers, clustered together, perhaps from thirty to fifty to a plant. Before potatoes were known, this plant was much esteemed. The epithet Jerusalem is a mere corruption of the Italian word *Girasole*, (from *girare*, to turn, and *sol*), or sun-flower; the name Artichoke is bestowed from the resemblance in flavor which the tubers have to the bottoms of artichokes. *Neill.*

Use. The roots are esteemed a wholesome, nutritious food, and are eaten boiled, mashed with butter, or baked in pies, and have an excellent flavor. Planted in rows, from east to west, the upright herb of the plant affords a salutary shade to such culinary vegetables as require it, in the midsummer months, as lettuce, turnips, strawberries, &c.

Propagation. " It is raised by planting, either some small offset tubers of the main roots, or middling sized roots cut into pieces for sets, which is more eligible. Preserve one or two full eyes to each cutting.

Quantity of Sets. For a row 120 feet in length, the sets being inserted two feet apart, half a peck, or sixty roots will be sufficient. *Abercrombie.*

Culture. It will grow in any spare ordinary part of the garden; but to obtain fine large roots, give it an open compartment of pretty good mellow ground. The season for planting is February, March, or beginning of April. Having digged the compartment, plant them, either by dibble, in rows two feet and a half asunder, about eighteen inches in the lines, and three or four inches deep; or, in drills by a hoe, the same depth and distances. The plants will come up in April and May. In their advancing growth, hoe and cut down all weeds, drawing a little earth to the bottom of the stems. The root will multiply into a progeny of tubers, in a cluster in each plant, increasing in size till September and October: you may then cut away the stems, and dig up the produce as wanting. Or, in November, when they are wholly done growing, it will be proper to take up a quantity, and lay in dry sand under cover, to be ready as wanting, in frosty weather, when the others are frozen up in the ground, or affected by the frost.

" As the roots of this plant are very prolific, the smallest piece of a tuber will grow. In taking up the produce, you should therefore clear all out as well as possible; as any remaining part will come up the following year disorderly, and pester the ground; and would thus continue rising for many years, but not eligible to cultivate for a good crop. Therefore, to answer a demand, make a fresh plantation every year."

Subsect. 3. *The Turnip.* — *Brassica Rapa*, L. (*Eng. Bot.* 2176.); *Tetrad. Siliq.* L.; and *Cruciferæ*, J. *Navet*, Fr.; *Steckrübe*, Ger.; and *Navone*, Ital.

1322. This is a biennial plant, growing in a wild state in some parts of England; but better known as an inhabitant of the garden and the farm. In its wild state, the root-leaves are large, of a deep-green color, very rough, jagged, and gashed; in the second season it sends up a flower-stalk, with leaves embracing the stem, smooth, glaucous, oblong, and pointed.

Use. The use of the root, boiled and mashed as a dish, in broths, soups, and stews, or entire, is familiar over all Europe. The top-shoots, from such as have stood the winter, are gathered whilst tender, and dressed as spring-greens or spinach. The seed is also sometimes sown as small salading.

" The navew or French turnip," Dickson observes, (*Hort. Trans.* vol. i.), " enriches all the foreign soups. Stewed in gravy, it forms a most excellent dish, and being white, and of the shape of a carrot, when mixed alternately with those roots upon a dish, it is very ornamental. In France, as well as in Germany, few great dinners are served up without it in one shape or other." In using it, there is no necessity to cut away the outer skin or rind, in which, indeed, the flavor chiefly resides; scraping it will be quite sufficient. Justice observes, that it is neither fit to be eaten boiled alone nor raw; but that two or three of them in seasoning will give a higher flavor than a dozen of other turnips. *British Gardener's Director*, p. 159.

Varieties. Those in general cultivation are the

Early white Dutch
Early stone
Common round white
Large round white
Yellow Dutch
Aberdeen yellow

Maltese golden, an excellent and beautiful root
Green-topped large round white, skin of the crown green
Red-topped large white
Tankard, large oblong

French, *B. napus*, *navet de Meaux*, Fr., small oblong
Small round French, *petit Berlin*, Fr., *teltaw*, Ger.
Swedish, large round, and a very hardy plant, more valued for field-culture than in gardens for the table.

Estimate of Sorts. " The first three sorts are the fittest for early, first succession, and main summer crops for the table. The early white Dutch is proper both for the most early and first succession-crops, as is also the early stone. The common round white is highly eligible for the main-crop; and the large round white stands nearly on a par with that, and, if not sown to come in with it, should at least succeed it, as a late summer and autumn crop. In large grounds, portions of the large white green-topped, and the large white red-topped, may be sown for autumn and winter; but the surest plant for winter consumption is the yellow Dutch; although constituted to stand intense frost unhurt, it has a fine flavor, and is very nutritive. Small portions of any of the other sorts may be cultivated in secondary crops for variety, or to answer a particular demand. The French, or navet, is of excellent flavor. It was anciently used throughout the south of Europe, and was more cultivated in this country a century ago than it is now. It is still in high repute in France, Germany, and Holland. It is grown in the sandy fields round Berlin, and also near Altona, from whence it is sometimes imported to the London market. Before the war, the late queen had regular supplies sent to England from Mecklenburgh. The Swedish, for its large size and hardy nature, is extensively cultivated in fields for cattle: it is also occasionally raised in gardens for the table, to use in young growth as the common turnip.

Seed estimate. For a seed-bed four feet and a half by twenty-four, the plants to remain and be thinned to seven inches' distance, half an ounce.

Time of Sowing. " This root can be obtained most part of the year, by sowing every month in spring and summer. Make first, a small sowing in the last fortnight of March, or the first days of April, for early turnips in May and June; but, as these soon fly up to seed the same season, adopt a larger early sowing about the middle of April. The first main sowing should follow at the beginning, or towards the end of May, for roots to draw young about the end of June, and in full growth in July and August. Sow full crops in June and July, to provide the main supplies of autumn and winter turnips. Make a final smaller sowing in the second or third week of August, for late young crops, or to stand for the close of winter and opening of spring: the turnips of this sowing continue longer than those of the previous sowings before they run in the spring. As the crops standing over winter shoot up to seed-stalks in February, March, or April, the root becomes hard, stringy, and unfit for the table. Make the sowings a day or two before or after the prescribed times for the opportunity of showery weather; or, if done at a dry time, give a gentle watering.

Soil and Situation. "The turnip grows best in a light, moderately rich soil, broken fine by good tilth. Sand or gravel, with a mixture of loam, produces the sweetest flavored roots. In heavy excessively rich land, the plant sometimes appears to flourish as well; but it will be found to have a rank taste, and to run more speedily to flower. A poor, or exhausted soil, ought to be recruited with a proportion of manure suited to the defect of the staple earth. Dung, when requisite, should have been laid on the preceding autumn; for when fresh, it affords a nidus for the turnip-fly. Let the early crop have a warm aspect, and the lightest, driest soil. Sow the crops raised after the first of May in the most open exposure.

Process in Sowing, and Precautions against the Fly. Let the ground be well broken by regular digging, and neatly levelled to receive the seed. Procure bright, well-dried seed. At a season when the turnip-fly is not apprehended, the seed may be put into the ground without any preparation, either alone or mixed with a little sand; but in the hot weather of summer, it is advisable to use some cheap and effectual preventive of the fly. It appears from a trial of Knight, at the suggestion of Sir Humphrey Davy, that lime slaked with urine, and mixed with a treble quantity of soot, if sprinkled in with the seed at the time of sowing, will protect the seeds and germs from the ravages of this pernicious insect; but this antidote cannot be conveniently applied unless the sowing be in drills. A yet simpler remedy, found by Mean to be perfectly successful, is, to steep the seed in sulphur-water, putting an ounce of sulphur to a pint of water, which will be sufficient for soaking about three pounds of seed." *Abercrombie.*

Arch. Gorrie, a Scottish gardener of merit, tried steeping the seed in sulphur, sowing soot, ashes, and sea-sand, along the drills, all without effect. At last, he tried dusting the rows, when the plants were in the seed-leaf, with quicklime, and found that effectual in preventing the depredations of the fly. "A bushel of quicklime," he says, "is sufficient to dust over an acre of drilled turnips; and a boy may soon be taught to lay it on almost as fast as he could walk along the drills. If the seminal leaves are powdered in the slightest degree, it is sufficient; but should rain wash the lime off before the turnips are in the rough-leaf, it may be necessary to repeat the operation if the fly begin to make its appearance." *Cal. Hort. Mem.* vol. i.

Mixing equal parts of old seed with new, and then dividing the mixture, and steeping one-half of it twenty-four hours in water, has often been tried with effect, and especially by farmers. By this means, four different times of vegetation are procured, and consequently four chances of escaping the fly.

Radish-seed is also frequently mixed with that of the turnip, and the fly preferring the former, the latter is allowed to escape.

"One of the easiest remedies," Neill observes, "is to sow thick, and thus ensure a sufficiency of plants both for the fly and the crop." But the most effectual preventive on a large scale is found in sowing late, where that can be done; the fly in its beetle state having fed on other herbage, and disappeared before the turnip comes into leaf.

Abercrombie directs to "sow broad-cast, allowing half an ounce of seed for every 100 square feet, unless some particular purpose will be answered by drilling. In the former method, scatter the seed regularly and thinly; in dry weather, tread or roll it in lightly and evenly; but after heavy showers, merely beat it gently down; rake-in fine. Let drills be an inch deep, and twelve or fifteen inches asunder. In the heat of summer it is of great importance to wait for rain, if the ground be too extensive to be properly watered; for the fermentation caused by copious rain and heat, gives an extraordinary quick vegetation to the seed, which in a few days will be in the rough-leaf, and out of all danger from the fly. This insect is weakened or killed by drenching showers, and does no injury to the turnip when much rain falls. It is desirable to have the last sowing finished by the twentieth of August."

When a crop is destroyed by the fly, the necessary reparation is immediately to dig or stir the ground, and make another sowing; watering soon, and occasionally afterwards, unless rain falls.

Subsequent Culture. "As soon as the plants have rough leaves about an inch broad, hoe and thin them to six or eight square inches' distance, cutting up all weeds. As the turnips increase in the root, a part may be drawn young by progressive thinnings, so as to leave those designed to reach a full size ultimately ten or twelve square inches. Water garden-crops sometimes in hot weather.

"One great advantage attending the cultivation of the navet is, that it requires no manure whatever; any soil that is poor and light, especially if sandy, suits it, where it seldom exceeds the size of one's thumb or middle finger; in rich manured earth, it grows much larger, but is not so sweet or good in quality." *Justice and Dickson.*

Taking the Crop and Preserving it by Housing. "In the successive crops, begin to draw as above in a thinning order, that such others as are coming forward may have room to enlarge in succession; by which means a regular supply will be procured till March or April of the second season; specific sorts being sufficiently hardy to continue good throughout our ordinary winters. But of the winter crops for the table, draw a portion occasionally in November, December, or whenever there is an appearance of the frost setting in severe. Cut the tops off close, and house the roots in some lower shed or cellar, laid in sand, ready for use while the ground is frozen." Instead of cutting the top and roots close off, some prefer leaving about an inch of the top, and the whole of the root; and, when the bulbs are kept in a sufficiently cool store, this seems preferable, as more likely to retain the sap. *Abercrombie.*

Turnip Tops. These are to be gathered from among the earliest spring-produced leaves, either from the crown, or flower stalk. They are equally good from any of the varieties, and less acrid from those of the Swedish. Sometimes very late sowings are made in September and October, which never bulb, but which are preserved entirely for thin produce, as greens in spring.

Field Turnips. Where a family can be supplied from the field, the roots will always be found of a better flavor than those produced in the garden; and the same remark applies to all the Brassica tribe, excepting the cauliflower and brocoli, and to potatoes and most tuberous roots.

To save Seed. "Either leave, in the spring, some of the best sound roots of the winter-standing crop, or leave, in May or June, a part of the spring-sown crop of the same year: or, to be more certain of good kinds, transplant, in November or February, a quantity of full-grown well-shaped roots of the autumn or winter crop, into large, deepish drills, two feet asunder; inserting the bottom fibre into the nether ground, and the main root fully to the bottom of the drill; and earth well over. The plants will shoot in large branchy stalks in summer, and ripen seed in July or August."

It is preferable, however, to procure turnip-seed, as indeed that of most other vegetables, from the regular seedsmen; as the seed-farmers have opportunities of keeping the sorts distinct, which cannot be had within the precincts of a walled-garden.

SUBSECT. 4. *Carrot.*—*Daucus carota*, L. (*Eng. Bot.* t. 1174.); *Pent. Dig.* L.; *Umbelliferæ*, J. *Carotte*, Fr.; *Gelbe Rübe*, Ger.; and *Carota*, Ital.

1323. The carrot is a hardy biennial, and common in many parts of Britain, in sandy soils, and by road-sides. It is known in many places by the name of bird's-nest, from the appearance of the umbel when the seeds are ripening. The leaves are pinnatified and much cut: the plant rises to the height of two feet, and produces white flowers in June and July, succeeded by rough, hispid seeds, which ripen in August. The root of the plant, in its wild state, is small, dry, sticky, of a white color, and strong-flavored; but the root of the cultivated variety is large, succulent, and of a red-yellow, or pale straw-color.

Use. It is used in soups and stews, and as a vegetable dish. Parkinson informs us, that in his day, ladies wore carrot-leaves in place of feathers. In winter, an elegant chimney ornament is sometimes formed, by cutting off a section from the head or thick end of a carrot containing the bud, and placing it in a shallow vessel with water. Young and delicate leaves unfold themselves, forming a radiated tuft, of a very handsome appearance, and heightened by contrast with the season of the year.

The varieties of the carrot in common cultivation are,

1. Large red, or field carrot; grows to a large size, and is chiefly cultivated in fields and in farmers' gardens for coloring butter.
2. Orange carrot; large, long root, of an orange color; best sort for the main-crop.
3. Early horn; short, smaller root; for a small early crop. Also for shallow soils.
4. Late horn; same characteristics; but suited for a late crop.

W. Christie enumerates the following varieties, as having been grown in the garden of the Horticultural Society, some of which are foreign sorts newly introduced.

Horn carrots.—Early red, common early, long horn.
Long carrots.—White, yellow, long yellow, long orange, long red, purple; and the altringham, or superb, originally from Cheshire. *Hort. Trans.* v. iv. 388.

Soil. The carrot requires a light mellow soil, mixed with sand, which should be dug or trenched one or two spades deep, breaking well all the lumpy parts, so as to form a porous bed, and an even surface. The orange and red sorts, on account of their longer roots, require a soil proportionally deeper than the horn.

Seed Estimate, and Sowing. The seeds have numerous forked hairs on their borders, by which they adhere together, and therefore should, previously to sowing, be rubbed between the hands, and mixed with dry sand, in order to separate them as much as possible. They are also very light, and therefore a calm day must be chosen for sowing; and the seeds should be disseminated equally, and trod in before raking. Previously to sowing, if convenient, the seed should be proven, by sowing a few in a pot, and placing it in a hot-bed or hot-house, as it is more frequently bad than most garden-seeds. For a bed four and a half feet by thirty, one ounce will be requisite, and the same for one hundred and fifty feet of drill-row.

Times of Sowing. To have early summer carrots, sow on a warm border in the beginning of February; or, to have them still more forward, sow in a moderate hot-bed, giving copious admissions of air. In the open garden, " begin with the early horn in the last fortnight of February, or first week of March, as dry, fine, and open weather may occur. The first-sown beds should be assigned a favorable situation, and covered for a time with haulm. Follow with the orange in the first fortnight of March, and make successive sowings thence till the 20th of April, for main crops. Add smaller sowings twice in May, for plants to draw young late in summer: also sow a few at the commencement of July for a later succession of young carrots in summer and autumn. Lastly, in the beginning of August, two separate small sowings may be made, for plants to stand the winter, and afford young roots early in spring, March and April."

Insects. Carrots, when they come up, are apt to be attacked by insects like the turnip; the most approved remedies for which are thick sowing, in order to afford both a supply for the insects and the crop; and late sowing, especially in light soils, thus permitting the grubs to attain their fly state before the seed comes up.

Culture. " When the plants are up, two or three inches in growth, in May and June, they will require thinning and clearing from weeds, either by hand or small hoeing. Thin from three to five inches' distance such as are designed for drawing in young and middling growth. But the main crop, intended for larger and full-sized roots, thin to six or eight inches' distance. Keep the whole clean from weeds in their advancing young growth. Some of small and middling growth will be fit for drawing in June and July; large sizeable roots, in August and September; and those of full growth, by the end of October." *Abercrombie.*

Preserving during Winter. " Carrots are taken up at the approach of winter, cleaned, and stored among sand. They may be built very firm, by laying them heads and tails alternately, and packing with sand. In this way, if frost be excluded from the store-house, they keep perfectly well till March or April of the following year. Some persons insist that the tops should be entirely cut off at the time of storing, so as effectually to prevent their growing; while others wish to preserve the capability of vegetation, though certainly not to encourage the tendency to grow."

To save Seed. Plant some largest best roots in October, November, or the last fortnight of February, two feet apart; insert them a few inches over the crowns. They will yield ripe seed in autumn, of which gather only from the principal umbel, which is likely not only to afford the ripest and largest seed, but the most vigorous plants. A considerable quantity of carrot-seed for the supply of the London seedsmen is raised near Weathersfield, in Essex; and much is imported from Holland.

Subsect. 5. *Parsnip.* — *Pastinaca sativa*, L. (*Flor. Dan.* t. 1206.); *Pent. Dig.* L.; and *Umbelliferæ*, J. *Panais*, Fr.; *Pastinake*, Ger.; and *Pastinaca*, Ital.

1324. This is a biennial British plant, common in calcareous soils by road-sides near London. The wild variety is figured in *English Botany*, t. 556. The garden parsnip has smooth leaves, of a light or yellowish-green color, in which it differs from the wild plant, the leaves of which are hairy and dark-green; the roots also have a milder taste: it does not, however, differ so much from the native plant, as the cultivated does from the native carrot.

Use. The parsnip has long been an inmate of the garden, and was formerly much used. In Catholic times, it was a favorite Lent root, being eaten with salted fish. " In the north of Scotland," Neill observes, " parsnips are often beat up with potatoes and a little butter; of this excellent mess the children of the peasantry are very fond, and they do not fail to thrive upon it. In the north of Ireland, a pleasant table beverage is prepared from the roots, brewed along with hops. Parsnip wine is also made in some places; and they afford an excellent ardent spirit, when distilled after a similar preparatory process, to that bestowed on potatoes destined for that purpose.

Varieties. There is only one variety in general cultivation in Britain; but the French possess three, the *Coquaine*, the *Lisbonaise*, and the *Siam*.

The *coquaine*, Dr. Macculloch informs us, (*Caled. Hort. Mem.* vol. i. p. 408.), is much cultivated in Guernsey and Jersey. The roots run sometimes four feet deep, and are rarely so small in circumference as six inches, having been known to reach sixteen. The leaves of this variety grow to a considerable height, and proceed from the whole crown of the root.

The *Lisbonnaise* does not extend to so great a depth as the coquaine; but the root is equally good in quality, and what is lost in length is gained in thickness. The leaves are small and short, and only proceed from the centre of the crown.

The *siam* has a root of a yellowish color, not very large, but tender, and more rich in taste than the other varieties.

Soil. The soil most proper for the parsnip should be light, free from stones, and deep. It should be dug or trenched before sowing at least two spits deep; and the manure should either be perfectly decomposed, or if recent, deposited at the bottom of the trench.

Seed Estimate, and Sowing. Sow in the end of February, or in March, but not later than April; and for a bed five feet by twenty, the plants to remain thinned to eight inches' distance, *half an ounce* of seed is the usual proportion. Having prepared either beds, four or five feet wide, or one continued plot, sow broad-cast, moderately thin, and rake the seed well into the ground.

Culture. When the plants are about one, two, or three inches high, in May or June, let them be thinned and cleared from weeds, either by hand, or by small hoeing; thinning them from eight or twelve inches' distance. Keep them afterwards clean from weeds till the leaves cover the ground, after which no further culture will be required. The roots will be pretty large by the end of September, from which time a few may be drawn for present use: but the parsnip is far best at full maturity, about the close of October, indicated by the decay of the leaf. The root will remain good for use till April and May following.

Preserving during Winter. The parsnip is not so liable as the carrot to be hurt by frost, if left in the ground. But it would be proper, in the beginning of November, when the leaves decay, to dig up a portion of the roots, and to cut the tops off close, laying them in sand, under cover, ready for use in hard frosty weather. The rest will keep good in the ground till they begin to shoot in the spring: then, in February or March, dig them up; cut the tops off; and, preserved in sand, the roots will remain sound till about the end of April.

To save Seed. Transplant some of the best roots in February, two feet asunder, inserted over the crowns: they will shoot up in strong stalks, and produce large umbels of seed, ripening in autumn." *Abercrombie.*

Subsect. 6. *Red Beet.* — *Beta vulgaris*, L. (*Schk. Han.* i. t. 56.); *Pent. Dig.* L. and *Chenopodeæ*, B. P. *Betterave*, Fr.; *Rothe Rübe*, Ger.; and *Barba Biettola*, Ital.

1325. The *Red Beet* is a biennial plant, rising with large, oblong, thick, and succulent leaves, generally of a reddish or purple color; the roots often three or four inches in diameter, of a foot or more in length, and of a deep red color. It produces greenish flowers in August. The red beet is a native of the sea-coast of the south of Europe; it was cultivated in this country by Tradescant, the younger, in 1656, and then called *beet rave*, (or beet radish), from the French name *betterave*.

Use. The roots are boiled and sliced, and eaten cold, either by themselves, or in salads; they also form a beautiful garnish, and are very much used as a pickle. Some consider the green-leaved variety as more tender in the roots than the red-leaved sort; others prefer those with a few small, dark-red leaves. From one variety, having a red skin, but white flesh, sugar is prepared in some parts of France and the Netherlands; but this manufacture, introduced under Buonaparte's reign, is now almost entirely given up in favor of West India produce. The roots, dried and ground, are sometimes used as "a supplement to coffee," and dried in an oven in thin slices: they are used in confitures. *N. Cours d' Agricultur*, art. *Bette.*

Varieties. These are numerous, but the principal are,

The common long-rooted, which suits light, deep, rich soils, and grows very large.

The short, or turnip-rooted, suited to shallow soils.

The green-leaved, red-rooted, suited to soils of light open texture.

W. Morgan has enumerated the following sorts of red beet, as having been cultivated in the garden of the Horticultural Society:

Large-rooted.
Long-rooted.
Dwarf, one of the best.
Turnip-rooted, an early variety.
Small-red.
Castelnaudari, much esteemed in France, and said to have the flavor of a nut.
Green-topped, much grown in Scotland: He also enumerates some yellow rooted sorts, none of which are in general cultivation. *Hort. Trans.* v. iii. p. 277.

Seed and Soil. The beet is always raised from seed, and for a bed four feet and a half by twelve feet, one ounce is requisite. The soil in which it naturally delights is a deep rich sand, dry and light rather than moist. Sowing in seed-beds and transplanting has been tried; but though it may answer for the spinach or pot-herb beets, (white and its varieties), it will not answer where the object is a large clean root.

Sowing. The beet is sown annually in the last week of March, or beginning of April. If sown earlier, many of the plants are apt to run into flower, and so become useless. " The ground on which it is sown should have been previously enriched by mellow compost and sea-sand; but rank dung is not to be laid in, as it is apt to induce canker. For the long-rooted kind, trench to the depth of eighteen inches. Sow either broad-cast on the rough surface, and rake well into the earth; or, as the seed is large, sow in drills an inch or two deep, and a foot asunder; or dot it in with a thick blunt-ended dibble, in rows that distance, making holes ten or twelve inches apart, about an inch and a half deep; drop two or three seeds in each hole, but with the intention to leave only one best plant.

Subsequent Culture. " When the young plants are advanced into leaves, one, two, or three inches in growth, they must be thinned and cleared from weeds, either by hand or small hoeing, especially those sown promiscuously broad-cast and in drills: thin the latter to twelve inches' distance; and those holed in by dibble, to one in each place. They will acquire a large full growth in the root by September or October, to take up for use as wanted, and in continuance all winter and spring following: or in November, it may be proper to dig up a quantity, cut off the leaves, and deposit the roots in dry sand, under cover, ready for use in winter, in case of hard frosty weather, which would fix them fast in the ground; or the rest may be digged up at the same time, and trenched in close together in some dry compartment, to be covered occasionally in severe frost, to prevent their being frozen in, that they may be readily taken up as wanted. Towards spring, in February or beginning of March, if any remain in the bed where raised, their removal then, being trenched in close together over the root, will, in some degree, check their shooting, and preserve them from running, so as to keep them good all the spring till May and June. *Abercrombie.*

Housing. In the northern counties, the winter stock of beet is commonly lifted and housed in sand, in the manner of carrots. In digging up the roots for this purpose, great care must be taken that they be not in any wise broken or cut, as they bleed much. For the same reason, the leaves should be cut off, at least an inch above the solid part of the root.

To save Seed. Either have a few strong roots standing in the rows; or select a few, and transplant them to a spot where they will be in no danger, when in flower, of being impregnated with any other variety. They will shoot up the second year, when their flower-stalks should be tied to stakes, to prevent their breaking over.

SUBSECT. 7. *Skirret.* — *Sium Sisarum*, L. (*Schk. Hand.* i. t. 69.); *Pent. Dig.* L.; and *Umbelliferæ*, J. *Chervis*, Fr.; *Zuckerwürzel*, Ger.; and *Sisaro*, Ital.

1326. This is a perennial, tap-rooted plant, a native of China, known in this country since 1548. The lower leaves are pinnated, and the stem rises about a foot high, terminated by an umbel of white flowers, in July and August. The root is composed of fleshy tubers, about the size of the little finger, and joined together at the crown or head; they were formerly much esteemed in cookery. In the north of Scotland, the plant is cultivated under the name of *crummock*.

Use. The tubers are boiled, and served up with butter; and are declared by Worlidge, in 1682, to be " the sweetest, whitest, and most pleasant of roots."

Culture. " This plant grows freely in a lightish soil, moderately good. It is propagated both from seed, and by off-sets of established roots. The better method is to raise seedlings, to have the root in perfection, young and tender.

By Seed. " Sow between the 21st of March and the 15th of April; a fortnight later rather than any earlier for a full crop, as plants raised forward in spring are apt to start for seed in summer. Sow on an open compartment of light ground, in small drills eight inches apart. When the plants are one or two inches high, thin them to five or six inches asunder. They will enlarge in growth till the end of autumn: but before the roots are full grown, in August, September, or October, some may be taken up for consumption as wanted: those left to reach maturity will continue good for use throughout winter, and in spring, till the stems run.

By Slips. " Having some plants of last year's raising, furnished with root off-sets, slip them off; taking only the young outward slips, and not leaving any of the larger old roots adhering to the detached off-sets: which plant by dibble, in rows from six to nine inches asunder. They will soon strike, and enlarge, and divide into off-sets; which, as well as the main roots, are eatable and come in for use in proper season.

To save Seed. " Leave some old plants in the spring: they will shoot in stalks, and ripen seed in autumn."

Subsect. 8. *Scorzonera*, or *Viper's Grass.* — *Scorzonera Hispanica*, L. (*Lam. Ill.* t. 647. f. 5.); *Syng. Polyg. Æqu.* L.; and *Cichoraceæ*, J. *Scorzonère*, or *Salsafis d'Espagne*, Fr.; *Scorzonere*, Ger.; and *Scorzonera*, Ital.

1327. This is a hardy perennial, a native of Spain, the south of France, and Italy, cultivated in this country since 1576. The stem rises two or three feet high, with a few embracing leaves, and is branched at top; the lower leaves are linear, eight or nine inches long, and end in a sharp point; the flowers are yellow, and appear from June to August. The root is carrot-shaped, about the thickness of one's finger; tapering gradually to a fine point, and thus bearing some resemblance to the body of a viper.

Use. The outer rind being scraped off, the root is steeped in water, in order to abstract a part of its bitter flavor. It is then boiled or stewed in the manner of carrots or parsnips. The roots are fit for use in August, and continue good till the following spring.

Culture. "To have an annual supply, sow every year; for although the plant, as to its vegetable life, be perennial, the root continuing only one season useful, must be treated merely as a biennial. The quantity of seed for a bed four feet and a half by ten feet, to be sown in drills fifteen inches asunder, is one ounce. Sow every spring, at the end of March, or in April: follow with a secondary sowing in May. This root likes a deep, light soil. Allot an open compartment. Sow either broad-cast, and rake in evenly; or in small drills, twelve or fifteen inches asunder, and earth over half an inch or an inch deep. When the young plants are two or three inches high, thin them to six or eight inches' distance. Clear out all weeds as they advance in growth. The plants having a free increase all summer, the roots will, some of them, be of a moderate size to begin taking up in August, others in September, but will not attain full growth till the end of October, when, and during the winter, they may be used as wanted; or some may be dug up in November, and preserved in sand under cover, to be ready when the weather is severe. The plants left in the ground continue useful all winter till the spring; then those remaining undrawn, shoot to stalk in April and May, and become unfit for the table.

To save Seed. "Leave some old plants in the spring; which will shoot up in tall stems, and produce ripe seed in autumn." *Abercrombie.*

Subsect. 9. *Salsify*, or *Purple Goat's Beard.* — *Tragopogon porrifolius*, L. (*Eng. Bot.* 638.); *Syng. Polyg. Æqu.* L.; and *Cichoraceæ*, J. *Salsifis*, Fr.; *Bocksbart*, Ger.; and *Sassifica*, Ital.

1328. This is a hardy biennial, a native of England, but not very common. The root is long and tapering, of a fleshy white substance; the herb smooth, glaucous, and rising three or four feet high. The leaves, as the trivial name imports, resemble those of the leek; the flowers are of a dull purple color, closing soon after mid-day; the seed, as in other species of goat's-beard, is remarkable for having attached to it a broad feathery crown. It has taken place in gardens of the *T. pratensis*, which was cultivated in Gerarde's and Parkinson's time, but is now entirely neglected.

Use. The roots are boiled or stewed like carrots, and have a mild, sweetish flavor; the stalks of year-old plants are sometimes cut in the spring, when about four or five inches high, and dressed like asparagus.

Culture. "Salsify is raised from seed, annually, in the spring, and for thirty feet of drill, one ounce of seed is sufficient. Allot an open situation. The soil should be light and mellow, full two spits deep, that the long tap-root may run down straight. Sow in March, April, and in May, for first and succession crops, either broad-cast in beds, and rake in the seed, or in small drills, eight or ten inches asunder. The plants are to remain where sown. When they are two or three inches high, thin them about six inches apart. In the dry, hot weather of summer, water now and then till the ground be soaked. The roots having attained a tolerable size in August and Septemper, may be taken up occasionally for present use. Those remaining, perfect their growth in October, for a more general supply; and will continue good all winter, and part of the following spring. For winter use, take up a portion before frost hardens the ground, and preserve in sand. Such year-old plants as remain undrawn in the following spring, shoot up with thick, fleshy, tender stalks: these are occasionally gathered young to boil; the roots continuing good till the plant runs to stalk in April or May.

To save Seed. "Leave or transplant some of the old plants in spring; which will shoot, and produce ripe seed in autumn." *Abercrombie.*

Subsect. 10. The *Radish.* — *Raphanis sativus*, L. (*Lam. Ill.* t. 568.); *Tetrad. Siliq.* L.; and *Cruciferæ*, J. *Radis* and *Rave*, Fr.; *Rettig*, Ger.; and *Rafano*, Ital.

1329. This plant is an annual, a native of China, and mentioned by Gerarde in 1584, "The leaves are rough, lyrate, or divided transversely into segments, of which the inferior less ones are more remote. The root is fleshy, and fusiform in some varieties, in others sub-globular; white within, but black, purple, yellow, or white, on the outside; the flowers pale violet, with large, dark veins; pods long, with a sharp beak."

Use. Formerly the leaves were often boiled and eaten; but now the roots are chiefly employed. These are eaten raw in spring, summer, autumn, and winter. The young seedling leaves are often used with cresses and mustard, as small salad; and radish seed-pods, when of plump growth, but still young and green, are used to increase the variety of vegetable pickles, and are considered a tolerable substitute for capers.

Varieties. These may be divided into the spring, autumn, and winter sorts. Spring radishes may be subdivided into the long or spindle-rooted (*Rave*, Fr.); and the round or turnip-rooted (*Radis*, Fr.); the autumn sorts are chiefly oval or turnip-rooted, and the winter radishes are ovate or oblong, and dark-colored. "The character of a good long rooted radish," Strachan observes, "is to have its roots straight, long, free from fibres, not tapering too suddenly, and especially to be fully formed on the top, or well shouldered, as it is called, and without a long neck; the roots should be ready to draw whilst the leaves are small, whence the name *short-top radish*, and if they soon attain a proper size, as well as force well, they are then called, *early* and *frame radishes.*" *Hort. Trans.* vol. iii. p. 438.

Spring and Summer Kinds.

Long-Sorts.—Scarlet, or salmon-coloured, and its sub-varieties;
Short-topt scarlet;
Early frame scarlet; which are the two sorts most generally cultivated.
Purple, an early sort of good flavor, but at present neglected.
Long white, the original variety cultivated in Gerarde's time, white, semi-transparent, and delicate.

Turnip Radishes.

White, root globular like a turnip.
Early white, a sub-variety.
The pink, rose-colored, scarlet and crimson, are names applicable to one sort which approaches to the pear-shape.

Autumn Kinds.

White Russian, the root larger than any of the long-rooted kinds, white tapering like a carrot, flavor nutty, like that of the rampion. *Hort. Trans.* iii. 115.
Yellow turnip, root large, ovate, yellow, or dusky-brown, and rough without, but the flesh white.
Round brown, root large, shape irregular, externally matted with greenish-brown, and the flesh soft, and of a greenish-white.

Winter Radishes.

White Spanish, root large, oval, outside white tinged with green, flesh hot, firm, solid, and white.
Oblong brown, root middle-sized, pear-shaped, outside coat rough and brown, marked with white circles, flesh hot, firm, solid, and white, plant very hardy.
Black Spanish, root large, irregularly pear-shaped, rough and black externally, and the flesh hot, firm, solid, and white: very hardy.
Purple Spanish, a sub-variety of the black, with a purple skin.
Christie, in *Hort Trans.* iv. 13.

Estimate of Sorts. The spindle-rooted kinds are cultivated in the largest proportion for the first crops. The small turnip-rooted sorts may be sown in spring as secondary crops, and in summer and autumn for more considerable supplies. The winter sorts have a coarser flavor than the other kinds; but being of a hardy nature, are frequently sown. They are sliced in salads, or occasionally eaten alone with salt, vinegar, and other condiments.

Propagation. All the varieties are raised from seed.

Soil and Situation. The soil should be light and mellow, well broken by digging: for sowings between the middle of October and the middle of February, let the site be a dry sheltered border, open to the full sun. From the middle of February to the end of March, any dry, open compartment will be suitable. As spring and summer advance, allot cooler and shaded situations. A scattering of the smaller growing sorts may be sown among some broad-cast crops of larger growth, such as spinach, lettuce, and onion; it may be also drilled between wide rows of beans, or on ground intended to be sown with a late spring crop.

Times of Sowing. "The crops raised between the middle of October and the middle of February, are usually confined to the spindle-rooted kinds. Of the early short-top red, a first small saving may be made at the end of October, another in November, and a third in the last fortnight of December, if open temperate weather; respectively to stand over the winter: but make the principal early sowings in January, or the beginning of February. From this time sow every fortnight or ten days, in full succession crops till the end of May; as well the white and red small turnip-rooted as the autumn sorts. The winter sorts are sometimes raised at the beginning of summer; but the fittest season to sow them is from the end of June to the end August; that is, in July for use in autumn, and in August, to provide a supply thoughout winter.

Seed, Process in Sowing, and Common Culture. "Sow each sort separate; and for a bed four feet six inches by twelve feet, two ounces of seed will be required of the spring sorts, and an ounce and half for the autumn varieties. All the kinds may be sown either broad-cast or in drills; but the latter is preferable, as allowing the roots to be drawn regularly, with less waste. If you sow broad-cast, it is a good method to make beds four or five feet wide, with alleys between, a foot wide, the earth of which may be used to raise the beds, or not, as the season may make it desirable to keep the beds dry or moist. Avoid sowing excessively thick, as it tends to make the tops run, and the roots stringy. Rake-in the seed well, full half an inch deep, leaving none on the surface to attract the birds. If you trace drills, let them be for the spindle-rooted kinds half an inch deep, and about two inches and a half asunder; for the small turnip-rooted, three quarters of an inch deep, and four or five inches asunder; and for the black turnip or Spanish, six or eight inches asunder, because the root grows to the size of a middle-sized turnip. As the plants advance in growth, thin them so as to leave the spindle-rooted about two inches square distance, and the other sorts three, four, or five, leaving the most space to the respective sorts in free-growing weather. In dry, warm weather, water pretty frequently: this swells the roots, and makes them mild and crisp."

Occasional Shelter. "The crops sown between the end of October and the end of February, besides being favored in situation, will want occasional shelter, according to the weather. On the first approach of frost, whether the seed is just sown, or the plants have appeared, cover the ground, either with clean straw, dry long haulm, or dried fern, two or three inches thick, or with mats supported on short stout pegs. The covering will keep off the birds, and by its warm effect on the mould, forward the germination of the seed. The time for removing or restoring it must be regulated by the weather; as the plants should be exposed to the full air whenever it can be safely done. If the season be cold without frost, take off the covering every morning, and put it on towards evening; and if the weather be sharp and frosty, let it remain on night and day, till the plants have advanced into the first rough leaves, and afterwards occasionally, till the atmosphere is settled and temperate. Replace it constantly at night till there is no danger of much frost happening; then wholly discontinue the covering."

Pods for Pickling. "Radish seed-pods should be taken for pickling when of plump growth, in July and August, while still young and green.

To save Seed. "Transplant a sufficiency of the finest plants in April or May, when the main crops are in full perfection. Draw them for transplanting in moist weather, selecting the straightest, best-colored roots, with the shortest tops, preserving the leaves to each; plant them, by dibble, in rows two feet and a half distant, inserting each root wholly into the ground, down to the leaves. Keep the red and salmon-colored kinds in separate situations, to prevent a commixture of their farina, and to preserve the kinds distinct. With proper watering, they will soon strike, and shoot up in branchy stalks, producing plenty of seed; which will be ripe in September or October. In transplanting for seed the turnip-rooted kinds, select those with the neatest-shaped roundest roots, of moderate growth, and with the smallest tops. They, as the others, will yield ripe seed in autumn. To obtain seed of the winter sorts, sow in the spring to stand for seed; or leave, or transplant, in that season, some of the winter-standing full roots. As the different kinds ripen seed in autumn, cut the stems; or gather the principal branches of pods; and place them in an open, airy situation, towards the sun, that the pod, which is of a tough texture, may dry, and become brittle, so as readily to break, and give out the seed freely, whether it be threshed or rubbed out."

For *Forcing the Radish*, see Chap. vii. sect. 13.

Sect. IV. *Spinaceous Plants.*

The excellence of this class consisting in the succulency of the leaves, almost every thing depends on giving them a rich soil, stirring it frequently, and supplying water in dry seasons. The space they occupy in the garden is not considerable, say a thirtieth part; more especially as some of them, the common spinach for example, often come in as a temporary crop between rows of peas, or beans, or among cauliflowers and brocolis, &c. The plant of this class the most deserving of culture in the cottage-garden, is the Swiss-chard, which produces abundance of succulent, and most nutritious foliage. It is to be found in every cottage-garden in Switzerland and the north of France.

Subsect. 1. *Spinach.* — *Spinacia oleracia*, L. (*Schk. Hand.* iii. t. 324.); *Diœc. Hexan.* L.; and *Chenopadeæ*, B. P. *Epinard*, Fr.; *Spinat*, Ger.; and *Spinaci*, Ital.

1330. This is an annual plant, cultivated in this country since 1568, and probably long before; but of what country it is a native is not certainly known; some refer it to Western Asia. The leaves are large, the stems hollow, branching, and, when allowed to produce flowers, rising from two to three feet high. The male and female flowers, as the name of the class imports, are produced on different plants; the former come in long terminal spikes; the latter in clusters, close to the stalk at every joint. It is the only diœcious plant cultivated for culinary purposes.

Use. The leaves are used in soups; or boiled alone, and mashed and served up with gravies, butter, and hard boiled eggs. The leaves may be obtained from sowings in the open ground at most seasons of the year, but chiefly in spring, when they are largest and most succulent.

Varieties. These are:

The round-leaved, or smooth-seeded; and
The oblong triangular-leaved, or prickly-seeded.

Estimate of Sorts. "These varieties of spinach are adapted for culture, principally, at two different seasons. The round-leaved sort, of which the leaves are larger, thicker, and more juicy, is mostly sown in spring and summer, for young spinach in those seasons: the triangular-leaved is chiefly sown in autumn, to stand for winter and the following spring; for the leaves being less succulent, it is hardier to stand the inclement weather: but a portion of this is acceptable, when the other sort is principally raised.

Summer Crop.—Times of Sowing. "Begin in January, if open weather, with sowing a moderate crop of the round-leaved. Sow a larger quantity in February; and more fully in March. The plants presently fly to seed in summer, especially if they stand crowded; it is therefore proper to sow about once in three weeks, from the beginning of March to the middle of April: then, every week till the middle of May: from which time, till the end of July, sow once a fortnight. Small crops, thus repeated, will keep up a succession during the rest of summer and throughout autumn. A portion of the prickly-seeded spinach may be sown as thought proper, to come in among the successive summer crops; and if drilled between lines of other vegetables, will encroach less than the smooth-seeded, a thing to be considered where the spare room is not of a liberal width.

Soil and Situation. "The soil which suits any of the general summer crops will do for spinach; that for the early crop should be lightest and driest. For a January sowing, allot a warm border, or the best sheltered quarter. Afterwards, for all the supplies during summer, sow in an open compartment. Where it is necessary to make the utmost of the ground, the spring sowings, in February, March, and April, may be made in single drills between wide rows of young cabbages, beans, peas, or other infant crops of slow growth; or they may be made still better on spots intended to receive similar plants, including cauliflowers and horse-radish; and the spinach will be off before the slower growing crops advance considerably: or spinach and a thin crop of radishes may be sown together; and the radishes will be drawn in time, to give room for the spinach.

Seed, and Process in Sowing. "When raised by itself, spinach is generally sown broad-cast, and two ounces will sow a bed four feet and a half by thirty feet: but in drills one ounce will sow the same space. In drills, it is easier to weed and gather: let the drills be from nine to twelve inches apart. Beds four feet wide, with small alleys, are convenient of access. Let the ground be thoroughly dug. Whether broad-cast or in drills, sow thinly; and rake or earth in about an inch deep.

Subsequent Culture. "When the plants are up, showing leaves about an inch broad, clear them from weeds, either by hand or small-hoeing; and thin the plants where crowded (especially the broad-cast crops) to three inches apart; and when advanced in growth, every other may be cut out for use, increasing the distance to about six inches, that the remainder may grow stocky, with large spreading leaves. The plants of the early and succession crops attain proper growth for gathering in April, May, and June. When the leaves are from two to five inches in breadth, cut the plants clean out to the bottom, or sometimes cut only the larger leaves. But as soon as there is any appearance of their running to seed, they may be drawn out clean as wanted.

Winter Crop.—Times of Sowing. "The prickly-seeded, or triangular-leaved, is alone constituted to stand a severe winter, and the quantity of seed is the same as in the spring-sowings. The main winter crop should be sown in the first or second week of August, and a secondary one towards the end of that month, to stand later in the spring, until the round spinach comes in. The plants of these sowings will acquire proper growth and strength, and will not run the same year, nor very early in the spring, which is apt to be the case with crops sown sooner.

Site. "Allot a compartment of dry-lying mellow ground, with an open aspect to the winter's sun; and let it be digged regularly.

Process in Sowing. "In general, sow broad-cast, treading the seed down, and raking it well into the ground. The bed may be one continued space; or the ground may be divided into beds three or four feet wide, with spade-wide alleys between them, which are convenient both in the culture and the gathering of the crop. A portion may be sown thinly in broad shallow drills, from six to twelve inches asunder. When the plants are advancing with leaves an inch broad, in September, they will require thinning and clearing from weeds; which may be done either by hand or by small-hoeing: thin the plants to two or three inches' distance. If by October and November the plants are forward in growth, with leaves two or three inches broad, some may be gathered, occasionally, in the larger leaves; or, where most crowded, plants may be cut out to give the others room for a strong stocky growth, so as to be more able to endure the cold and wet in winter, and produce larger and thicker leaves. In this stage, clear out all weeds by hand, as any left in hoeing would grow again, especially in a moist season. During the winter, if the spinach advances in pretty free growth, some may be partially gathered as wanted, taking the larger outward leaves: the others will increase in succession. At the end of winter, thin the plants to seven inches by seven, ten by five, or twelve by four. On a dry day, stir the surface of the mould, if it has been much battered by rough weather. The plants will reach full growth in February, March, and April, bearing, for frequent gathering, numerous clusters of large leaves. In April and May, the larger plants may be cut out fully for use, clean to the bottom, or drawn, if the ground be wanted; as they will then soon go to seed-stalks, past useful growth; and will be succeeded in May and June by the young spring-sown crops of round spinach.

To save Seed. "To obtain seed of the round-leaved, leave a sufficient quantity of established plants in April, May, or June, to run up in stalks; or transplant in autumn some of the spring-sown which have not run. To save seed of the triangular-spinach, transplant in March some good strong plants, of the winter crop. For large supplies, a portion of each may be sown in February, or the first fortnight of March, to stand wholly for seeding. Sow each sort separate. Respecting both kinds, observe, that they are of the class *Diœcia*, the male and female flowers growing separately, on two distinct plants. When the plants are flowering for seed, the cultivator should examine whether the male plants, distinguishable by the abundant farina upon the blossoms, stand crowded or numerous to excess; in which case he should pull up the superfluous plants, leaving a competency for fertilizing the female blossoms, which else would prove abortive. And when the female blossoms are set, it is best to dispose of all the male plants, drawing them by hand; which will give more room to the females to grow and perfect their seed. The plants rejected may be profitably given to young pigs. The seed ripens in July and August."

Subject. 2. *The White Beet.* — *Beta Cicla*, L.; *Pent. Dig.* L.; *Chenopodeæ*, B. P. *Bette*, or *Poirée*, Fr.; *Mangold Kraut*, Ger.; and *Biettola*, Ital.

1331. This is a hardy biennial plant, with leaves larger than the red beet, and very thick and succulent. It is a native of the sea coasts of Spain and Portugal, and was introduced in 1570, and cultivated by Gerarde and Parkinson. It produces greenish flowers in August and September.

Use. The white beet is cultivated in gardens entirely for the leaves, which are boiled as spinach, or put into soups. Those of the great white, or sweet beet are esteemed for the midribs and stalks, which are separated from the lamina of the leaf, and stewed, and eaten as asparagus, under the name of *chard*. The variety called the *Mangold Würzel*, Ger. (*Beetroot*), is reckoned a valuable agricultural plant for feeding cattle, and affording sugar.

Varieties. The principal of those known in this country are:

The common green-leaved, small-rooted beet, the roots not thicker than a man's thumb.

The common white, small-rooted, the leaves whiter, and with white ribs and veins.

The great white or Swiss *chard*, large stalks, smaller erect leaves, with strong white ribs and veins; grown in many parts of the continent for the chard, which in taste nearly equals asparagus.

Propagation and Soil. It is raised from seed; and, for a bed four feet and a half by twelve, sown in drills, one ounce is requisite. The soil for the varieties to be used as pot-herbs, may be considerably stronger and richer than for the red or yellow beets, and need not be quite so deep. The plants endure for two years, shooting the autumn of the second; but it is best not to depend on the shot or shoot leaves of the second year, but to sow at least annually.

Sowing. The white beet is generally sown in gardens in the beginning of March, and sometimes also in September, to furnish a supply of tender leaves late in the season, and early next spring. Sow either broad-cast, and rake in the seeds; or in drills, six or eight inches apart for the smaller kinds, and ten or twelve for the larger. For the mangold, eighteen inches are not too much.

Culture. When the plants have put out four leaves, they are hoed and thinned out to from four inches to a foot, according to the sort. A second thinning should take place a month afterwards, and the ground should be kept clear of weeds, and stirred once or twice during the season with a fork or pronged hoe. In cultivating the *Swiss chard*, the plants are frequently watered during summer, to promote the succulency of the stalks; and in winter they are protected by litter, and sometimes earthed up, partly for this purpose, and partly to blanch the stalks. Fresh chards are thus obtained from August to May. The mangold is often transplanted, especially in field-culture, but this being foreign to our present purpose, we take leave of it. When the garden sorts of white beet are transplanted, the proper time is during moist weather in May or June. The distance from plant to plant may be from ten to fourteen inches, much of the advantage of transplanting depending on the room thus afforded the plants; together with the general disposition of transplanted annuals, with fusiform roots, as the turnip, carrot, &c. to throw out leaves and lateral radicles.

Gathering. The most succulent and nearly full-grown leaves being gathered as

Seed Estimate, and Sowing. The seeds have numerous forked hairs on their borders, by which they adhere together, and therefore should, previously to sowing, be rubbed between the hands, and mixed with dry sand, in order to separate them as much as possible. They are also very light, and therefore a calm day must be chosen for sowing; and the seeds should be disseminated equally, and trod in before raking. Previously to sowing, if convenient, the seed should be proven, by sowing a few in a pot, and placing it in a hot-bed or hot-house, as it is more frequently bad than most garden-seeds. For a bed four and a half feet by thirty, one ounce will be requisite, and the same for one hundred and fifty feet of drill-row.

Times of Sowing. To have early summer carrots, sow on a warm border in the beginning of February; or, to have them still more forward, sow in a moderate hot-bed, giving copious admissions of air. In the open garden, "begin with the early horn in the last fortnight of February, or first week of March, as dry, fine, and open weather may occur. The first-sown beds should be assigned a favorable situation, and covered for a time with haulm. Follow with the orange in the first fortnight of March, and make successive sowings thence till the 20th of April, for main crops. Add smaller sowings twice in May, for plants to draw young late in summer: also sow a few at the commencement of July for a later succession of young carrots in summer and autumn. Lastly, in the beginning of August, two separate small sowings may be made, for plants to stand the winter, and afford young roots early in spring, March and April."

Insects. Carrots, when they come up, are apt to be attacked by insects like the turnip; the most approved remedies for which are thick sowing, in order to afford both a supply for the insects and the crop; and late sowing, especially in light soils, thus permitting the grubs to attain their fly state before the seed comes up.

Culture. "When the plants are up, two or three inches in growth, in May and June, they will require thinning and clearing from weeds, either by hand or small hoeing. Thin from three to five inches' distance such as are designed for drawing in young and middling growth. But the main crop, intended for larger and full-sized roots, thin to six or eight inches' distance. Keep the whole clean from weeds in their advancing young growth. Some of small and middling growth will be fit for drawing in June and July; large sizeable roots, in August and September; and those of full growth, by the end of October." *Abercrombie.*

Preserving during Winter. "Carrots are taken up at the approach of winter, cleaned, and stored among sand. They may be built very firm, by laying them heads and tails alternately, and packing with sand. In this way, if frost be excluded from the store-house, they keep perfectly well till March or April of the following year. Some persons insist that the tops should be entirely cut off at the time of storing, so as effectually to prevent their growing; while others wish to preserve the capability of vegetation, though certainly not to encourage the tendency to grow."

To save Seed. Plant some largest best roots in October, November, or the last fortnight of February, two feet apart; insert them a few inches over the crowns. They will yield ripe seed in autumn, of which gather only from the principal umbel, which is likely not only to afford the ripest and largest seed, but the most vigorous plants. A considerable quantity of carrot-seed for the supply of the London seedmen is raised near Weathersfield, in Essex; and much is imported from Holland.

Subsect. 5. *Parsnip.* — *Pastinaca sativa*, L. (*Flor. Dan.* t. 1206.); *Pent. Dig.* L.; and *Umbelliferæ*, J. *Panais*, Fr.; *Pastinake*, Ger.; and *Pastinaca*, Ital.

1324. This is a biennial British plant, common in calcareous soils by road-sides near London. The wild variety is figured in *English Botany*, t. 556. The garden parsnip has smooth leaves, of a light or yellowish-green color, in which it differs from the wild plant, the leaves of which are hairy and dark-green; the roots also have a milder taste: it does not, however, differ so much from the native plant, as the cultivated does from the native carrot.

Use. The parsnip has long been an inmate of the garden, and was formerly much used. In Catholic times, it was a favorite Lent root, being eaten with salted fish. "In the north of Scotland," Neill observes, "parsnips are often beat up with potatoes and a little butter; of this excellent mess the children of the peasantry are very fond, and they do not fail to thrive upon it. In the north of Ireland, a pleasant table beverage is prepared from the roots, brewed along with hops. Parsnip wine is also made in some places; and they afford an excellent ardent spirit, when distilled after a similar preparatory process, to that bestowed on potatoes destined for that purpose.

Varieties. There is only one variety in general cultivation in Britain; but the French possess three, the *Coquaine*, the *Lisbonaise*, and the *Siam*.

The *coquaine*. Dr. Macculloch informs us, (*Caled. Hort. Mem.* vol. i. p. 408.), is much cultivated in Guernsey and Jersey. The roots run sometimes four feet deep, and are rarely so small in circumference as six inches, having been known to reach sixteen. The leaves of this variety grow to a considerable height, and proceed from the whole crown of the root.

The *Lisbonaise* does not extend to so great a depth as the coquaine; but the root is equally good in quality, and what is lost in length is gained in thickness. The leaves are small and short, and only proceed from the centre of the crown.

The *siam* has a root of a yellowish color, not very large, but tender, and more rich in taste than the other varieties.

Soil. The soil most proper for the parsnip should be light, free from stones, and deep. It should be dug or trenched before sowing at least two spits deep; and the manure should either be perfectly decomposed, or if recent, deposited at the bottom of the trench.

Seed Estimate, and Sowing. Sow in the end of February, or in March, but not later than April; and for a bed five feet by twenty, the plants to remain thinned to eight inches' distance, *half an ounce* of seed is the usual proportion. Having prepared either beds, four or five feet wide, or one continued plot, sow broad-cast, moderately thin, and rake the seed well into the ground.

Culture. When the plants are about one, two, or three inches high, in May or June, let them be thinned and cleared from weeds, either by hand, or by small hoeing; thinning them from eight or twelve inches' distance. Keep them afterwards clean from weeds till the leaves cover the ground, after which no further culture will be required. The roots will be pretty large by the end of September, from which time a few may be drawn for present use: but the parsnip is far best at full maturity, about the close of October, indicated by the decay of the leaf. The root will remain good for use till April and May following.

Preserving during Winter. The parsnip is not so liable as the carrot to be hurt by frost, if left in the ground. But it would be proper, in the beginning of November, when the leaves decay, to dig up a portion of the roots, and to cut the tops off close, laying them in sand, under cover, ready for use in hard frosty weather. The rest will keep good in the ground till they begin to shoot in the spring: then, in February or March, dig them up; cut the tops off; and, preserved in sand, the roots will remain sound till about the end of April.

To save Seed. Transplant some of the best roots in February, two feet asunder, inserted over the crowns: they will shoot up in strong stalks, and produce large umbels of seed, ripening in autumn." *Abercrombie*.

Subsect. 6. *Red Beet.* — *Beta vulgaris*, L. (*Schk. Han.* i. t. 56.); *Pent. Dig.* L. and *Chenopodeæ*, B. P. *Betterave*, Fr.; *Rothe Rübe*, Ger.; and *Barba Biettola*, Ital.

1325. The *Red Beet* is a biennial plant, rising with large, oblong, thick, and succulent leaves, generally of a reddish or purple color; the roots often three or four inches in diameter, of a foot or more in length, and of a deep red color. It produces greenish flowers in August. The red beet is a native of the sea-coast of the south of Europe; it was cultivated in this country by Tradescant, the younger, in 1656, and then called *beet rave*, (or beet radish), from the French name *betterave*.

Use. The roots are boiled and sliced, and eaten cold, either by themselves, or in salads; they also form a beautiful garnish, and are very much used as a pickle. Some consider the green-leaved variety as more tender in the roots than the red-leaved sort; others prefer those with a few small, dark-red leaves. From one variety, having a red skin, but white flesh, sugar is prepared in some parts of France and the Netherlands; but this manufacture, introduced under Buonaparte's reign, is now almost entirely given up in favor of West India produce. The roots, dried and ground, are sometimes used as "a supplement to coffee," and dried in an oven in thin slices: they are used in confitures. *N. Cours d' Agricultur*, art. *Bette*.

Varieties. These are numerous, but the principal are,

The common long-rooted, which suits light, deep, rich soils, and grows very large.

The short, or turnip-rooted, suited to shallow soils.

The green-leaved, red-rooted, suited to soils of light open texture.

W. Morgan has enumerated the following sorts of red beet, as having been cultivated in the garden of the Horticultural Society:

Large-rooted.
Long-rooted.
Dwarf, one of the best.
Turnip-rooted, an early variety.
Small-red.
Castelnaudari, much esteemed in France, and said to have the flavor of a nut.
Green-topped, much grown in Scotland: He also enumerates some yellow rooted sorts, none of which are in general cultivation.
Hort. Trans. v. iii. p. 277.

Seed and Soil. The beet is always raised from seed, and for a bed four feet and a half by twelve feet, one ounce is requisite. The soil in which it naturally delights is a deep rich sand, dry and light rather than moist. Sowing in seed-beds and transplanting has been tried; but though it may answer for the spinach or pot-herb beets, (white and its varieties), it will not answer where the object is a large clean root.

Sowing. The beet is sown annually in the last week of March, or beginning of April. If sown earlier, many of the plants are apt to run into flower, and so become useless. " The ground on which it is sown should have been previously enriched by mellow compost and sea-sand; but rank dung is not to be laid in, as it is apt to induce canker. For the long-rooted kind, trench to the depth of eighteen inches. Sow either broad-cast on the rough surface, and rake well into the earth; or, as the seed is large, sow in drills an inch or two deep, and a foot asunder; or dot it in with a thick blunt-ended dibble, in rows that distance, making holes ten or twelve inches apart, about an inch and a half deep; drop two or three seeds in each hole, but with the intention to leave only one best plant.

Subsequent Culture. " When the young plants are advanced into leaves, one, two, or three inches in growth, they must be thinned and cleared from weeds, either by hand or small hoeing, especially those sown promiscuously broad-cast and in drills: thin the latter to twelve inches' distance; and those holed in by dibble, to one in each place. They will acquire a large full growth in the root by September or October, to take up for use as wanted, and in continuance all winter and spring following: or in November, it may be proper to dig up a quantity, cut off the leaves, and deposit the roots in dry sand, under cover, ready for use in winter, in case of hard frosty weather, which would fix them fast in the ground; or the rest may be digged up at the same time, and trenched in close together in some dry compartment, to be covered occasionally in severe frost, to prevent their being frozen in, that they may be readily taken up as wanted. Towards spring, in February or beginning of March, if any remain in the bed where raised, their removal then, being trenched in close together over the root, will, in some degree, check their shooting, and preserve them from running, so as to keep them good all the spring till May and June. *Abercrombie.*

Housing. In the northern counties, the winter stock of beet is commonly lifted and housed in sand, in the manner of carrots. In digging up the roots for this purpose, great care must be taken that they be not in any wise broken or cut, as they bleed much. For the same reason, the leaves should be cut off, at least an inch above the solid part of the root.

To save Seed. Either have a few strong roots standing in the rows; or select a few, and transplant them to a spot where they will be in no danger, when in flower, of being impregnated with any other variety. They will shoot up the second year, when their flower-stalks should be tied to stakes, to prevent their breaking over.

SUBSECT. 7. *Skirret.* — *Sium Sisarum*, L. (*Schk. Hand.* i. t. 69.); *Pent. Dig.* L.; and *Umbelliferæ*, J. *Chervis*, Fr.; *Zuckerwürzel*, Ger.; and *Sisaro*, Ital.

1326. This is a perennial, tap-rooted plant, a native of China, known in this country since 1548. The lower leaves are pinnated, and the stem rises about a foot high, terminated by an umbel of white flowers, in July and August. The root is composed of fleshy tubers, about the size of the little finger, and joined together at the crown or head; they were formerly much esteemed in cookery. In the north of Scotland, the plant is cultivated under the name of *crummock.*

Use. The tubers are boiled, and served up with butter; and are declared by Worlidge, in 1682, to be " the sweetest, whitest, and most pleasant of roots."

Culture. " This plant grows freely in a lightish soil, moderately good. It is propagated both from seed, and by off-sets of established roots. The better method is to raise seedlings, to have the root in perfection, young and tender.

By Seed. " Sow between the 21st of March and the 15th of April; a fortnight later rather than any earlier for a full crop, as plants raised forward in spring are apt to start for seed in summer. Sow on an open compartment of light ground, in small drills eight inches apart. When the plants are one or two inches high, thin them to five or six inches asunder. They will enlarge in growth till the end of autumn: but before the roots are full grown, in August, September, or October, some may be taken up for consumption as wanted: those left to reach maturity will continue good for use throughout winter, and in spring, till the stems run.

By Slips. " Having some plants of last year's raising, furnished with root off-sets, slip them off; taking only the young outward slips, and not leaving any of the larger old roots adhering to the detached off-sets: which plant by dibble, in rows from six to nine inches asunder. They will soon strike, and enlarge, and divide into off-sets; which, as well as the main roots, are eatable and come in for use in proper season.

To save Seed. " Leave some old plants in the spring: they will shoot in stalks, and ripen seed in autumn."

Subsect. 8. *Scorzonera*, or *Viper's Grass.* — *Scorzonera Hispanica*, L. (*Lam. Ill.* t. 647. f. 5.); *Syng. Polyg. Æqu.* L.; and *Cichoraceæ*, J. *Scorzonère*, or *Salsafis d'Espagne*, Fr.; *Scorzonere*, Ger.; and *Scorzonera*, Ital.

1327. This is a hardy perennial, a native of Spain, the south of France, and Italy, cultivated in this country since 1576. The stem rises two or three feet high, with a few embracing leaves, and is branched at top; the lower leaves are linear, eight or nine inches long, and end in a sharp point; the flowers are yellow, and appear from June to August. The root is carrot-shaped, about the thickness of one's finger; tapering gradually to a fine point, and thus bearing some resemblance to the body of a viper.

Use. The outer rind being scraped off, the root is steeped in water, in order to abstract a part of its bitter flavor. It is then boiled or stewed in the manner of carrots or parsnips. The roots are fit for use in August, and continue good till the following spring.

Culture. "To have an annual supply, sow every year; for although the plant, as to its vegetable life, be perennial, the root continuing only one season useful, must be treated merely as a biennial. The quantity of seed for a bed four feet and a half by ten feet, to be sown in drills fifteen inches asunder, is one ounce. Sow every spring, at the end of March, or in April: follow with a secondary sowing in May. This root likes a deep, light soil. Allot an open compartment. Sow either broad-cast, and rake in evenly; or in small drills, twelve or fifteen inches asunder, and earth over half an inch or an inch deep. When the young plants are two or three inches high, thin them to six or eight inches' distance. Clear out all weeds as they advance in growth. The plants having a free increase all summer, the roots will, some of them, be of a moderate size to begin taking up in August, others in September, but will not attain full growth till the end of October, when, and during the winter, they may be used as wanted; or some may be dug up in November, and preserved in sand under cover, to be ready when the weather is severe. The plants left in the ground continue useful all winter till the spring; then those remaining undrawn, shoot to stalk in April and May, and become unfit for the table.

To save Seed. "Leave some old plants in the spring; which will shoot up in tall stems, and produce ripe seed in autumn." *Abercrombie.*

Subsect. 9. *Salsify*, or *Purple Goat's Beard.* — *Tragopogon porrifolius*, L. (*Eng. Bot.* 638.); *Syng. Polyg. Æqu.* L.; and *Cichoraceæ*, J. *Salsifis*, Fr.; *Bocksbart*, Ger.; and *Sassifica*, Ital.

1328. This is a hardy biennial, a native of England, but not very common. The root is long and tapering, of a fleshy white substance; the herb smooth, glaucous, and rising three or four feet high. The leaves, as the trivial name imports, resemble those of the leek; the flowers are of a dull purple color, closing soon after mid-day; the seed, as in other species of goat's-beard, is remarkable for having attached to it a broad feathery crown. It has taken place in gardens of the *T. pratensis*, which was cultivated in Gerarde's and Parkinson's time, but is now entirely neglected.

Use. The roots are boiled or stewed like carrots, and have a mild, sweetish flavor; the stalks of year-old plants are sometimes cut in the spring, when about four or five inches high, and dressed like asparagus.

Culture. "Salsify is raised from seed, annually, in the spring, and for thirty feet of drill, one ounce of seed is sufficient. Allot an open situation. The soil should be light and mellow, full two spits deep, that the long tap-root may run down straight. Sow in March, April, and in May, for first and succession crops, either broad-cast in beds, and rake in the seed, or in small drills, eight or ten inches asunder. The plants are to remain where sown. When they are two or three inches high, thin them about six inches apart. In the dry, hot weather of summer, water now and then till the ground be soaked. The roots having attained a tolerable size in August and Septemper, may be taken up occasionally for present use. Those remaining, perfect their growth in October, for a more general supply; and will continue good all winter, and part of the following spring. For winter use, take up a portion before frost hardens the ground, and preserve in sand. Such year-old plants as remain undrawn in the following spring, shoot up with thick, fleshy, tender stalks: these are occasionally gathered young to boil; the roots continuing good till the plant runs to stalk in April or May.

To save Seed. "Leave or transplant some of the old plants in spring; which will shoot, and produce ripe seed in autumn." *Abercrombie.*

Subsect. 10. The *Radish.* — *Raphanis sativus*, L. (*Lam. Ill.* t. 568.); *Tetrad. Siliq.* L.; and *Cruciferæ*, J. *Radis* and *Rave*, Fr.; *Rettig*, Ger.; and *Rafano*, Ital.

1329. This plant is an annual, a native of China, and mentioned by Gerarde in 1584, opening of spring, let the whole of both sorts be well cleared from weeds; they will continue fit to draw young, during all the spring months, till May; then let some of the bulbous kinds be thinned, to remain for early bulbing in June and July; but as they will soon after shoot up in stalk, they are chiefly for present use, not being eligible as keeping-onions.

Lifting and preserving the general Crop of Onions. This, according to Nicol, should not be delayed after the beginning or middle of September. When taken up, they are to be spread thin on the ground; "but if the weather be wet, they had better be removed to a gravel walk, or a space purposely covered with sand or gravel, in the full sun. Turn them over once or twice a day, until they are thoroughly dried, and then store them in a well-aired loft, &c.; here still turn them occasionally, if they lie anywise thick; or may string them up by the tails, or hang them in nets. If they are not intended to be strung, the tails and outer husks should be displaced before housing them, and the latter at all events; that is, just as much as comes easily off in rubbing. The manner of stringing them is this: take in your hand three or four by the tails; tie them hard with a new strand of matting, or a bit of packthread; place on two or three more onions; lap the thread once or twice round their tails; place more onions, which also lap hard, and so on. In this manner may be made a string (as it is called) or bunch, of a yard in length, or more; which, by being hung up in a dry, well-aired place, free from frost, is an excellent way of keeping onions."

In Portugal, "when the onions are ripe," Warre observes, "they are drawn up out of the ground, and a twist is given to the top, so as to bend it down. They are left on the ground to season, before they are housed; then, immediately platted with dry straw into ropes or strings, of twenty-five each, and hung up to dry; they are not permitted to sweat in a heap. Their keeping well depends greatly upon the weather being dry and favorable, when they are brought into the house, and also upon their being carefully handled, and not bruised. In this country, I have practised, with much success, searing the roots with a hot iron, for the purpose of preserving the onions, which checks their sprouting, and they should be kept in a dry, airy place."

To save Seed. "Select some of the largest, well-housed, sound, firm bulbs, either in October, the beginning of November, or in February. Draw drills three or four inches deep, either a single row, or two or three rows together, a foot asunder; in which plant the onions, six, ten, or twelve inches apart, and earth in about three inches. In planting double or treble rows, allow an interval of two feet between each bed of two or three rows, to admit of going-in, both to place stakes and horizontal lines for the support of the seed-stems, and to cut down weeds. The plants will shoot up in stalks two or three feet high, producing each a large head of seed, which will ripen in August or September."

Culture of the Potatoe Onion. This variety, erroneously supposed to have been brought from Egypt by the British army about 1805, was grown in Driver's nursery in 1796, and has been known in Devonshire for upwards of twenty years. It is thus cultivated at Arundel-castle, by Maher. Having thoroughly prepared the ground, and formed it into beds four feet wide, "I draw lines the whole length, three to each bed, and with the end of the rake-handle, make a mark (not a drill) on the surface; on this mark I place the onions, ten inches apart; I then cover them with leaf-mould, rotten dung, or any other light compost, just so that the crowns appear exposed. Nothing more is necessary to be done until they shoot up their tops; then, on a dry day, they are earthed up, like potatoes, and kept free from weeds until they are taken up. In the west of England, where this kind of onion is much cultivated, I understand that it is the practice to plant on the shortest day, and take up on the longest. The smallest onions used for planting swell, and become very fine and large, as well as yield off-sets; the middle-sized and larger bulbs produce greater clusters." *Hort. Trans.* iii. 305.

G. Dymond states (*Hort. Trans.* iii. 306.), that in Devonshire it is planted in rows twelve inches apart, and six inches' distance in the row; that the plants are earthed up as they grow, and that the smaller bulbs yield a greater increase than the larger. A similar practice is adopted by some Scotch cultivators. *Caled. Hort. Mem.* i. 343. and iv. 216.

Subsect. 2. *Leek.* — *Allium porrum*, L.; (*Blackw.* t. 421.); *Hexan. Monog.* L.; and *Asphodeleæ*, B. P. *Poireau*, Fr.; *Lauch*, Ger.; and *Poro*, Ital.

1337. This is a hardy biennial, a native of Switzerland, and introduced in 1562. The stem rises three feet, and is leafy at bottom, the leaves an inch wide. The flowers appear in May, in close, very large balls, or purplish peduncles. The leek is mentioned by Tusser; but was, no doubt, known in this country long before his time.

Worlidge, speaking of Wales, says, "I have seen the greater part of a garden there stored with leeks, and part of the remainder with onions and garlic."

Use. The whole plant is used in soups and stews; but the blanched stem is most esteemed. Leeks formerly consituted an ingredient in the dish called *porrage*, which some suppose to be derived from the Latin *porrum*.

The *varieties* are,

- The narrow-leaved, or Flanders leek
- The Scotch, or flag, or Musselburgh leek
- The broad-leaved, or tall London leek.

Propagation. From seed; and for a bed, four feet wide by eight in length, one ounce is requisite.

Soil and Site. The soil should be light and rich, lying on a dry subsoil. A rank soil does not suit it, so that when manure is necessary, well-reduced dung, mixed with road-drift, is better than dung alone. The situation should be open. Let the ground be dug in the previous autumn or winter ready for sowing in spring. For the principal crop, allot beds four or five feet wide. A small crop may be sown thinly with a main crop of onions, and when the latter are drawn off, the leeks will have room for full growth.

Times of Sowing. A small first crop, or the subordinate crop in the onion-bed, may be sown at the end of February, if the weather be mild, and the ground in a dry state; but it is better not to sow the main supply till the course of March; or first week of April. It is eligible to sow a secondary crop at the end of April or beginning of May, for a late succession in winter and the following spring.

Course of Culture. When the plants are three or four inches high, in May or June, weed them clean, and thin where too crowded. Water well in dry hot weather, to bring the plants forward. The leek is much improved in size by transplanting; those designed for which will be fit to remove when from six to ten inches high, from June till August. For this purpose, thin out a quantity regularly from the seed-bed, either in showery weather, or after watering the ground: trim the long weak tops of the leaves and the root-fibres; and plant them, by dibble, in rows from nine to twelve inches asunder, by six or eight inches in the row; inserting them nearly down to the leaves, or with the neck-part mostly into the ground, to whiten it a proportionate length. Press the earth to the fibres with the dibber, but leave the stem as loose as possible, and as it were standing in the centre of a hollow cylinder. Give water, if the weather be dry. Those remaining in the seed-bed, thin to six or eight inches' distance. Keep the whole clear from weeds. In hoeing, loosen the ground about the plants, to promote their free vigorous growth. Some plant in hollow drills, and earth up as in celery-culture, which produces very large stems. The main crops will attain a mature useful size in September, October, and November; and continue in perfection all winter and the following spring. When frost is expected, a part may be taken up, and laid in sand. The late-sown crop will continue till May, without running to stalk.

To save Seed. Transplant some best full plants, in February or the beginning of March, into a sunny situation, or in a row near a south fence. They will shoot in summer, in single, tall, seed stalks. Support them, as necessary, with stakes; and they will produce ripe seed in September. Cut the ripe heads with part of the stalk to each; tie two or three together, and hang up under cover, to dry and harden the seed thoroughly, when it may be rubbed out, cleaned, and put by for future service. *Abercrombie.*

Subsect. 3. *Chive.* — *Allium Schœnoprasum*, L. (*Eng. Bot.* 2438.); *Hexan. Monog.* L.; and *Asphodeleæ*, B. P. *Civette*, Fr.; *Binsenlauch*, Ger.; and *Cipoletta*, Ital.

1338. The *Chive*, or *Cive*, is a hardy perennial plant, a native of Britain, though found but rarely in meadows and pastures. The leaves rise from many small bulbous roots connected in bunches; are awl-shaped, thread-like, and produced in tufts. The flowers are white, tinged with reddish-purple, and appear on round stalks in June.

Use. Chives, when gathered, are cut or shorn by the surface, and on this account are generally named in the plural. The foliage are employed as a salad ingredient in spring, being esteemed milder than onions or scallions. Occasionally the leaves and roots are taken together, slipped to the bottom singly in small separate cibols, in lieu of young onions in the spring for salads. They are also used as a seasoning to omelets, soups, &c.

Culture. Cives may be planted in any common soil and situation. The plant is propagated by slips; or by dividing the roots in the spring or autumn. Plant them in any bed or border, from eight to twelve inches apart; they will soon increase into large bunches. In gathering the leaves for use, cut them close, and others will shoot up in succession. A bed lasts three or four years; after which period it must be renewed, by dividing the roots.

Subsect. 4. *Garlic.* — *Allium sativum*, L. (*Moris.* s. 4. t. 15. f. 9.); *Hexandria Monogynia*, L.; and *Asphodeleæ*, B. P. *Ail*, Fr.; *Knoblauch*, Ger.; and *Aglio*, Ital.

1339. This is a hardy perennial, bulbous-rooted plant, growing naturally in Sicily and the south of France. The leaves are linear, long, and narrow. The bulb is composed of a dozen or fifteen subordinate bulbs, called cloves. It flowers in June and July, and has been cultivated in this country since 1548.

Use. It is cultivated for the sake of the bulb, which is used in various kinds of dishes, being in general introduced only for a short period into the dish while cooking, and withdrawn when a sufficient degree of flavor has been communicated. It is much more used in foreign, and especially in Italian, cookery than in ours. It is occasionally also prescribed in medicine.

Culture. " Garlic is propagated by planting the cloves on sub-divisions of the bulb, and prefers " a light, dry soil, rich, but not recently dunged. In February, March, or beginning of April, having some large full bulbs, divide them into separate cloves, and plant them singly in beds, in rows lengthwise. Set them from six to nine inches asunder, two or three inches deep, either in drills or in holes made with a blunt-ended dibble. In placing the cloves in drills, thrust the bottom a little into the ground, and earth them over the proper depth. The plants will soon come up: keep them clear from weeds. The bulbs will be full grown in July or beginning of August.

Taking the Crop. " The maturity of the bulbs is discoverable by the leaves changing yellowish, in a decaying state; when they may be taken wholly up. Continue the stalky part of the leaves to each root: spread them in the sun to dry and harden, and then tie them in bunches by the stalks, and house them to keep for use, as wanted; they will remain good till next spring and summer. If, in their advancing growth, some are required for present use, before attaining maturity, a few of the early planting may be drawn in May or June; but permitting the general supply to attain full growth as above. *Abercrombie.*

Subsect. 5. *Shallot.* — *Allium ascalonium*, L. (*Mor. His.* s. 4. t. 14. f. 3.); *Hexan. Monog.* L.; and *Asphodeleæ*, B. P. *Echalotte*, Fr.; *Schalotte*, Ger.; and *Scalogni*, Ital.

1340. This is a bulbous-rooted perennial, a native of Palestine, found, as the trivial name imports, near Ascalon. Some old authors denominate it the barren onion, from the circumstance of its seldom sending up a flower-stalk. The roots separate into cloves, like those of garlic; and the leaves rise in tufts like those of the chive, but larger. The flavor of the bruised plant is milder than any of the cultivated alliaceous tribe.

Use. The cloves are used for culinary purposes, in the manner of garlic and onions. In a raw state, cut small, it is often used as sauce to steaks and chops; and sometimes a clove or two is put in winter salads. The roots become mature in July and August, and, dried and laid in store, are in season till the following spring.

Culture. The shallot is propagated by dividing the clustered root into separate offsets. These are to be planted in February, or early in March, or in October and November. Planting in autumn is generally preferred as producing the best bulbs; but great care must be taken that much wet do not reach the roots in winter. Abercrombie directs to " lay out some light, rich ground, in beds four feet wide, and in rows extending along these, to plant the off-sets six inches apart, either in drills two inches deep, or inserted to that depth by the dibber, or with the finger and thumb." Nicol advises not to dung land intended for shallots, as rendering them liable to the attacks of maggots and insects: a very common complaint of gardeners.

Machray, at Errol, (*Cal. Hort. Mem.* i. 275.) finds soot mixed with the manure given to shallot-beds effectual in preventing the appearance of maggots; while the roots were improved in size.

Henderson, of Delvine, (*Caled. Mem.* vol. i. 199.) to prevent the maggot, picks out the very smallest shallot roots for planting; manures the ground with well-rotted dung, or house-ashes. He plants about the middle of October, as recommended by Marshal, and never has had the roots injured by the maggot in the smallest degree. " Autumn planting," he says, " is the whole secret." To prove this, he planted some roots in spring, only seven feet distance from those planted in autumn; and while the latter were untouched, the former were destroyed by these insects. The smallness of the roots planted, prevents them from growing mouldy. The most intense frost does not hurt them. From 204 cloves planted in October, 1810, he lifted, in August, 1811, above 5000 good clean roots, measuring in general about three and a half inches in circumference.

Knight, to guard against the maggots in shallots, tried planting the bulb on the surface, instead of burying it two or three inches in the soil; and the experiment was attended with such perfect success, that he confidently recommends this mode of culture. He places a rich soil beneath the roots, and raises the mould on each side to support them till they become firmly rooted. This mould is then removed by the hoe and water from the rose of a watering-pot, and the bulbs, in consequence, are placed wholly out of the ground. "The growth of those plants," he adds, "now so closely resembled that of the common onion, as not to be readily distinguished from it; till the irregularity of form, resulting from the numerous germs within each bulb, became conspicuous. The forms of the bulbs, however, remained permanently different from all I had ever seen of the same species, being much more broad and less long; and the crop was so much better in quality, as well as much more abundant, that I can confidently recommend the mode of culture adopted, to every gardener." *Hort. Trans.* vol. ii. p. 98.

Taking and preserving the Crop. When the leaves begin to decay, the bulbs are fit to be taken up, when they should be dried and housed, either in the floor of the root-loft, in nets hung from the roof, or in strings, as recommended for onions. Should any roots be wanted during the growth of the crop, a few may be taken up young in June and July for immediate consumption.

Subsect. 6. *Rocambole.* — *Allium Scorodoprasum*, L. (*Plenck. Ic.* t. 256.); *Hexan. Monog.* L.; and *Asphodeleæ*, B. P. *Ail d'Espagne*, Fr.; *Rockenbollnn*, Ger.; and *Scorodopraso*, Ital.

1341. This is a perennial plant, a native of Denmark, and mentioned by Gerarde as cultivated in 1596. It has compound bulbs, like garlic, but the cloves are smaller. These are produced at the roots, and also, though of a smaller size, on the stem, which rises two feet high, and produces the bulbs in the axillæ of the leaves in July and August.

Use. The cloves, both of the stalk and root, are used in the manner of garlic or shallot, and nearly for the same purposes. It is considered milder than garlic.

Culture. It is propagated by planting the separated cloves of the root-bulb, or occasionally the cloves of the head, in February, March, or April. A small bed, or a few rows, will be sufficient for a family garden. Plant it either by dibble, or in drills, in rows six inches apart, and two inches deep. The plants shoot up, each in a slender stalk, contorted at top, and terminated by a small head of cloves, which, as well as the root, will acquire full growth in July or August, for immediate use; or to be taken up, and spread to dry, tied in bunches, and housed for future consumption.

Subsect. 7. *Celery.* — *Apium graveolens*, L. (*Eng. Bot.* 1210.); *Pent. Dig.* L.; and *Umbelliferæ*, J. *Ache*, Fr.; *Æppich*, Ger.; and *Appio*, Ital.

1342. This is a hardy biennial plant, a native of Britain, and known in its wild state by the name of *smallage*. It is frequent by the sides of ditches, and near the sea, where it rises with wedge-shaped leaves, and a furrowed stalk producing greenish flowers in August. The whole plant has a rank, coarse taste, and the effects of cultivation in producing from it the mild sweet stalks of celery are not a little remarkable.

Use. The blanched leaf-stalks are used raw, as a salad, from August till March; they are also stewed, and put in soups. In Italy, the unblanched leaves are used for soups, and when neither the blanched nor the green leaves can be had, the seeds bruised, form a good substitute. The root only of the variety called the *celeriac* is used, and Sabine informs us, (*Hort. Trans.* vol. iii.) "is excellent in soups, in which, whether white or brown, slices of it are used as ingredients, and readily impart their flavour. With the Germans, it is also a common salad, for which the roots are prepared by boiling, until a fork will pass easily through them; after they are boiled, and become cold, they are eaten with oil and vinegar. They are also sometimes served up at table, stewed with rich sauces. In all cases, before they are boiled, the coat and the fibres of the roots, which are very strong, are cut away; and the root is put in cold water, on the fire, not in water previously boiling."

Varieties. These are:

The common upright Italian
The large hollow upright
The solid stalked upright
The large red stalked upright
The turnip-rooted, or celeriac
The celeri-rave, of the French, and
The Knott-cellerie, of the Germans.

This is hardier than the other kinds, and will continue longer in spring. It is grown to a large size in the neighbourhood of Hamburgh, and sometimes imported for the London market.

Estimate of Sorts. The first three sorts are preferable for general culture. The red variety is rather coarse for salads, but is hardy to stand the winter, and well adapted for soups and stews. The turnip-rooted is cultivated on account of its root, which is fit for use in September and October, and may be preserved in sand through the winter.

Celery may be grown to 10 lbs. weight, and averaging 6 lbs. each head. A head of celery, we are informed, (*Caled. Hort. Mem.* vol. ii. p. 297.) was dug up on the 4th of October, 1815, at Longford, near Manchester, which weighed 9 lbs. when washed, with the roots and leaves still attached to it, and measured four feet six inches in height. It was of the red sort, perfectly solid, crisp, and firm, and remarkably well flavored.

Propagation. All the sorts are raised from seed; and half an ounce is reckoned sufficient for a seed-bed, four feet and a half wide by ten feet in length, of the upright sorts; but for celeric, a quarter of an ounce will be enough for a bed four feet square.

Soil. "Celery delights in a soil rather moist, rich in vegetable mould, but not rank from new unrotted dung.

Times of Sowing. "The most forward crop is slightly forced: any of the varieties may be sown in the spring in the open garden at two or three different times, from the 21st of March till the first week in May; but the principal sowing should be made in the first fortnight of April.

Early Crop. "For early summer and autumn celery: sow a small portion towards the end of February, in a moderate hot-bed. When the young plants are about two inches high, prick out some into a warm border, two or three inches apart, or rather into a second slight hot-bed, if before the 21st of March, as well to protect the plants as to expedite their growth for final planting. As soon as the leaves are six inches high, in May or June transplant them into trenches for blanching, as directed below for the main crops. But as these early-sown plants will not continue long in full growth, before many of them will pipe or run, you should plant only a moderate crop, for a temporary supply: when they are advanced in the trenches from eight to twelve inches in growth, begin to earth them up several inches on both sides each row; continue earthing up by degrees as they rise higher, till they are whitened from six to twelve inches in length; when they may be digged up as wanted.

Main Crops. "To raise the main crops for summer, autumn, and winter, make a considerable sowing at the commencement of April. Sow in beds of light mellow earth, and rake in the seed lightly and regularly. In very dry weather, give moderate watering both before and after the plants come up. When they are two, three, or four inches high, thin the seed-bed, and prick out a quantity at successive times into intermediate beds, three or four inches asunder. Water those removed, and till they have struck."

D. Judd sows about the middle of January in a warm situation, on very rich ground, protecting it by mats at night. When the plants are from two to three inches high, he pricks out into a nursery-bed, immersing the plants as he draws them, in water, so as they may remain moist while out of ground. The plants remain in the nursery bed till they become "very strong." *Hort. Trans.*, vol. ii.

John Walker, a gardener, near Manchester, grows the red celery; sows for the early crop about the 1st of March, and for the late crop about the 1st of April. "The seed-bed is formed of fresh, dark, loamy soil, mixed with old rotten dung, half and half, and placed on a hot-bed. The nursery or "transplanting bed is formed with old hot-bed dung, very well broken, laid six or seven inches thick, on a piece of ground which has lain some time undisturbed, or has been made hard by compression. The situation should be sunny. The plants are set six inches apart in the dung, without soil, and covered with hand-glasses. They are watered well when planted, and frequently afterwards. By hardening the soil under the dung in which the plants are set, the root is formed into a brush of fibres; and by thus preventing the pushing of a tap-root, the plant never runs to seed before the following spring." *Caled. Hort. Mem.* vol. ii.

Transplanting into Trenches. "When either the plants left in the seed-bed, or those removed, are from six to twelve inches high, or when the latter have acquired a stocky growth, by four or five weeks' nurture in the intermediate bed, transplant them into trenches for blanching. For this purpose allot an open compartment. Mark out the trenches a foot wide, and from three feet to three and a half distance; dig out each trench lengthwise, a spade in width, and a light spit-deep, that is, six or eight inches. Lay the excavated earth smoothly in the intervals, making the edges of the trenches equally full and straight; also loosen the bottom moderately, in a level order, to receive the plants. Before inserting them, it would essentially strengthen the soil to apply some good rotten dung in each trench two or three inches thick, and let it be digged in at the bottom regularly, a moderate depth. Then, having lifted the plants, just trim any long straggling tops of the leaves and fibres of the roots; also slip off side-shoots; plant a single row along the bottom of each trench, four or five inches apart. Give a good watering directly; and occasionally after, if the weather be dry, till the plants take root and show a renewed growth. Continue planting out a monthly succession in June, July, August, and September; thus providing for a supply from July and August of the present summer throughout the course of autumn and winter, till May in the following spring."

Judd prepares his ground for transplanting, by trenching it two spades deep, mixing with it in the operation a good dressing of well-reduced dung from the old forcing-beds. He says, "I give it a second trenching, that the dung may be the better incorporated with the mould, and then leave it in as rough a state as possible, till my plants are ready to be put out.

"In the ground thus prepared, I form trenches twenty inches wide, and six inches deep, at six feet distance from each other, measuring from the centre of each trench. Before planting, I reduce the depth of the trenches to three inches, by digging in sufficient dung to fill them so much up. At the time of planting, if the weather be dry, the trenches are well watered in the morning, and the plants are put in, six inches apart, in the row, in the evening, care being taken by the mode above mentioned, to keep the fibres quite wet whilst out of ground; as they are drawn from the nursery-bed, the plants are dressed for planting, and then laid regularly in the garden pan. The trenches in which my rows of celery are planted, being so very shallow, the roots of the plants grow nearly on a level with the surface of the ground: this I consider particularly advantageous; for as considerable cavities are necessarily formed on each side when the moulding takes place, all injury from stagnant water or excess of moisture is prevented. The trenches, when planted, are watered as may be required." He adds, "that he prepares his ground for celery during the winter, and avoids putting much of a crop in the space between the trenches, especially one that grows tall, as he finds celery does best, when it grows as open as possible.

Walker makes his trenches at four feet distance, and eighteen inches wide, twelve deep, and filled nine inches with a compost of fresh strong soil, and well-rotted dung; three-fourths dung, and one-fourth soil. Old hot-bed dung is the best. The plants should be taken up with as much dung as will conveniently adhere to the roots, and the side-shoots are removed from the stems; they are then set with the hand at nine or ten inches apart in the centre of each trench; it is necessary to water well until they are ready to be earthed up, but not afterwards."

Landing-up. As the plants in the trenches rise from ten to fifteen inches high, Abercrombie begins to land-up for blanching, observing "to trim in the earth gently, when first raised to the stems, with a hoe or spade, but mostly the latter. When the plants are of more advanced growth, earth them up equally on both sides each row, three, four, or five inches, according to the strength and height of the different crops. Repeat this once a week or fortnight, till by degrees they are landed-up from twelve inches to two feet, in order to blanch them of some considerable length. Continue thus landing-up the different crops from July till February. As the autumnal and main winter-crops attain full growth, give them a final landing-up near the tops, which will increase the length of the blanched part, and also protect the latter crops more effectually during the winter."

In landing-up celery, Judd does "not think it well to load the plants with too much mould at first; the two first mouldings, therefore, are done very sparingly, and only with the common draw-hoe, forming a ridge on each side of the row, and leaving the plants in a hollow, to receive the full benefit of the rain and waterings. When the plants are strong enough to bear six inches height of mould, the moulding is done with the spade, taking care to leave bases enough to support the mass of mould which will ultimately be used in the ridge, and still keeping for some time the plants in a hollow, as before directed. The process of moulding is continued through the autumn, gradually diminishing the breadth of the top, until at last it is drawn to as sharp a ridge as possible to stand the winter.

"In the operation of moulding it is necessary, in order to prevent the earth from falling into the heart of the plant, to keep the outer leaves as close together as possible; for this purpose, before I begin the moulding, I take long strands of bass matting, tied together till of sufficient length to answer for an entire row; and I fasten this string to the first plant in the row, then pass it to the next plant, giving it one twist round the leaves, and so on, till I reach the other end, where it is again fastened; when the moulding is finished, the string is easily unravelled, by beginning to untwist it at the end where it was last fastened."

Walker, "Having removed the lateral shoots, the leaves of each plant being held together with one hand, the soil, pulverized, is drawn round with the other, taking care not to earth up too high at once, nor too close. The heart should always be left quite free. This may be repeated about once a fortnight, until the plants are ready for use."

Late Crop. "For late spring celery to stand till the end of May in the returning spring, without running considerably, it is expedient to make a small late sowing at the commencement of May. The plants when six weeks old may be pricked on intermediate beds in rows, six inches by three asunder; to remain till September or October; then transplant them into moderate trenches; as they advance in growth, earth them up a little in winter; and, finally, in the spring, in February or March.

Occasional Shelter. "On the approach of frost, take up a part of the crop, and lay it by under dry sand for winter use. To preserve the plants left in the bed, lay some long dry litter over the tops; which remove in every interval of mild weather." It is a common complaint that very fine looking celery is often found to be rotten at the base of the leaf-stalks; the fact being, that when celery is full grown and the blanching completed, it begins to decay, and will not keep good in the ground for more than a month at most. Some, therefore, take up and preserve in dry sand; but in that situation it soon becomes tough and dry. The best mode seems to be that of forming successive plantations.

Taking the Crop. "It is best to begin at one end of a row, and dig clean down to the roots, which then loosen with a spade, that they may be drawn up entire without breaking the stalks."

Cultivation of Celeriac. The times of sowing are the same as for the other sorts. The plants require a rich well manured soil, and, according to an account communicated by Lord Stanhope to J. Sabine, (*Hort. Trans.* iii.), the plants are raised on a hot-bed under glass, and transplanted when two or three inches high to another hot-bed, and set one inch and a half apart. "In the beginning or middle of June they are transplanted into a flat bed in the open air, at the distance of fifteen inches from each other, and not in trenches like other celery. They must be abundantly watered as soon as they are set out, and the watering must be repeated every other day, or, if the weather should be warm, every day. As they increase in size, they will require a greater quantity of water, and they must be occasionally hoed. The roots will be fit for use in September or October." In a note to this paper, J. Sabine states, that he has been informed, that the plan of giving excess of water is peculiar, and that the vigorous growth of the plant is more dependent on richness of soil than on any other cause. Abercrombie directs to earth up the bulbs four or five inches, to blanch them when they are full grown.

To save Seed. "Either leave some established plants in the spring where growing; or in February or March dig up a competent number, cut down the top-leaves, and set the plants in the ground, full two feet asunder. They will produce seed in autumn."

Walker grows only red celery; and in preparing plants for seed, chooses the most solid, of the reddest color, and the smallest size. When taken out of the transplanting-bed, the lateral shoots being removed, they should be planted in a dry warm, situation, where the seed will ripen well."

Sect. VI. *Asparaginous Plants.*

This class may be considered as comparatively one of luxury. It occupies a large proportion of the gentleman's garden, often an eighth part; but does not enter into that of the cottager. A moist atmosphere is congenial to the chief of them, especially to asparagus and sea-kale, which are sea-shore plants, and are brought to greater perfection in our islands, than any where else, excepting perhaps in Holland.

Subsect. 1. *Asparagus.* — *Asparagus officinalis*, L. (*Eng. Bot.* t. 339.); *Hex. Monog.* L.; and *Asphodeleæ*, B. P. *Asperge*, Fr.; *Spargel*, Ger.; and *Asparago*, Ital.

1343. This is a perennial plant, found in stony or gravelly situations near the sea, but not very common. It grows near Bristol, in the Isle of Portland, and sparingly in Seaton Links, near Edinburgh. The roots consist of many succulent, round bulbs, forming together a kind of transverse tuber, from which numerous erect, round stems arise with alternate branches, subdivided into alternate twigs, not unlike a larch fir-tree in miniature. The leaves are very small, linear, and bristle-shaped; the flowers nodding, of a yellowish-green, and odorous, are produced from June to August; and the berries of a yellowish-red: the whole plant has a very elegant appearance. Many of the steppes in the south of Russia and Poland are covered with this plant, which is there eaten by the horses and oxen as grass. In its native state, it is so dwarfish in appearance, even when in flower, that none but a botanist attending to the minute structure, would consider it as the same species with our cultivated plant.

This vegetable is cultivated extensively for the London market; and it is estimated, that in the parish of Mortlake alone, there are generally about eighty acres under this crop. One grower there, Biggs, has sometimes had forty acres under asparagus at one time. A great deal is also grown near Deptford, and one grower there, Edmonds, has had eighty acres entirely under this crop; — a thing, Neill observes, which must appear almost incredible to those who have not witnessed the loads of this article daily heaped on the green-stalls of the metropolis for the space of nearly three months.

"Asparagus, it may be remarked, was a favorite of the Romans; and they seem to have possessed a very strong growing variety, as Pliny mentions, that, about Ravenna, three shoots would weigh a pound; with us, six of the largest would be required. It is much praised by Cato; and as he enlarges on the mode of culture, it seems probable that the plant had but newly come into use. In this country, Dutch asparagus was preferred in the end of the 17th century; and this variety is still distinguished for affording the thickest shoots. In a garden formed at Dunbar, in the very beginning of the 18th century, by provost Fall, (a name well known in the mercantile world,) asparagus was for many years cultivated with uncommon success. The variety used was the red-topped, and it was brought from Holland. The soil of the garden is little better than sea-sand. This was trenched two feet deep, and a thick layer of sea-weed was put in the bottom of the trench, and well pressed together and beat down. This was the only manure used, either at the first planting, or at subsequent dressings. There was an inexhaustible supply of the article generally at hand, as the back-door of the garden opens to the sea-shore." *Neill*, in *Ed. Encyc. Art. Hort.*

Use. The esculent part is the early shoots or buds, when three or four inches high, and partially immerged from the ground in May and June. They are in great esteem in Britain, and on the continent; and this plant has, in consequence, been cultivated for an unknown period.

Varieties. There are two varieties cultivated: viz.

1. The Red-topped, rising with a large head, full, close, and of a reddish-green.
2. The Green-topped, rising with a smaller head, not generally so plump and close, but reckoned better flavored.

The Battersea, Deptford, Large Gravesend, Large Reading, The Dutch, Cork, and Early Mortlake, are sub-varieties.

Estimate of Sorts. Both varieties are in great estimation: the red-topped is most generally cultivated by market-gardeners, and the green-topped in private gardens. Both succeed by the same mode of culture.

Propagation. Asparagus is propagated only from seed, though the roots might be divided like those of the garden ranunculus, if thought necessary. It is best, however, to raise the plant from seed; and it is of considerable importance to gather it from the strongest and most compact shoots; such seed, as might naturally be expected, yielding by far the best plants. Seed, as well as one and two-year old plants, may be purchased from nurserymen and market-gardeners: and when a new garden is formed, the latter practice is generally adopted for the first plantation, in order to gain time.

Quantity of Seed or Roots. If sown to transplant, for a bed four feet and a half wide by six feet in length, one quart of seed will be requisite. If sown to remain, for a bed four feet and a half wide by thirty feet in length, one pint is necessary. If plants a year old are wanted for a plantation, then, for a bed four feet and a half wide by thirty feet in length, to contain four rows of plants, nine inches distant in the row, one hundred and sixty plants will be requisite.

Sowing, and Culture in Seed-bed. It is generally sown broad-cast on a four-feet bed, in March, not very thickly, often with a thin sprinkling of onions or radishes. The seed being slightly trodden in, the bed is raked smooth, and after the plants make their appearance, they are to be kept as free of weeds as possible, and the ground stirred with a narrow hoe once or twice during the summer. In the end of October following, the roots are protected from the frost by spreading over the ground some rotten dung or litter, which remains till March or April, according to the season, when the plants are transplanted to a quarter prepared for their final culture.

D. Judd (*Hort. Trans.* vol. ii.) sows in drills eighteen inches apart, burying the seed two inches: the object is to admit of stirring between. He keeps the plants thin, and if the weather proves dry, waters once a week or fortnight.

Soil and Preparation. "Asparagus ground should be light, yet rich; a sandy loam, well mixed with rotten-dung or sea-weed, is accounted preferable to any. The soil should not be less than two feet and a half deep; and before planting a bed, it is considered good practice to trench it over to that depth, burying plenty of dung in the bottom, as no more can be applied there for eight or ten years. It can scarcely, therefore, be too well dunged; besides, although the plant naturally grows in poor, sandy soil, it is found that the sweetness and tenderness of the shoots depend very much on the rapidity of the growth, and this is promoted by the richness of the soil. Damp ground, or a wet sub-soil, are not fit for asparagus: indeed, the French consider wetness as so prejudicial to this plant, that they raise their asparagus beds about a foot above the alleys in order to throw off the rain." *Neill.*

Abercrombie says, "For planting asparagus, allot a compartment of sound, brownish loam, mixed with sand, in an open quarter, full to the sun. Having trenched it thirty inches deep, or as near that depth as the soil will allow, manure the bed with well-reduced dung, six inches thick, or more, digging in the dung regularly one spade deep. Then lay out the ground in regular beds four feet and a half wide, with intervening alleys three feet wide. If the soil is naturally too light and poor, improve it with a little vegetable-mould, or pulverized alluvial compost, after the bottom has been dunged."

D. Judd, (who laid before the Horticultural Society, in 1816, "a specimen of asparagus, pronounced, by those who saw it, to be the finest they had ever seen,") says, "Prepare a piece of good land, unincumbered with trees, and that lies well for the sun;

give it a good dressing of well reduced horse-dung from six to ten inches thick, all regularly spread over the surface; then proceed with the trenching (if the soil will admit) two feet deep; after this first trenching, it should lie about a fortnight or three weeks, and then be turned back again, and then again in the same space of time; by this process, the dung and mould become well incorporated; it may then be laid in small ridges till the time of planting. This work should all be performed in the best weather the winter will afford, that is, not while it rains, or snow is lying on the ground, as it would tend to make the land heavy and sour: all this is to be particularly attended to, as the preparation of the soil is of more consequence than all the management afterwards. At the time of planting, I always spread over the ground another thin coat of very rotten dung, and point it in half a spade deep, making my beds three feet wide only, with two feet of alleys; so that three rows of grass, one foot apart, are all I plant on each bed: I find this to be the best method, as by this plan there is not the least trouble in gathering, whereas you are obliged to set a foot on one of the wide beds, before you can get at all the grass, to the great injury of the bed and the buds under the surface."

Dr. Macculloch gives the following mode of preparing an asparagus bed, as practised in France; and which, it is stated, has been adopted by a gentleman in Peebleshire with success:

" A pit, the size of the intended plantation, is dug five feet in depth, and the mould which is taken from it, must be sifted, taking care to reject all stones, even as low in size as a filbert-nut: the best parts of the mould must then be laid aside for making up the beds. The materials of the bed are then to be laid in the following proportions and order: six inches of common dunghill manure, eight inches of turf, six inches of dung as before, six inches of sifted earth, eight inches of turf, six inches of very rotten dung, eight inches of the best earth. The last layer of earth must then be well mixed with the last of dung. The quarter must now be divided into beds five feet wide, by paths constructed of turf, two feet in breadth, and one foot in thickness." *Caled. Hort. Mem.* vol. ii.

Removal, and Planting. Take up the plants carefully with a fork, to avoid cutting the roots, exposing them to the air as short a time as possible; and at the time of planting, place them among a little sand in a basket covered with a mat.

Nicol says, " It is of very great importance for the insuring of success in the planting of asparagus, to lift the roots carefully, and to expose them to the air as short time as possible. No plant feels a hurt in the root more keenly than asparagus; the fibrils are very brittle, and if broken, do not readily shoot again." *Kal.* 47.

The common *season for planting* is March and April; but J. Smith (*Caled. Hort. Mem.* vol. i.) has proved experimentally that it may also be successfully performed in June, without any extraordinary care. Judd, already mentioned, transplants when he observes the plants beginning to grow, which, he says, is " the best time for the plants to succeed. If moved earlier, they perhaps have to lie torpid for two or three weeks, which causes many of them to die, or if not, they shoot up very weak." In France, (according to Dr. Macculloch,) they plant even as late as July, cutting off such young shoots as the plants have made before the operation.

The *distance* at which asparagus is commonly planted, is nine inches in the row, and one foot between the rows; in general, between every fourth row so planted, a double distance is left for an alley. Many asparagus-farmers, however, consider it better to plant in single rows at two feet and a half or three feet distance, than to adopt the bed-form. The crowns of the plants are generally covered two inches with soil.

Method of Planting. " Stretch a line lengthwise the bed, nine inches from the edge, and with a spade, cut out a small trench about six inches deep, perpendicular next to the line, turning the earth displaced along by the other side the trench; and, having the plants ready, set a row along the trench, nine inches apart, with the crown of the roots two inches below the surface, drawing some earth just to fix them as placed. Having planted one row, directly cover them in fully with the earth of the trench, raking it back regularly an equal depth over the crown of the plants. Proceed then to open another trench a foot from the first; plant it as above; and in the same manner plant four rows in each bed. Then lightly raking the beds lengthwise, draw off any stones and hard clods, and dress the surface neat and even. Then let the edges be lined out in exact order, allowing three feet for each alley. But sometimes in planting large quarters of asparagus, a first trench having been made, and the roots planted as above, then a second trench is opened, of which the earth is turned into the first over the plants. So proceed in planting the whole; making allowance between every four rows for an alley of three feet. In a dry spring or summer, water the roots from time to time, till the plants are established." *Abercrombie.*

Judd strains the line, and cuts down a trench, sloping in the usual way for planting box, and making choise of all the finest plants, puts them in one foot apart, and one inch and a half below the surface. This done, he lets the alleys and beds lie level till autumn, and then digs out the alleys deep enough to get from four to six inches of mould all over the bed; over this he lays a good coat of rotten dung, and fills in the alleys with long dung.

In France, they plant in beds five feet wide, separated by paths constructed of turf, two feet in breadth, and one foot in thickness. The plants are placed eighteen inches asunder, spreading out the roots as wide as possible in the form of an umbrella, and keeping the crown one and a half inch under ground. A pin is put to each plant as a mark; and as soon as the earth is settled and dry, a spade-full of fine sand is thrown over each pin in the form of a mole-hill.

Extent of the Plantation. An asparagus quarter should not contain less than a pole of ground, as it often needs this quantity to furnish a good dish at one time. For a large family, about sixteen roods are kept in a productive state, which are calculated to furnish, on an average, between two hundred and three hundred shoots every day in the height of the season. *Neill.*

Abercrombie says, when the buds come to be fully productive, five square poles of ground planted with 1600 plants, will yield from six to eight score heads daily.

Progressive Culture. Permit the entire crop the two first years, and the greater part of it the third year, to run up to stalks; keeping the beds free from weeds, and stirring the surface. It is a common practice to sow onions, lettuce, &c. the two first years over the beds; and to plant cauliflower in the alleys between them. The advantage of this practice is questionable; and, at all events, it should not be continued after the plants are in full bearing. Judd, having dug out the alleys the first season, instead of repeating that operation the next, lays on a coat of good dung three inches thick, and forks it evenly into the beds and alleys, and so on every season after, "never digging out the alleys any more, as it is known the asparagus plant forms a fresh crown every season; and sometimes it happens, that in a few years the crown will increase almost into the alley; so, that by digging out this, you must inevitably spoil that plant: if this is not the case when the beds are in good condition, the roots will be sure to work out at the sides into the alleys, and by digging out the latter, these roots must be cut off, and you will often see them exposed all the winter before dung can be got to fill them up; rather than be treated in this way, they had better be without any thing all the winter, as asparagus does not suffer generally by frost. The first two years I have a very thin crop of celery plants or lettuce upon the beds, but nothing afterwards; nor do I plant any thing in the alleys after the same period, for I think the asparagus is injured thereby."

Autumn Dressing. The following is the usual practice, as described by Abercrombie: "Towards the end of October or beginning of November, the stalks which have run up to seed, having done growing, or begun to decay, cut them down close, and carry them away; then hoe off all weeds from the beds into the alleys: this done, proceed with the line and spade to mark out the alleys the prescribed width; then dig each alley lengthwise, a moderate spade deep, and spread a good portion of the earth equally on each side over the adjoining beds; digging down the weeds as you advance, clean to the bottom of the alleys, under a proper depth of earth. Form the edges of the beds full and straight, and the alleys of an equal depth; and thus let them remain till spring.

On the above practice, Judd, (as we have seen,) says, "Rather than treat them in this way, they would be better without any thing." He fills up the alleys with litter or dung, to exclude the frost.

Nicol recommends covering asparagus beds with good dung, and not mere litter, as frequently is done, in the idea that the roots would otherwise perish. Fresh dung mixed with sea-weed, he considers the very best manure for asparagus. *Kal.* 129.

The French cover in autumn, with six inches of dung, and four of sand; and in performing this operation, as well as every other, great care is taken not to tread on the beds, so as to condense the earth. In planting and cutting, a plank is always used to tread on; and the turf-divisions of the beds which are intended to prevent the condensation of the earth below, in consequence of walking among the beds, are removed every three years.

Neill mentions a very proper precaution before covering, which is, to stir the surface of the beds with a fork, in order that the juices of the manure washed down by the rains, may be readily imbibed. He adds, that some cover the manure with a thin layer of earth from the alleys, which is called *landing-up*.

Spring Dressing. About the end of March or towards the middle of April, before the buds begin to advance below, proceed, with a short three-tined fork, to loosen the surface of the beds; introducing the fork slanting two or three inches under the mould, turn up the top earth near the crown of the roots, with care not to wound them. Then rake the surface lengthwise the bed, neatly level, drawing off the rough earth and hard clods into the alleys; also, trim the edges of the beds and surface of the alleys regularly even. Thus to loosen the bed, enables the shoots to rise in free growth, admits the air, rains, and sunshine, into the ground, and encourages the roots to produce buds of a handsome, full size." *Abercrombie.*

Time of coming to a Bearing state. In general, transplanted asparagus comes up but slender the first year; it is larger the second; and the third year some shoots may be fit for gathering; in the fourth year the crop will be in good perfection. *Abercrombie.*

Judd begins to cut the third season, but not generally. By the French method before mentioned, "in three years the largest plants will be fit to cut for use."

Cutting and Gathering. "In new plantations, be careful not to begin cutting till the stools are advanced to mature age, having been planted three or four years, and become of competent strength for producing full-sized shoots. Likewise observe, both in new and old beds, to gather all the produce in a regular successive order within the proper limits of the season specified above. As the rising shoots project two, three, four, or five inches at most above ground, while the top-bud remains close and plump, they are in the best condition for gathering. Cut them off within the ground, with a narrow sharp-pointed knife, or small saw, nine inches long; thrusting the knife, or saw, down straight, close to each shoot separately, cut it off slantingly, about three inches below the surface, with care not to wound the younger buds advancing below. Observe, in a new plantation, in the first year's gathering, if the shoots come up of irregular sizes, to cut only some of the larger for a fortnight or three or four weeks, and then permit the whole to run; but otherwise, when in strong production, gather all as they come, two or three times a week, or as required, during the season, till the 21st of June; then, at farthest, terminate the cutting, and permit the after-shoots to run up in stalk till October. If from a particular inducement you cut later than the 21st of June, be careful to leave two or more shoots to each stool, in order to draw nourishment to it; for the stools left without growing-shoots will perish, and by negligence in this respect many vacuities or unproductive spots are left in beds." *Abercrombie.*

The best method of cutting, Nicol observes, is to scrape away an inch or two of the earth from the shoot you would cut, and then slip the asparagus knife, (*figs.* 34 and 35), down another inch or two, taking care not to wound the crown, or any adjoining shoot. Shoots two inches under the ground, and three or four above it, make the handsomest dishes.

After the beds are in full bearing, Neill states, "That all the shoots are gathered as they advance, till the end of June or beginning of July;" a common rule being to "let asparagus *spin*, (grow up,) when green peas come in." Dr. Macculloch states, that the same practice is pursued in France.

Judd says, "I never make a practice of cutting very much after the first week in June: I then begin to let it run; in fact, I never cut the very small grass at all. Asparagus being so valuable a vegetable, some persons continue to cut indiscriminately till the latter end of June, but this practice is of very great injury to the next year's produce." *Hort. Trans.* vol. ii. 237.

Duration of the Crop. Generally, three months; from the middle of April to the middle of July. *Neill.*

Duration of the Plantation. Abercrombie says, "A plantation of asparagus, under good culture will mostly continue for ten or twelve years to afford plentiful crops; after which, the stools usually decline in fertility, and the shoots in quality; so that to provide a permanent, annual supply, some fresh beds should be planted a sufficient time before-hand, allowing four years for their advancing to a productive state."

Dr. Macculloch says, the French beds which he describes, "will generally last *thirty years*; but, if they be planted in such abundance as to require cutting once in two years, half the bed being always in a state of reservation, it will last a *century or more.*" *Caled. Mem.* vol. ii. 250.

To save Asparagus Seed. "Select some of the finest and earliest heads as they make their appearance in the spring; tie them to stakes during summer, taking care not to drive the stake through the crown of the plant. In autumn, when the berries are ripe, wash out the seeds, if for the market, or to be sent to a distance; but, for home-sowing, keep them in the berry till the time of sowing, the pulp being a great nourishment to the seed, which ought to be kept in a dry place during the winter." *Judd* in *Hort. Trans.* vol. ii. 234.

Forcing Asparagus. Meager, writing in the middle of the 17th century, mentions, that the London market was, at that period, supplied with forced asparagus early in the year. "Some having old beds of sparragus, which they are minded to destroy, and having convenience of new or warm dung, lay their old plants in order on the dung, and the heat doth force forward a farewell crop." *English Gardener.* 188.

Where much asparagus is forced, it becomes necessary to form plantations on purpose for an annual supply. The plants are raised from seed in the usual way; but when transplanted, as they are not intended to remain longer than three years in the bed or plantation, they need not be planted wider than seven or nine inches. When of three years' standing in the bed, they are eligible for removal to the forcing-pit or frame, or to be excited by a super-stratum of tan and warm dung, in the manner of sea-kale or rhubarb. As some guide to proportion the forcing plantations to the demand, 600 plants are required for an ordinary-sized three-light frame, which, Nicol says, will yield a dish every day for about three weeks. For the details of forcing asparagus, see ch. viii. sect. 9.

Subsect. 2. *Sea-cale.* — *Crambe maritima*, L.; (*Eng. Bot.* 924.); *Tetrad. Siliq.* L.; and *Cruciferæ*, J. *Chou marin*, Fr.; *Meerkohl*, Ger.; and *Crambio*, Ital.

1344. This is a hardy perennial, found in various parts of our shores. The whole plant is smooth, of a beautiful glaucous hue, covered with a very fine meal; occasionally, however, it varies like the wallflower-leaved ten-week stock, with quite green leaves. The radical leaves are large, more or less sinuated and indented, containing in the axil a bud or rudiment of next year's stem. The flower is of a rich white appearance, and smells strongly of honey. The common people on the western shores of England have, from time immemorial, been in the practice of watching when the shoots begin to push up the sand or gravel, in March and April; when they cut off the young shoots and leaf-stalks, then blanched and tender, and boil them as greens. The precise period of its introduction to the garden is unknown. Parkinson and Bryant state, that the radical leaves are cut by the inhabitants where the plant grows wild, and boiled as cabbage; and W. Jones, of Chelsea, assured the late W. Curtis, that he saw bundles of it in a cultivated state exposed for sale in Chichester market in 1753.

J. Maher states, (*Hort. Trans.* i.) that "the *Crambe maritima* was known and sent from this kingdom to the continent more than two hundred years ago, by L'Obel and Turner; but Miller, in 1731, was the first who wrote upon it professionally.

About the year 1767, it was cultivated by Dr. Lettsom, at Grove-hill, and by him brought into general notice in the neighbourhood of London. In the *Gardener's Dictionary*, published in 1774, by James Gordon, at Fountain-bridge, near Edinburgh, directions are given for the cultivation of this vegetable, and for blanching it, by covering the beds four inches deep with sand or gravel.

Professor Martyn has printed some valuable instructions for its cultivation, from the MS. of the Rev. M. Laurent; and the late W. Curtis, by a pamphlet on its culture, has done more to recommend it, and diffuse the knowledge of it, than any of his predecessors.

Sea-cale is now a common vegetable in Covent-garden market, and Neill observes, has even begun to appear on the green-stalls of the Scottish metropolis. But in France it is nearly unknown. Bastien (*Manuel du Jardinier*, 1807,) describes the *chou marin d'Angleterre*, but he appears to have tried to use the broad green leaves, instead of the blanched shoots. Disgusted with his preparation, he denies the merits of sea-cale, and resigns the plant, with a sneer, to colder climates. When the French gardeners, however, have learned to cultivate it, and especially to force it at mid-winter, it will doubtless soon become a favorite with the Parisians.

Use. The young spring shoots, and the stalks of the unfolding leaves, blanched by rising through the natural ground in a wild state, or by earthing up in gardens, are the parts used; and when boiled, and dressed like asparagus, are not inferior to that vegetable. They form also an excellent ingredient in soups. Sometimes the ribs of the large leaves are peeled and dressed as asparagus, after the plant has ceased to send up young growths. By forcing, sea-cale may be had in perfection from November till May, a period including all the dead months of the year. It is remarked by Nicol, that vegetables are seldom improved by forcing, but that sea-cale forms an exception, the forced shoots produced at mid-winter being more crisp and delicate in flavor than those procured in the natural way in April or May. Sir George Mackenzie, (*Caled. Hort. Mem.* vol. i. 313.) observes, that sea-cale cannot easily be overdone in cooking, and that after being well boiled, it should be thoroughly drained, and then suffered to remain a few minutes before the fire, that a farther portion of moisture may be exhaled.

Propagation. Sea-cale is generally, and best raised from seed; of which, if sown to transplant, for a seed-bed four feet by nine, sown in drills a foot apart by eight inches in the row, two ounces will suffice; if sown to remain, then the same quantity will serve for a plot five feet by fifteen, sown in drills two feet apart. Plantations may also be formed by detaching rooted offset shoots from established plants, or by cuttings of the roots, leaving about two eyes to each cutting. The last fortnight of March, and the first of April comprises the best time for putting in seed, or cuttings, and removing plants.

Soil. The native soil of sea-cale is deep sand, sometimes covered or partially interlaminated with alluvial matter from the sea; "Hence," says Abercrombie, "a light, dry, moderately rich mould, of a loose texture, suits it best. A fit soil for it, (he adds,) may be composed of one-half drift sand, two-sixths rich loam, and one-third small gravel, road-stuff, or sea-coal ashes. If the loam be not rich, add a little rotten dung." Thomas Barton (*Caled. Hort. Mem.* vol. ii. 99.) cultivates sea-cale in "a pretty strong loam, on a loose till-bottom, which he previously prepared by trenching, and mixing with it a good portion of vegetable mould from decayed leaves, adding a quantity of river sand."

Culture. Maher pursues the following mode: "Prepare the ground in December or January, by trenching it two feet and a half deep; if not that depth naturally, and light, it must be made so artificially, by adding a due proportion of fine white sand, and very rotten vegetable mould: if your ground is wet in winter, it must be effectually drained, so that no water may stand within a foot at least of the bottom; for the strength of your plants depends on the dryness of the bottom, and richness of your soil. Then divide the ground into beds, four feet wide, with alleys of eighteen inches, after which, at the distance of every two feet each way, sow five or six seeds two inches deep, in a circle of about four inches diameter: this operation must be performed with strict care and regularity, as the plants are afterwards to be covered with blanching-pots, (*fig.* 90.), and both the health and beauty of the crop depends upon their standing at equal distances. In the months of May and June, if the seeds are sound, the young plants will appear. When they have made three or four leaves, take away all but three of the best plants from each circle, planting out those you pull up, (which by a careful hand may be drawn with all their tap-root,) in a spare bed for extra forcing, or to repair accidents. The turnip-fly and wireworm are great enemies to the whole class of tedradynamia plants. I know no remedy for the latter, but picking them out of the ground by hand; the former may be prevented from doing much damage, by a circle of quick-lime strewed round the young plants. If the months of June and July prove dry, water the whole beds plentifully. In the following November, as soon as the leaves are decayed, clear them away, and cover the beds an inch thick with fresh light earth and sand, that has laid in a heap and been turned over at least three times the preceding summer; this, and indeed all composts, should be kept scrupulously free from weeds, many of which nourish insects, and the compost is too often filled with their eggs and grubs. Upon this dressing of sandy loam, throw about six inches in depth of light stable litter, which finishes every thing to be done the first year.

"In the spring of the second year, when the plants are beginning to push, rake off the stable litter, digging a little of the most rotten into the alleys, and add another inch in depth of fresh loam and sand. Abstain from cutting this year, though some of the plants will probably rise very strong, treating the beds the succeeding winter exactly as before.

"The third season, a little before the plants begin to stir, rake off the winter covering, laying on now an inch in depth of pure dry sand or fine gravel. Then cover each parcel with one of the blanching pots, pressing it very firmly into the ground, so as to exclude all light and air; for the color and flavor of the sea-cale is greatly injured by being exposed to either."

"Barton, in the autumn, covers all the sea-cale beds, excepting the roots intended to be taken up for forcing, with leaves, as they are raked up from the pleasure-grounds; covering each bed in thickness according to the strength and age of the roots, giving the greatest covering to the oldest, upon an average from five inches to a foot when first laid on: over this, I place a slight covering of long dung, just sufficient to keep the leaves from being blown about. The covering is suffered to remain on the beds until the whole is cut for use the following spring; after which the dung and leaves may be removed, and the ground dug regularly over. By this treatment, the heads will be found free and well blanched, and, from the sweetness of the leaves, free from any unpleasant flavor. As the heads become ready for use, they will raise the covering, by which means they will be easily perceived, without removing any more of the covering than the part where those heads are that are intended to be cut. Those beds which have had the thickest covering of leaves in autumn, come first into use, and the others in rotation; so that the last cutting is from what was sown the spring before. Aware that cutting from one-year-old plants is generally disapproved of, Barton defends the practice from his experience of its not proving injurious; and because thereby the sea-cale season is prolonged, as the one-year-old plants "come in much later in spring than the old-established roots." *Caled. Hort. Mem.*

Taking the Crop. Cut the young stems, when about three inches above ground, carefully, so as not to injure any of the remaining buds below, some of which will immediately begin to swell. A succession of gatherings may be continued for the space of six weeks, after which period the plants should be uncovered, and their leaves suffered to grow, that they may acquire and return nutriment to the root for the next year's buds. The flowers, when seeds are not wanted, ought to be nipped off with the finger and thumb, as long as they appear. *Hort. Trans.* vol. i.

Forcing Sea-cale. No vegetable is more easily or more cheaply forced than sea-cale, whether the operation be performed in beds or drills, in the open air, or in hot-bed frames, or flued-pits. Abercrombie, Nicol, and Maher, recommend forcing in beds in the open air. " Seven weeks," the former observes, " before the time at which you wish to cut shoots for the table, begin to prepare the plants for forcing, and to ferment a sufficient quantity of fresh stable-dung.

" Having trimmed the leaves from the plants, carefully point the surface of the ground; and over the tops of the roots, spread fresh light earth, mixed with drift-sand or coal-ashes, two or three inches in depth. When the dung is well prepared, which will be in about three weeks, proceed to the forcing. If you mix tree-leaves with the dung, begin to ferment them a week or fortnight sooner. Cover each of the plants, either with a regular blanching-pot, or with a garden-pot of the largest size. When the latter is employed, stop the hole with a cork, and cement it with clay, to keep out both the weather and the rank steam from the lining. Then lay a portion of prepared-dung alone or mixed with tree-leaves, about and over each pot, pressing it down firm, extending it eight or ten inches all round, and raising the bank six or eight inches above the pot. It will be necessary to examine the plants frequently, and to measure the heat within the covers now and then, lest, by some inadvertency, the quantity of litter should not have been well-apportioned or rightly prepared. If the heat be under 50°, there is not enough heat to excite the plants; and if above 60°, it is too fiery, and may injure them. In about three weeks or a month after being covered up, the first shoots will be from six to ten inches long, and fit for the table. If the plant send up a flower-stalk, cut it away; and successive supplies of shoots will be produced, till perhaps the end of the third month from beginning to force."

The only thing necessary in forcing sea-cale, Maher observes, is to be very particular in guarding against too much heat, using trial-sticks, and never, if possible, exceeding 55°. So much mischief ensues when this is violent, that it is far better to begin time enough, and force slowly, rather than quickly. Like Abercrombie, Maher covers with dry sea-coal ashes, sifted neither very small nor very large. These are the best remedy against worms, which, after forcing is commenced, often spring up on the surface, and spoil the delicacy of the young shoots. Salt, he adds, also effectually destroys worms, and will not injure the sea-cale.

Unless the weather be unusually rigorous, it will not be necessary to renew the linings of hot litter oftener than once in seven or eight weeks. Abercrombie directs to take away the exhausted part, and mix the remainder with fresh dung and leaves. Maher says, after the sea-cale is gathered, the dung will be found in the finest possible state for spring hot-beds. When the stools will produce no more shoots, remove the litter and the covers, and dress the ground, in order, as observed by Maher, that their leaves may be suffered to grow, and acquire and return nutriment to the root for the next year's buds. Nicol says, he knows an instance of a row of sea-cale having been forced in the above way every season for seven years, in which the plants in it are as vigorous and healthy as others in the same quarter that are forced only every second year.

Barton forces sea-cale on dung-beds, under frames, exactly in the manner generally adopted for asparagus. The advantages he considers to be the certainty of having the vegetable fit for use at any particular time, and the saving of dung and labor. The latter saving, he says, " must appear obvious to every practical gardener, when he considers the difficulty attending the keeping up a proper and regular degree of heat, by covering with dung over pots and other similar methods, (as generally practised,) at so inclement a season of the year; requiring three times the quantity of dung to produce an equal number of heads, to what will be necessary when the roots are placed in a frame; for a common melon-frame will contain as many heads as are capable of being produced in two drills of twenty yards each, by covering with hot dung. He finds two frames, of three lights each, quite sufficient for a large family: the first prepared about the beginning of November, and the second about the last week in December; and by the time the second frame is exhausted, sea-cale will be ready for use in the open ground." *Caled. Hort. Mem.*

W. Gibbs, of Inverness, (*Caled. Mem.* vol. i. p. 388.) also forces in frames, blanching by keeping the bed covered with mats. Economy and certainty he considers to be the advantages attending this mode. As the plants are no longer of use after being forced, a succession is kept up by annual sowings, and the plants are allowed to attain three years growth before taking up for forcing.

Baldwin forces sea-cale where it stands in the open garden in the following manner: " On each side of a three-foot bed, in which the sea-cale has been planted, trenches are formed two feet deep, and eighteen inches wide at bottom; the side of the trench next the bed is perpendicular, the other side is sloped, so as to make the top of the trench at the surface level, two feet and a half wide: this trench is filled with linings of hot dung, on the inner edges of which, garden lights are placed, and the glass kept covered with mats until the cale is fit to cut. The same plan," he adds, " is applicable to asparagus, and also to rhubarb, or any other perennial vegetable intended to be excited where it stands, and a covering of boards, canvas, or mats, might be substituted for the glass lights." *Hort. Trans.* iv. 63.

A. Melross, of Ardgowan, forces sea-cale in a vinery. He plants "along the back of the flue where no vine-roots are, places covers on the plants, and in two weeks, when the heat for forcing vines is kept up," he has "as fine sea-cale as could be desired. When a dish is cut, he lifts the roots, and supplies their places by others from the open ground. He considers this a very easy and certain method, especially in a wet climate." *Caled. Hort. Mem.* iv. 164.

Gathering. Remove a part of the earth, leaves, or whatever is employed in blanching: cut off the heads or shoots, and slip off the stalks of the leaves.

Produce. From four to six heads, according to the size, tied together like asparagus, make a dish: and, Maher says, a blanching-pot which contains three plants, will afford a dish twice in a season. Hence, from sixty to a hundred pots will suffice for forcing sea-cale for a large family. From the above data, it is easy to form an estimate of the breadth of ground requisite for plantations of this plant to come in naturally.

To save Seed. Let a stool which has not been cut, run in spring; and seed will be produced on every stem.

Subsect 3. *Artichoke.* — *Cynara Scolymus*, L. (*Blackw.* t. 458.) *Syng. Polyg. æqu.* L.; and *Cynarocephalæ*, J. *Artichaut*, Fr.; *Artischoke*, Ger.; and *Carcioffolo*, Ital.

1345. This plant is a perennial, with numerous large pinnatifid leaves, three or four feet long, covered with an ash-colored down; the mid-rib deeply channelled and furrowed. The time of flowering is August and September. It is a native of the south of Europe, and was introduced in England in 1548.

Use. The flower-heads in an immature state contain the part used, which is the fleshy receptacle, commonly called the bottom, freed from the bristles and seed down, vulgarly called the *choke*, and the *talus* or lower part of the leaves of the calyx. In France, the bottoms are very commonly fried in paste, and they form a desirable ingredient in ragouts. They are occasionally used for pickling; and sometimes they are slowly dried and kept in bags for winter use. In France, the bottoms of young artichokes are frequently used in the raw state as a salad; thin slices are cut from the bottom with a scale or calyx leaf attached, by which the slice is lifted, and dipped in oil and vinegar before using. The *chard* of artichokes, or the tender central leaf-stalk blanched, is by some thought preferable to that of the cardoon. The flowers possess the quality of coagulating milk, and have sometimes been used in place of rennet.

Varieties. There are two varieties cultivated:

Conical, French, or oval Artichoke, with green head. The head is oval, the scales open, and not turned in at top as in the globe sort.

Globe, or largest, with dusky purplish head. The scales are turned in at top, and the receptacle more succulent than the other.

Estimate of Sorts. The globe sort is generally preferred for the main crop; but the conical, or French, is generally considered as possessing more flavor, as the flower-heads are cut off for use when in an immature state; both sorts continue producing them from July to November.

Propagation. This esculent is propagated by rooted suckers or young shoots, "rising in the spring from the roots of the old plants; these are fit to slip off for planting in March and April, when from five to ten inches high. Opening the ground to the old stool, slip them off clean to the root, leaving the three strongest on each mother-plant to advance for summer production. Those slipped off, prepare for planting, by pulling away some of the under and decayed or broken leaves, and by pruning any straggling long tops of the leaves remaining; also cut off casually hard or ragged parts at the bottom of the root. Then, having an open compartment, with a light rich soil of good depth, well dunged and dug, plant the sets by dibble, in rows four feet asunder, and two feet apart in each row. Give each plant some water: repeat this once or twice, if very dry weather, till they have taken root."

Subsequent Culture. "All spring and summer keep them clear from weeds by occasional hoeing between the plants: this, with regular waterings in the dry weather of summer, is all the culture which they require, till the season of production is terminated. They will produce some tolerable heads the same year, in August, and thence till November: next year they will head sooner, in full perfection. By having fresh stools planted every year or two, the old and new plantations together furnish a production of heads from June or July till November. Besides the main head, several smaller lateral heads generally spring from the sides of the stem in succession; but, in order to encourage the principal head to attain the full size, most of these side-suckers should be detached in young growth, when their heads are the size of a large egg, which in that state are also prepared for some tables. As to the continuing main-heads, permit them to have full growth till the scales begin to diverge considerably, but gather them before the flowers appear, cutting to each head part of the stalk. When the entire crop on a stem is taken, cut off the stem close to the ground, to give the plant more strength for new shoots." *Abercrombie.*

"To encourage the production of large main heads, some detach all the lateral heads in a young state. These are commonly in a fit state for eating raw, having attained about one-third of their proper size; and they are for this purpose frequently sold in Covent Garden market, chiefly to foreigners. Another thing practised with the same view is the shortening the ends of the large leaves." *Neill.*

Nicol mentions, that the strongest crops he ever saw, grew in rather a mossy earth that had been trenched fully a yard in depth, and had been well enriched with dung, and limed; and that the plants were generally covered before winter with a mixture of stable litter and sea-weed. This last article, we believe, is one of the very best manures for artichokes. In no place is the plant to be seen in greater perfection than in gardens in the Orkney Islands; and we know that the luxuriance of the plants in these is to be ascribed to the liberal supply of sea-weed dug into the ground every autumn. It was long ago remarked by a horticultural writer, that 'water drawn from ashes, or improved by any fixed salt, is very good for artichokes.' *Systema Agriculturæ*, 1682.

Winter Dressing. Abercrombie says, "First cut down all the large leaves, but without hurting the small central ones, or the new shoots. Then dig the ground between and along each row; raising it gradually from both sides, ridgeways over the roots, and close about the plants. In rigorous frosty weather, cover also in the litter, a foot thick, and close about each plant.

Spring Dressing. In spring, the litter and earth being removed in March or April, according to the kind of season, the stocks are examined; and two or three of the strongest or best shoots being selected for growing, the rest are removed by pressure with the thumb, or by a knife, or wooden chissel. Those shoots or suckers are used for new plantations. Dig the whole ground level, loosening it close up to the crown of the roots of every plant.

Duration of the Plants. "Artichoke plants continue productive for several years; but, every season, some well-rotted dung or fresh sea-weed, should be delved into the ground at the winter dressing. It is certain, however, that after a few years, the plants begin to degenerate, the heads becoming smaller and less succulent. It is therefore a general rule not to keep an artichoke plantation beyond four or at most six years. Scarcely any kind of grub or wire-worm ever touches the roots of artichokes: they form, therefore, an excellent preparative for a crop of onions, shallot, or garlic. In many gardens, a small new plantation is formed every year; and in this way the artichoke season, which begins in June, is prolonged till November; those from the old stocks continuing till August, when those from the new stocks come in. If the last gathered be cut with the stems at full length, and if these be stuck among moist sand, the heads may be preserved a month longer."

Culture for producing the Chard. "When the artichoke quarter is to be shifted, and the old stocks are at any rate to be destroyed, the plants may be prepared, after midsummer, when the best crop of heads is over, for yielding chards against winter. The leaves are to be cut over within half a foot of the ground; the stems as low as possible. In September or October, when the new shoots or leaves are about two feet high, they are bound close with a wreath of hay or straw, and earth or litter is drawn round the stems of the plants. The blanching is perfected in a month or six weeks. If the chards are wished late in winter, the whole plants may be dug up, before frost sets in, and laid in sand in their blanched state; in this way they may be kept for several weeks."

Seed. The heads when suffered to remain ten days or a fortnight, after the season of cutting, expand the calyx leaves, and display an aggregation of jagged purple florets, producing a fine appearance. When ripe seed is wanted, those heads in flower are to be bent down and retained in that position, so as that the calyx may throw off the autumnal rains. In general, however, the seed is not perfected in our climate.

Subsect. 4. *Cardoon*, or *Chardoon*. — *Cynara Cardunculus*, L. (*Tabern.* icon. 696.); *Syng. Polyg. æqu.* L.; and *Cynarocephalæ*, J. *Cardon*, Fr., Ger., and Ital.

1346. This is a hardy perennial plant, a native of Candia, introduced to England in 1658, and known in all the European languages under the same name. It greatly resembles the artichoke, but rises to a greater height; and becomes a truly gigantic herbaceous vegetable of four or five feet in height. It produces flowers like those of the artichoke in August and September. "In France," Neill observes, "the native prickly plant is sometimes cultivated under the name of *Cardoon of Tours*, and is accounted preferable to the common garden variety. So formidable are its spines, that great care is necessary in working about it, to avoid personal injury; a strong leather dress, and thick gloves, are therefore worn. This prickly sort has not yet been introduced into Britain."

Use. The tender stalks of the inner leaves of the cardoon, rendered white and tender by earthing-up, are used for stewing, and for soups and salads, in autumn and winter. When the plants are large, the inner leaves and stalks are rendered by blanching white, crisp, and tender, to the extent of two or three feet. The plant is not in much request, and is only cultivated in some particular family gardens, and a few market-grounds. On the continent, it is in considerable repute, as indeed are many of salad and pot-herbs, which are comparatively neglected in this country.

Propagation. Though a perennial, it often dies in the winter, and therefore requires to be raised from seed almost every year; and for a bed four feet wide by eight feet, two ounces are sufficient; formerly the plants were raised on hot-beds, and transplanted in May and June, but now the seed is generally sown where the plants are to remain.

Soil. The best soil for the cardoon is one that is light, deep, and not over rich.

Times of Sowing. The chief sowings are made in the spring; for a small early crop, in the last fortnight of March; and for the main crop, in the first or second week of April. Further, for a late full crop, you may sow towards the close of June.

Sowing for Transplanting. Sow in a bed of common light earth, moderately thin; and rake in the seed evenly. When the plants have risen, thin them to three or four inches' distance, to give them room to acquire stocky growth for transplanting. When they have been raised about eight weeks, transplant them; allotting an open compartment of well-digged ground, and taking an opportunity of rain falling. Having lifted the plants, trim any long straggling tops of the leaves and fibres of the roots. Plant them either in the level ground, or in drills, or form a hollow patch for each plant; in all cases at four feet and a half distance. Thus you will have ample scope for their growth, and considerable space of ground to land them up. Give water at planting, and occasionally till they take root. In their advancing growth, hoe and loosen the ground about the plants, cutting down all weeds.

Sowing to remain. " A crop may be raised by sowing where the crops are to remain, not to have any check by removal. Sow in small hollow patches, at the distance specified above, two or three seeds in each. Thin the plants to one strongest in each patch.

Landing-up. When the plants are advanced in large growth, two or three feet high or more, in August, September, and October, proceed to land them up for blanching. First tie the leaves of each plant together with hay or straw-bands; then, digging and breaking the ground, earth up round each plant a foot or more high or two-thirds of the stem. As the stems rise higher, tie and earth them up accordingly, giving them a final earthing in October.

Watering in Autumn. Regular waterings in the dry weather of August and September will prevent the plants from seeding.

Taking the Crop. When they are blanched a foot and a half, or two feet in length, or more, they may be digged up, as wanted, in September, October, and throughout winter.

Occasional Shelter. Protect the plants in severe frost with long litter, either as they stand, or turned down on one side.

To save Seed. Leave some full-grown plants in the spring, to shoot up in stalk. *Abercrombie.*

Subsect. 5. *Rampion.* — *Campanula Rapunculus*, L. (*Eng. Bot.* 283.); *Pent. Monog.* L.; and *Campanulaceæ*, B. P. *Raiponce*, Fr.; *Rapunzel*, Ger.; and *Raperonzo*, Ital.

1347. This is a biennial plant, a native of England, but rare. The root is long, white and spindle-shaped; the lower leaves oval-lanceolate, and waved; the flower-stalk is about two feet high, and furnished with a panicle of blue flowers in July and August. The whole plant abounds with a milky juice.

Use. The root is eaten raw like a radish, and has a pleasant nutty flavor; it is also sometimes cut into winter salads, and then the leaves as well as the root are used.

Culture. The seed should be sown in the latter end of May, on a shady border of rich earth, not over stiff, the mould being made as firm as possible: it is better not to rake in the seed, which, being so very fine, may, by that operation, be buried too deep. If the sowing is earlier than May, the plants will sometimes run to flower in the autumn, and so become useless. Moderate waterings must be given, as they come up, through a fine rose of a watering-pot, and it is necessary that they be kept, at all times, tolerably moist. When the plants are of sufficient size, they must be thinned out, to the distance of three or four inches apart; those drawn will bear transplanting well, if put into a border similar to the seed-bed, but care must be taken to insert the roots straight into the earth, and not to press the mould too close; the roots which become forked are not so good as the straight ones. In November, the plants will be fit for use, and will continue so until April." *Dickson, in Hort. Trans.*

To save Seed. Leave or transplant some of the best plants in spring, and they will produce flowers and abundance of seed in autumn.

Subsect. 6. *Alisander, or Alexanders.* (*fig.* 326.) — *Smyrnium Olusatrum,* L. (*Eng. Bot.* 230.); *Pent. Trig.* L.; and *Umbelliferæ,* J. *Maceron,* Fr.; *Smyrnerkrant,* Ger.; and *Macerone,* Ital.

326.

1348. It is a biennial plant, rising about two feet high, and flowering in May and June; the leaves are of a pale-green color, and the flowers yellowish. It grows naturally near the sea in several places, and may often be observed naturalized near old buildings.

Use. It was formerly much cultivated, its leaf-stalks having been used when blanched, as a pot-herb and salad. It somewhat resembles the celery in flavor, by which vegetable it has been almost entirely supplanted. Some consider the leaves and stalks of the *S. perfoliatum,* a native of Italy, as preferable to those of this plant.

Culture. " Where the plants are in demand, sow a proportionate crop at the close of March, in the course of April, or beginning of May: either broad-cast, raking in the seed; the plants, when between three and six inches high, to be transplanted into drills, eighteen inches or two feet asunder, by five or six inches apart in each row; or sow at once in drills that distance, to remain, thinning out the superfluous plants in proper time. The seed is sold by weight, and if sown to transplant, for a bed three feet and a half wide by six feet in length (21 superficial feet), half an ounce will suffice; if sown to remain, then for a bed four feet by twenty-four, containing two drills, two feet apart, or for forty-eight feet in length of drilling, then one ounce will be requisite. When the plants are well advanced in growth, earth them up several inches on each side the rows, to blanch the lower parts white, for use in summer, autumn, &c. You mây likewise sow a moderate portion in August, to stand over the winter for a supply in spring and the early part of the summer, till the spring-sown plants come in."

To save Seed. " The alisander produces nothing fit for the table after the second year; and as it ripens plenty of seed in autumn, it is proper to save some every year for sowing as above." *Abercrombie.*

Subsect. 7. *The Hop.* — *Humulus Lupulus,* L. (*Eng. Bot.* 427.); *Diæc. Pent.* L.; and *Urticeæ,* J. *Houblon,* Fr.; *Hopfen,* Ger.; and *Lupolo,* Ital.

1349. This is a perennial plant, a native of Britain, and well-known as being cultivated for its flowers, which are used in preserving beer. It rises with a rough shoot, and rough tripartite leaves, the former climbing round whatever comes in its way to a considerable height, and producing flowers of a peculiar odour in Jùly.

Use in Cookery. The young shoots, when they have risen three or four inches from the root, were formerly gathered and boiled like asparagus, to which they are very little inferior; these shoots are still occasionally to be found in the market, under the name of hop-tops. A pillow filled with hop-flowers will induce sleep, unattended with the bad effects of soporifics which require to be taken internally.

Culture. The hop is propagated by dividing the roots in autumn or spring. It requires a deep rich soil, which should be frequently stirred and kept quite free of weeds, and the plantation should be renewed every seven or ten years according to circumstances. In field-culture, it is planted in hills or in groups of three or four plants, at six or eight feet centre from centre; but in growing a few for hop-tops, they may be planted in single rows at three feet distance, and one foot asunder in the row.

Subsect. 8. *Bladder-Campion.* — *Silene inflata,* H. K. (*Eng. Bot.* t. 164.); *Cucubalus behen,* L.; *Dec. Trig.* L.; and *Caryophylleæ,* J.

1350. This is a perennial, growing naturally by the sides of corn-fields and pastures; and also on the sea-shore. The stems are smooth and erect, rising from a foot to eighteen inches high. The leaves are smooth, glaucous, and the flowers in nodding panicles.

Use. Our kitchen-gardens, Bryant observes, scarcely afford a better flavored vegetable than the young shoots of this plant when boiled. They ought to be gathered when they are not above two inches long. The sprouts are to be nipped off when of a proper size, and the plants will produce a succession of fresh ones for at least two months.

Culture. A similar culture to that given to the asparagus, or sea-cale, would answer, and probably highly improve this plant. Bryant says, its culture would well reward the gardener's trouble. Seeds may either be procured from wild plants, or the roots, which run very deep, may be transplanted into deep light soil.

The *S. maritima*, L. and Smith. (*Eng. Bot.* 957.); bears a considerable resemblance to the *S. inflata*, and might in all probability be used for the same purpose. It is distinguished by its decumbent stem, narrow leaves, and solitary flowers.

Subsect. 9. *Thistle.* — *Carduus* and *Onopordium*, L.; and *Cynarocephalæ*, J.

1351. There are two sorts of thistle, which are, or were formerly used as asparaginous plants, *viz.* the *Milk-Thistle*, and *Cotton-Thistle.*

The *Milk-Thistle*, or *Our Lady's Thistle*, is the *Carduus Marianus*, L. (*Eng. Bot.* t. 976.) It is a biennial plant, a native of Britain, and found in church-yards and near ruined buildings. The plant rises from four to six feet high, furnished with large leaves, covered with an irregular net-work of beautiful milky veins.

Use. When very young, the leaves are used as a spring salad; and blanched, are used in winter salads; stripped of their spines, they are sometimes boiled and used as greens; and the young stalks peeled, and soaked in water to extract a part of their bitterness, are said to be excellent. Early in the spring of the second year, the root is prepared like salsify or skirret; the receptacle of the flower is pulpy, and eats like that of the artichoke.

Culture. The seeds are sown in a good dry soil, early in February; and when the plants come up, they are thinned out to one foot and a half distance from one another. The intervals are to be kept free of weeds, and stirred occasionally during the summer; and in autumn the leaves are to be tied up like those of endive, and the earth drawn round to blanch them. The blanched herb being cut off for use during winter, the roots remain to be used in spring.

To save Seed. Leave one or two plants untied up the first season, and in the second they will produce flowers in July, and seed in August.

The *Cotton-Thistle* is the *Onopordium acanthium*, L. (*Eng. Bot.* t. 977.) It is a biennial plant, indigenous in various parts of Britain, and remarkable for its large downy leaves and lofty stem, often rising ten feet high, and covering a circle of six or eight feet diameter.

Use. It was formerly used like the artichoke and cardoon; the receptacle and the tender blanched stalks, peeled and boiled, being the parts used.

Culture. The same as the *Cardoon.* See subsect. 4.

Sect. VII. *Acetarious Plants.*

These are a numerous class; of various culture, habits, and use, and of which but little that is general can be here observed, excepting that they are all articles of comparative luxury, or condiments, rather than food; and consequently, that though they occupy a moderate portion, perhaps a fortieth of the kitchen-garden, yet, excepting a few of the sorts, as the lettuce, radish, cress, &c. they are seldom found in those of the cottager.

Subsect. 1. *Lettuce.* — *Lactuca sativa*, L.; *Syngen. Polyg. æqu.* L.; and *Cichoraceæ*, J. *Laitue*, Fr.; *Gartensalat*, Ger.; and *Lattuga*, Ital.

1352. This is a hardy annual, introduced or cultivated in 1562, but from what country is unknown. Some authors consider it as merely a variety of one of the three native species; one of which, the *L. virosa*, seems very likely to be the parent plant. The leaves are large, milky, frequently wrinkled, usually pale-green, but varying much in form and color in the different varieties. Though of but a few months' duration in the same individual, yet, in gardens, by successive sowings in spring, summer, and autumn, it is obtained most part of the year.

Use. The use of lettuce as a cooling and agreeable salad is well known; it is also a useful ingredient in soups. It contains, like the other species of this genus, a quantity of opium juice, of a milky nature, from which, of late years, a medicine has been prepared by Dr. Duncan, senior, of Edinburgh, under the title of *Lactucarium*, and which he finds can be administered with effect in cases where opium is inadmissible." *Caled. Hort. Mem.* vol. i. 160. 259.; vol. ii. 314.; and vol. iv. 153.

Varieties. These are very numerous; and, from the names, many of them appear to have come to us from the Greek islands and the coast of the Levant. The best are:

Green cos
White cos
Silver cos
Spotted cos
Egyptian early cos
Black-seeded green cos
Lap
Brown cilicia
Green cilicia
Common white cabbage
Large white cabbage
Brown Dutch cabbage
Imperial cabbage, large and fine
Grand admiral, or admirable, a very large fine cabbage lettuce
Large Roman
Hardy green cabbage (capuchin)
Tennis-ball cabbage
Prussian

Estimate of Sorts. In their general growth, all the cos-lettuces are more or less upright, of an oblong shape. The cabbage-lettuces are round-leaved, growing in a compact full-head of squat form, close to the ground. Both have white, close, firm heads when in perfection; the varieties reach maturity from June till September. Meanwhile they are occasionally used in young open growth. In a very young state, the cabbage-lettuces have a milder, more agreeable taste than the cos: but when both classes are full grown, the flavour of the cos is preferred for salads, while the cabbage kinds are more used for soups. The Cilicia, of a nature between the other two, is much admired by some, but is less cultivated than formerly. The lap is drawn young, and cut with small salads. For principal summer and autumn crops, the white, the silver, the green, the spotted, the Egyptian, with the other kinds of cos, are eligible in the first degree. Next to these are the common and the large white cabbage, the brown Dutch, the imperial, the grand-admiral, the Roman, and both sorts of the Cilicia. Those kinds should be reserved for the end of summer which are the most backward in starting for seed, among which are the hardy green, the brown Dutch, and the tennis-ball. Any of the other kinds may be resorted to for secondary crops, or to answer a local preference for particular names. For a very early crop, or for a late sowing, to stand the winter, the fittest of the cos kinds are, the white, the green, the black-seeded, and the Egyptian; the latter is hardy, forms a close head, and comes early: of the cabbage class, the brown Dutch, and the hardy green, the common white, and the tennis-ball, are much relied upon for their hardiness in standing severe weather.

Propagation. From seed; of which, for a seed-bed four feet wide by ten feet in length, a quarter of an ounce is sufficient, and will produce upwards of four hundred plants.

Soil and Situation. " All the sorts grow freely on any rich mellow soil, where the sub-soil is dry. For the most part, raise this vegetable as a principal crop, on beds set apart for it; and keep the varieties separate, but to multiply the supplies throughout summer, portions may be sown, thinly intermixed with principal crops of leeks, onions, carrot, and spinage, which will come off before the lettuces are full grown; also, with any young perennials which stand at wide intervals.

Times of Sowing. " To obtain a constant supply of good lettuces, it is advisable to sow every month, from February to July, for the main summer and autumn crops; and to sow distinct sorts in August and September, to produce late autumn and winter plants, of which a reserve is to stand for spring and early summer heading-lettuces in the following year. For the first early crops, you may begin to sow at the end of January or beginning of February, if mild dry weather; or, more generally, later in February, or in the first week of March, on a sheltered south border. Some choice kinds may be sown in a frame, and forwarded by forcing. But for the main summer crops, sow in March and April, in any open situation. Follow with secondary sowings twice or oftener every month, from May till about the seventh of August; to provide for a succession through the summer, till October, as the plants sown early in the year, after heading fully, soon fly up to seed-stalks. The sowing in the midst of summer should be on shady borders. For a crop to come in during winter, and stand over partially till spring, make two late sowings, in the third week of August and last fortnight of September.

Process in Sowing. " The ground should have been broken fine in the previous digging. Sow broad-cast, moderately thin; rake in lightly, and very even.

Management of the Summer Crop. " In the successive crops raised from the opening of spring till the close of summer, when the plants reach about two, three, or four inches growth, they should be thinned; of those removed let a requisite number be planted out, from a foot to fifteen inches asunder, to remain for cabbaging. Such as continue in the seed-beds may be either gathered thinningly, in progressive stages, till the final reserve advance in close-heading; or, as they increase in size, be planted out at the square distance specified above, especially those designed to stand till of stocky growth. In dry weather, water well at transplanting. Also weed and hoe the beds thinned, and water them, if necessary. In the first heading crop of cos-lettuces, when about three parts grown, and beginning to close the inner leaves, a number may be forwarded in cabbaging, by tying the leaves together, moderately close, with strings of bass; the remainder will head and whiten, in due time, without this assistance. Under the above culture, the successive crops will advance freely to a stocky growth: the earliest will cabbage moderately in May, but more fully in June, and in perfection in July and August.

Crop raised on Heat. " For an accelerated crop, some may be sown in the beginning or middle of February on a gentle hot-bed. When the plants are one or two inches high, in March or April, prick a portion either into a warm border, if a mild season, and let them be shielded with mats, during nights and bad weather; or into a frame or slender hot-bed, to bring them more forward. According to their progress, in April or May, transplant them into the open garden, from six to twelve inches asunder, to remain for heading.

Winter-standing Crop. "To have lettuces for drawing in minor growth for use, during winter, and to stand over in part for returns in a mature stage, early next spring and the beginning of summer, sow in the third week of August and in the first fortnight of September, the suitable hardy sorts. You may, further, towards the close of September, sow a smaller portion on a warm border or sloping terrace; the plants to remain and take the chances of the weather: if these survive, they will be acceptable in the spring; some to thin out for use young, and the remainder to transplant for larger growth, early in summer, without running. The plants of the August and September sowing, will soon appear, and will be ready to transplant the same season. Some may remain where sown, and a good portion may be transplanted to warm borders; a quantity of the choice cos may be planted in beds of light dry earth, under frames or hand-lights, or under awnings, to have the protection of mats in cold nights, and partially on inclement days. Accordingly, about the middle or end of September, and in October, when the plants are two or three inches high, prick out a quantity (taking first those of the August sowing) from the seed-beds into prepared warm-lying ground, in rows six inches by four apart. From such as remain in the seed-beds, you may conveniently thin out some young plants, for occasional use in the winter, but so as to leave a competency to remain for spring. As October advances, let some considerable quantity of choice lettuces of the September sowing be pricked out from the seed-bed into dry sheltered south borders, three or four inches asunder, wholly to continue for spring and early summer-lettuces. Through October to the beginning of November, it is advisable to prick a quantity of the cos kinds thickly, in frames or under hand-lights, to have protection during the night, and in all bad winter weather; or, if deficient in frames and glasses, you may transplant a part into a south border, to be arched over with hoops, and covered occasionally with mats; or, as the young plants are tender in winter, protection, afforded in some of these ways, will preserve them more effectually from rigorous weather.

"During the winter, let those in frames, and the others under occasional shelter, have the free air on all mild dry days; but let them be defended always at night with the glasses, and with mats or other additional covering in intense frost or very rigorous weather: in the day-time, protect them from heavy rain, snow, and frost, but so as to admit the light; also, in a severe season, you may cover the choicer plants in the open borders with mats, light straw-litter, or fern; or occasionally with reed pannels, or wattled hurdles, placed slantingly over to the wall. These coverings should be continued only in rigorous frosts, and removed when the weather is open. Then in the spring, about March or April, the plants in open borders, which have survived the winter, should be thinned, so as to stand from six to twelve inches apart; and those thinned out may be planted in another compartment at the same distance. At the same period, all the lettuces which have wintered under frames, hand-glasses, or mats, should be transplanted into the open garden. In their final stations, the whole will advance to useful sizes in the course of April, or will reach full growth with stocky hearts about May: thus the table may be supplied till the early crops of spring succeed. The plants first sown in the current year come to have good heads in June and July.

"Winter and early spring lettuce may be further accelerated by transplanting some of the strongest autumn-raised plants, intermediately protected, as above, by frames or glasses, into hot-beds, or the borders of forcing-stoves: transplant the lettuces to be thus forced, with balls of earth about the roots, in December, January, and February. Those excited by heat in December will have cabbaged hearts by the beginning of March.

To save Seed. "Leave or transplant either some of the early winter-standing plants, in March or April, or of the forwardest spring-sown crops, in May or beginning of June, fifteen inches asunder. They will produce ripe seed in August and September."

Subsect. 2. *Endive.* — *Cichorium Endivia*, L.; *Syng. Polyg. Æqu.* L.; and *Cichoraceæ*, J. *Chicorée des Jardins*, Fr.; *Endivie*, Ger.; and *Endivia*, Ital.

1353. This plant is a hardy annual, a native of China and Japan, and introduced in 1548. The root leaves are numerous, large, sinuate, toothed, and smooth; the stem rises about two feet high, is branched, and produces pale blue flowers in July and August.

Use. It is cultivated for the stocky-head of leaves, which, after being blanched to take away the bitter taste, are used in salads and stews in autumn, winter, and spring. It is in great repute both in England and on the continent.

The varieties are:

Green curled-leaved; principal sort for the main crops.
White curled-leaved.
Broad-leaved Batavian; of largest upright growth.

Estimate of Sorts. "All the sorts are eligible for culture; but allot, principally, the green-curled for the main crops of autumn and winter endive, this being of the most stocky, full growth, and hardiest to stand severe weather. As to the others, allot a smaller portion of the white-curled for early summer and autumn use: of the broad-leaved kind, provide a moderate crop for autumn, till November or December; being by some esteemed preferable for stews and soups, though not much used in salads."

Propagation. All the varieties are raised from seed, of which, for a seed-bed four feet wide by ten in length, half an ounce is sufficient.

Times of Sowing. "The proper seasons are, May for a smaller early crop; and principally June and July to the beginning of August; for full and succession crops, all autumn and winter, till the following spring. For, if sown earlier than the middle of May or beginning of June, they will mostly run to stalk the same season, before attaining mature, useful growth. If any are required for early young summer endive, sow only a small portion of the white-curled, in April or May, as the plants will soon run to seed. In the middle or towards the end of May, you may begin sowing moderately of the different sorts; but do not sow fully till nearly the middle of June, that the plants may stand without running the same year. About the twelfth and twenty-fifth of that month, also at the beginning and middle of July, sow the main and succession crops for autumn and winter; and a final smaller sowing about the beginning of August, for late supplies in the end of winter and following spring.

Culture in the Seed-bed. "Sow each sort separately in beds of rich mellow earth, in an open situation; scattering the seeds thinly, and rake in the seed. When the plants are up an inch or two in growth, thin them moderately, where in clusters, that they may have room to grow stronger and stocky for transplanting. But if a portion are sown in soil of sufficient depth, and thinned to the distances mentioned under transplanting, instead of being moved, they may be expected to yield heads of the finest kind, under the same culture as is given to the others.

Transplanting. "As the plants attain a sufficient growth, being from four to six inches high, or in a month or five weeks from the time of sowing, proceed to transplant the successive crops. The ground should be light and rich on a dry subsoil. Dig it a full spit deep; set in shallow trenches, or drills the depth of a hoe, endive blanches with less trouble than if inserted on a level surface. The lines may be fifteen inches asunder; the plants ten or twelve inches distant in the line. Drawing the strongest first, plant out portions from June till October; but the principal removals will fall in August; in which month three different plantings may be made for succession; also for a general winter crop, at the beginning of September. While the plants are in hand, trim the extremities of the leaves, and shorten the top-roots a little. Water at planting; and moderately afterwards once in two days, if the weather be dry, till the plants take root.

"At the end of September, and in October, likewise plant some in a warm, dry border, to stand the winter more effectually. Also, in the last fortnight of October or beginning of November, it would be proper to insert some stout plants thickly on a bank of dry light soil, raised a foot or two behind, sloping to the south. Thus they will remain drier in winter, and will be preserved more securely from rotting in that season. The bed might be also defended in severe weather with frames and glasses, or with an occasional awning of mats or sail-cloth.

Blanching. "As the transplanted crops advance to full growth, stocky and full in the heart, some should have the leaves tied up every week or fortnight, to blanch or whiten, and to render them tender, crisp, and mild-tasted. Perform this in dry days; and in winter, when the weather is dry without frost. Using strings of fresh bass, or small osier twigs, tie the leaves regularly together a little above the middle, moderately close. If the soil be light and dry, earth them up half way; but if moist, merely tie them. The two curled sorts, if neatly earthed up, will branch pretty well without being tied. The Batavian, from its loftier, looser growth, in every case hearts and blanches better with a bandage. The blanching will be completed sometimes in a week, when the weather is hot and dry; at others, it may take a fortnight or three weeks; after which the endive should be taken up for use, or it will soon rot, in six days or less, especially if much rain fall. To save the trouble of tying, this esculent is also occasionally blanched: by setting up flat tiles or boards on each side the plants, which, resting against other in an angular form, and confined with earth, exclude the light. Further, endive may be blanched under garden-pots, or blanching-pots, in the manner of sea-kale. In the heat of summer and autumn, tying up is best; but in wet or cold weather, to cover the plants preserves while it blanches them.

Occasional Shelter. "At the approach of severe frost, cover some thickly with straw-litter. Also plunge a portion into a raised bank of light dry earth, under a glass-case, or covered shed, open to the south. Protect with litter in rigorous weather; but uncover, and give plenty of air on mild days.

To save Seed. " Allot some of the strongest old plants in February or March, if any remain; otherwise, sow seed in March or April, and transplant or thin the plants to twelve or fifteen inches' distance. They will shoot, and the seed ripen in autumn."

SUBSECT. 3. *Succory*, or *Wild Endive*. — *Cichorium Intybus*, L. (*Eng. Bot.* 539.); *Syngenesia Polygamia Æqualis*, L.; and *Cichoraceæ*, J. *Chicorée Sauvage*, Fr.; *Gemeine Cichorie*, Ger.; and *Cicoria*, Ital.

1354. Is a hardy perennial not uncommon in calcareous wastes and by road sides. The whole plant greatly resembles the common broad-leaved endive; the leaves are runcinated; the stem rises from two to four and five feet high, producing blue flowers from June to August. The plant is but little cultivated in gardens in this country, though it is in much repute on the continent, and especially in Italy. It has been grown in the fields, in France and England, as a fodder for cattle, when coming into flower; and is at present much cultivated in Holland and Flanders, for the roots, which are dried, and ground, and used on almost every part of the continent, partly along with, and partly as a substitute for coffee, by those who cannot afford to use that article genuine: but Miller and other English authors on horticulture do not notice it as an article for the garden.

Use. The leaves are blanched and used as those of endive, or during winter forced in the dark, and so blanched. In this state it is the *Barbe de Capucin* of the French. It is also sown thick in frames, and in the open air, and when it has produced two rough leaves, cut as a small salad. When lettuce or garden endive are scarce, chiccory can always be commanded as salading by those who possess any of the most ordinary means of forcing. The roots cut in pieces, dried and ground, afford a powder, which Dr. Howison (*Caled. Hort. Mem.* iv. 132.) thinks preferable to that of coffee; and Dr. Duncan (*Disc.* to *Caled. H. S.* 1820.) is of opinion that the plant might be cultivated with great national advantages, as a substitute for that exotic berry.

Culture. Isaac Oldacre, an excellent practical gardener, who experienced the advantages of cultivating this plant in the Imperial gardens near Petersburgh, gives the following directions. " It should be sown in the end of June or beginning of July, on a rich piece of ground, broad-cast, in the same manner as endive; when the leaves begin to cover the ground, thin out the plants, leaving those that remain on the beds from three to four inches apart; those pulled out may be planted into other beds, at the same distance as those which are left to remain; keep them clear from weeds, and if the leaves grow very strong, and shade the roots much, cut them off within one inch of the ground.

" The end of September or beginning of October is the proper time to shift the roots; the leaves should be first cut off with care, so as not to destroy the hearts of the plants, then dig up the roots, shorten them, and plant them in pots or portable boxes, with a dibble, very close together, in rich mould; give them water when dry, and shelter them in severe frosts, by a light covering of litter. After they are well rooted, the pots or boxes, as wanted, are to be removed into the mushroom-house, or cellar, where they must be entirely excluded from light, in order to blanch the leaves, which will be effected in six or seven days. Succory will thrive in a heat of sixty degrees, but it is best to keep it in a lower temperature. If the roots are strong, each pot or box will bear cutting twice, after which they should be removed, and changed for the succession, as the leaves of the future growth become bitter." *Hort. Trans.* vol. iii. p. 139.

To save Seed. Proceed as directed for endive.

SUBSECT. 4. *Dandelion*. — *Leontodon Taraxacum*, L. (*Eng. Bot.*); *Syng. Polyg. Æqu.* L.; and *Cichoraceæ*, J. *Dents de Lion*, or *Pissenlit*, Fr.; *Lowenzahn*, Ger.; and *Piscia in letto*, Ital.

1355. This is a hardy perennial, a native of Britain, and well known among gardeners as a troublesome weed.

Use. The leaves in early spring, when just unfolding, afford a very good ingredient in salads. The French sometimes eat the young roots, and the etiolated leaves, with thin slices of bread and butter. When blanched, the leaves considerably resemble those of endive in taste. The root is considered an equally good substitute for coffee as chiccory. *Caled. Hort. Mem.* iv. 138.

Culture. Though regularly produced in the London market, it is seldom or ever cultivated, being generally to be found in sufficient luxuriance by the sides of hedges and dry ditches. It might easily be propagated either by seeds or roots; and, if introduced as a garden plant, should have a rich deep soil, and be carefully tied up, and earthed round, to blanch it effectually. Cut off all the flowers as they appear, to prevent the dispersion of the seed, and the weakening of the plant. When salad is scarce, the dandelion might be dug up from road sides in winter, and forced in pots, like succory.

Subsect. 5. *Mustard.*—*Sinapis*, L.; *Tetrad. Siliq.* L.; and *Cruciferæ*, J.; *Sénevé*, Fr.; *Senf*, Ger.; and *Senapa*, Ital.

1356. There are two species of mustard in cultivation, the *black* and the *white*; both annuals, and natives of Britain.

The *white* mustard is the *Sinapis alba*, L. (*Eng. Bot.* t. 1677.) It grows naturally in corn-fields, and flowers in June and July. The leaves are pinnatifid, the pod round and rough, and abruptly terminated. The seed is yellow, and, as well as the flowers, is larger than those of the black species.

Use. This species is cultivated chiefly as a small salad, and is used like cresses while in the seed; when these are newly expanded, they are mild and tender; but when the plants have advanced into the rough leaves, they eat rank and disagreeable.

Culture. For spring and summer consumption, sow once a week, or fortnight, in dry warm situations, in February and March; and afterwards in any other compartment. "In summer, sow in shady borders, if it be hot sunny weather; or have the bed shaded. Generally sow in shallow, flat drills, from three to six inches apart; scatter the seed thick and regular, and cover in thinly with the earth, about a quarter of an inch. To furnish gatherings in winter, or early in spring, sow in frames or under hand-glasses; and when the weather is frosty, or very cold, in hot-beds and stoves, as directed for cress."

To save Seed. Either sow a portion in March or April, to stand for that purpose; or, for small supplies, leave some rows of the spring sowing, grown too large for salads; they will ripen seed in autumn.

The *black* mustard is the *S. nigra*, L. (*Eng. Bot.* 969.) the *Sénevé* of the French. It is frequent in corn-fields. It is altogether a larger plant than the white, with much darker leaves, and their divisions blunter. The flowers are small, the pods smooth, and lying close to the stem.

Use. Black mustard is chiefly cultivated in fields for the mill, and for medicinal purposes. It is sometimes, however, sown in gardens, and the tender leaves used as greens early in spring. The seed-leaves, in common with those of the cress, radish, rape, &c. are sometimes used as a salad ingredient; but the grand purpose for which the plant is cultivated is for the seeds, which ground, produce the well-known condiment. "If the seeds," Neill observes, "be taken fresh from the plant, and ground, the powder has little pungency, but is very bitter; by steeping in vinegar, however, the essential oil is evolved, and the powder becomes extremely pungent. In moistening mustard-powder for the table, it may be remarked, that it makes the best appearance when rich milk is used; but the mixture in this case does not keep good for more than two days. The seeds of both the black and white mustard are often used in an entire state medicinally.

Culture for the Mill. "To raise seed for flower of mustard, and other officinal occasions, sow, either in March or April, generally the black sort, or occasionally the white, in any open compartment; or make large sowings in fields, where designed for public supply. Sow moderately thick, either in drills from six to twelve inches asunder, or broad-cast, and rake or harrow in the seed. When the plants are two or three inches in the growth, hoe, or thin them moderately, where too thick, and clear them from weeds. They will soon run up in stalks; and in July or August return a crop of seed, ripe for gathering."

Subsect. 6. *Rape.*—*Brassica Napus*, L. (*Eng. Bot.* t. 2146.) *Tetrad. Siliq.* L.; and *Cruciferæ*, J. *Navette*, Fr.; *Repskohl*, Ger.; and *Napo salvatico*, Ital.

1357. It is a biennial plant, a native of Britain, and distinguished by its glaucous root-leaves, and yellow flowers, which appear in April.

Use. Rape is cultivated in gardens as a small salad herb, to be gathered young in the seed leaves, and used as cresses and mustard. Like these, it has a warm flavor, and is recommended as a stomachic. The plant is also much used in agriculture.

Culture for Small Salading. Sow at the same time with cresses, mustard, &c. in winter and spring; or at any season when small salading is required. Sow in drills or beds, and follow the culture directed for *White Mustard.*

To save Seed. Transplant two or three plants any time during the summer, and they will flower and seed the second year abundantly.

Subsect. 7. *Corn-Salad*, or *Lamb-Lettuce.*— *Valeriana Locusta*, L.; and *Fedia Olitoria*, Wild. (*Eng. Bot.* 811.); *Triand. Monog.* L.; and *Dipsaceæ*, J. *Mâche*, Fr.; *Ackersalat*, Ger.; and *Valerianello*, Ital.

1358. This is a diminutive annual plant, common in corn-fields or sandy soils. The leaves are long and narrow, of a pale glaucous hue, the lower ones rather succulent. The flowers are very small, pale, bluish, and collected into a close little corymb; they appear in the open fields in April. When cultivated, it rises a foot high, and flowers in March. Gerarde tells us, that foreigners using it while in England, led to its being cultivated in our gardens.

Use. It is used in salads through winter and early spring; both as a substitute for common lettuce in those seasons, and to increase the variety of small salads. For these purposes it has long been a favorite plant in France, under the denominations of *mâche, doucette, salade de chanoine,* and *poule grasse.*

Propagation. It is raised from seed, of which a quarter of an ounce is sufficient for a bed four feet by five.

Times of Sowing. " To answer the common demand, two or at most three sowings will be sufficient, viz. a principal sowing at the beginning or towards the middle of August; a secondary sowing early in September, to furnish together crops in winter and early spring; and a smaller sowing in spring, the close of February or course of March, if the plants are required in continuation throughout that season, though they are apt to get rank-tasted in warm dry weather. If wanted throughout summer, sow once a month, and cut the crop quite young.

Culture. " Sow in any bed of common mellow earth, broad-cast, and rake in the seed. When the plants are up, thin them two or three inches asunder, that they may have room to acquire some small stocky growth for gathering.

To save Seed. " Leave some plants in spring; they will produce seed in July or August."

SUBSECT. 8. *The Garden Cress.* — *Lepidium sativum,* L. (*Zorn.* ic. 16.); *Tetrad. Silic.* L.; and *Cruciferæ,* J. *Cresson,* Fr.; *Gemeine Kresse,* Ger.; and *Crescione,* Ital.

1359. It is a hardy annual plant, cultivated since 1548; but its native country is unknown. The cultivated plant rises with numerous small long leaves, curled or plain; from which proceeds a stalk from fifteen to twenty inches high, furnished with white flowers, which blossom in June and July. The whole plant partakes strongly of the pungent smell and acrid taste which distinguish the *Cruciferæ.*

Use. It is cultivated in gardens for the young leaves, which are used in salads, and have a peculiarly warm and grateful relish. It ranks among gardeners as the principal of the small salads.

Varieties. These are:

The common plain leafed, principally cultivated.

Curled-leaved; equally good as a salad, and preferable as a garnish.

Broad-leaved; less cultivated for salading; but grown for rearing young turkeys, &c.

Propagation. All the varieties are raised from seed, of which one ounce or one-eighth of a pint will suffice for a bed four feet by four feet.

Times of Sowing and Site of the Crop. " Cress should be raised three or four times every month, as it may be in demand, to have crops delicately young in constant succession. For culture in the open garden, begin in the first, second, or third week in March, as a forward spring may bring mild weather or otherwise: allot some warm situation for the early spring sowings; and if the weather take a cold turn, either put on a spare frame, or cover with matting between sunset and sunrise. When spring is confirmed, sow in any open compartment. At the beginning of summer, the same; but, in hot dry weather, either sow in a shady border, or if the situation be open, shade with mats in the middle of the day. For autumn sowings, when cold weather is approaching, allot some warm borders, and give occasional protection. When crops are in demand throughout winter, either sow in a moderate hot-bed, or in cradles to be placed in a stove; pans filled with rotten tan are to be preferred to pots or boxes with mould. From the last fortnight of October till the first in March, it will be mostly fruitless to sow in the open garden; but a terrace, sloping south under a frame, may be used at the decline of the year and most early part of spring, as the intermediate step between the open garden and hot-bed, if more within the means at command. During this interval, some market-gardeners sow it just within the glasses which cover larger plants."

The cress is often raised on porous earthen-ware vessels, of a conical form, having small gutters on the sides, for retaining the seeds. These are called pyramids, are somewhat ornamental in winter, and afford repeated gatherings.

Process in Sowing and subsequent Culture. " Having allotted a fine mellow soil to receive the seed, dig the surface, and rake it finally preparatory to sowing, which mostly perform in small flat shallow drills, four, five, or six inches asunder. Sow the seed very thick, and earth over very lightly, or but just thinly cover. Give occasional waterings in warm dry seasons.

Taking the Crop. " To gather cress in perfection, cut them while moderately young, either clean to the root, or only the tops of advanced plants. They will shoot again for future gathering, but the leaves will be hotter, and not so mild and tender as those of younger plants.

To save Seed. Either sow a portion in the spring for that purpose; or leave some rows of any overgrown old crop in April and May. The plants will yield seed in autumn."

Subsect. 9. *American Cress.* — *Erysimum præcox*, Smith. (*Eng. Bot.* t. 1129.); *Tetra. Siliq.* L.; *Cruciferæ*, J. *Cresson d'Amerique*, Fr.; *Amerikanisher Kresse*, Ger.

1360. This plant is a native of Britain, and found in watery places; and was formerly considered as a variety of the common winter-cress (*E. Barbarea*); but, as observed by Neill, it is only biennial; while the common winter-cress is perennial. It has smaller leaves, more frequently sinuated; the lower are lyre-shaped, and those on the stalk pinnatifid. It is often called *Black American Cress*, and sometimes *French Cress*.

Use. It is generally liked as a winter-cress and early spring salad, resembling in flavor the common water-cress, but rather more bitter. It is in demand in some places throughout the year.

Culture. It is raised from seed, which is sold by weight, and for every ten feet of drill, a quarter of an ounce will be requisite. "Sow in a bed of light dry earth, rather in drills nine inches apart, than broad-cast. For winter and spring use, make a sowing in the last fortnight of August, or beginning of September, on a warm sheltered border. If wanted throughout summer, sow every six weeks from March to August, giving a sunny or shaded situation according to the advancement of the season. Water occasionally in dry hot weather. At the approach of winter, shelter the plants, by laying a few light twigs among them so as not to interfere with their growth; and upon these, a covering of fern, reeds, or dry litter. The plants being cut, or the outside leaves stripped off, shoot again for another gathering."

To save Seed. "Let a few choice plants, raised in spring, run; and they will ripen seed before the decline of summer."

Subsect. 10. *Winter-Cress.* — *Barbarea vulgaris*, H. K. (*Eng. Bot.* 443.); and *Erysimum Barbarea*, L. and Smith; *Tetrad. Siliq.* L.; and *Cruciferæ*, J. *Barbare*, Fr.; *Winter Kresse*, Ger.; and *Erba di Santa Barbarea*, Ital.

1361. This is a well-known perennial plant, common in moist shady situations. The lower leaves are lyre-shaped, and the upper obovate and indented. The flower-stalk rises about a foot high, and produces yellow flowers from April to August. The whole plant is bitter and somewhat aromatic. Neill observes, "Some still consider the American cress of gardeners as a variety of this; but after cultivating both for several years, we have found those to be right who regard them as distinct." A double variety of *Barbarea* is well known in the flower-border as the *yellow-rocket* of gardeners.

Use and Culture. The same as the *American cress*.

Subsect. 11. *Water-cress.* — *Nasturtium officinale*, H. K. (*Eng. Bot.* t. 855.); the *Sisymbrium Nasturtium*, L.; *Tetrad. Siliq.* L.; and *Cruciferæ*, J. *Cresson de Fontaine*, Fr.; *Brünnenkresse*, Ger.; and *Cressione di Sorgenti*, Ital.

1362. This is a creeping amphibious perennial, growing in wet ditches and slow running streams. The stems are spreading, declining or floating, if in water. The leaves are alternate, pinnate, and somewhat lyre-shaped. The flowers are white in a corymb, soon lengthened out into a spike in June and July. The plant, when growing in a rapid current, has its leaves lengthened; and in this state, Martyn remarks, is sometimes mistaken for the water-parsnip, (*Sium nodiflorum*, L.) which commonly grows with it, and is deleterious.

Use. It forms an excellent spring salad either alone or with brook-lime or scurvy-grass. It is a popular favourite in spring in most places; and is eaten fasting, or with bread and butter, by those who have faith in its antiscorbutic virtues. The juice is decocted with that of scurvy-grass and Seville oranges, and forms the popular remedy called Spring juices.

Culture. It is generally gathered from native sources; but, near London, it is cultivated by some market-gardeners who can command a small stream of water, in beds sunk about a foot in a clayey soil, with a very gentle slope from one end to the other. Along the bottom of this bed, which may be of any convenient breadth and length, the plants are inserted about six inches' distance every way. Then, according to the slope and length of the bed, make dams six inches high across it, at intervals; so that when these dams are full, the water may rise not less than three inches on all the plants included in each. The water being turned on will circulate from dam to dam; and the plants, if not allowed to run to flower, will afford abundance of young tops in all but the winter months. A stream of water, no larger than what will fill a pipe of one inch bore, will, if not absorbed by the soil, suffice to irrigate in this way an eighth of an acre. As some of the plants are apt to rot off in winter, the plantation should be laid dry two or three times a year, and all weeds and decayed parts removed, and vacancies filled up.

Subsect. 12. *Brook-lime.* — *Veronica beccabunga*, L. (*Eng. Bot.* 655.); *Dian. Monog.* L.; and *Scrophularinæ*, B. P. *Beccabongue*, Fr.; *Bachbunge*, Ger.; and *Beccabungia*, Ital.

1363. This is a perennial plant, a native of Britain, and common in rivulets and wet ditches. It has a trailing or procumbent stem, furnished with smooth dark-green elliptical leaves, from the axillæ of which proceed bunches of blue flowers in July.

Use. The young tops and leaves are used as a salad, like the water-cress, with which it is often mixed, being milder, more succulent, and only slightly bitterish in taste. In Scotland the sprigs of brook-lime are brought to market under the name of *water-purpie*, and sold along with *wall-cresses*, (well, or water cresses.)

Culture. The same as for the water-cress.

Subsect. 13. *Garden-Rocket.* — *Brassica Eruca*, L. (*Schk. Hand.* 2. t. 186.); *Tetrad. Siliq.* L.; and *Cruciferæ*, J. *Roquette cultivée*, Fr.; *Raukette*, Ger.; and *Ruccola*, Ital.

1364. This is an annual plant, a native of Austria, and known in this country in 1573. The stem rises two feet high, is upright and branchy, and furnished with smooth, pulpy, cut, and toothed leaves. When in flower in July, it has a strong peculiar smell, almost fœtid. This plant is now neglected in Britain, but is still in use in several places on the continent.

Use. The leaves and tender stalks are used as salad ingredients, and form an agreeable addition to cresses and mustard early in spring.

Culture. Sow in a warm border early in February, and again in March and April for successive crops. Thin the plants after they have produced the first rough leaf to three or four inches asunder, and keep them clear of weeds. If a supply is desired throughout the year, monthly sowings may be made; and in autumn, under frames.

To save Seed. Allow a few of the strongest plants of the spring-sowing to come into flower; they will produce abundance of seeds in August.

Subsect. 14. *Scurvy-Grass.* — *Cochlearia officinalis*, L. (*Eng. Bot.* 550.); *Tetrad. Silic.* L.; and *Cruciferæ*, J. *Cranson officinal*, Fr.; *Löffelkraut*, Ger.; and *Coclearia*, Ital.

1365. This is a biennial plant, indigenous to most of our sea-shores, and, like the sea-pink, (*Statice*), growing also on inland mountains. The root-leaves are nearly round; those of the stem sinuated; the whole plant is low and spreading, seldom rising above a foot. The flowers are white, and appear in April and May.

Use. The smaller leaves are occasionally used like the water-cress, and sometimes eaten between slices of bread and butter. The plant is also occasionally used medicinally.

Varieties. A thick-leaved variety, called the Dutch scurvy-grass, is cultivated in some gardens.

Culture. The plant may either be propagated from seed, or by dividing the roots. It delights in a sandy soil and a moist atmosphere, which it finds alike by the sea-shore and on lofty mountains. It will grow, however, almost any where, and is often found firmly established on old walls and ruins, sowing itself, and thus remaining many years. When to be raised from seed, sow about July. Plants from a spring-sowing seldom prosper. Abercrombie says, "Sow in drills eight inches apart; and when the plants are up, thin them to six inches' distance; these thinned out, may be transplanted into new beds. In the following spring, the succulent leaves will be fit for use.

To save Seed. Leave some plants to flower in May, and they will ripen abundance of seed in July.

Subsect. 15. *Burnet.* — *Poterium Sanguisorba*, L. (*Eng. Bot.* t. 860.); *Monæc. Polyand.* L.; and *Rosaceæ*, J. *Petite Pimprenelle*, Fr.; *Pimpernelle*, Ger.; and *Pimpinella*, Ital.

1366. This is a hardy perennial plant, indigenous in Britain, and found in dry upland calcareous soils. The leaves are pinnated, and form a tuft next to the root; but are alternate on the stem: the leaflets are partly round-shaped, partly pointed, and much serrated on the edges. The stem rises fifteen inches high, and the flowers form small greenish heads tinged with purple in July.

Use. Burnet leaves are sometimes put into salads, and occasionally into soups, and they form a favourite herb for cool tankards. When slightly bruised, they smell like cucumber, and they have a somewhat warm taste. They continue green through the winter, when many other salad plants are cut off, or in a state unfit for use. It was formerly in much greater repute than at present.

Propagation and Culture. The plant may be raised from seed; of which half an ounce will suffice for a bed three feet by four. It may either be sown in spring or early in autumn. It may also be very readily propagated by parting the roots early in spring. When the plants are of two or three inches growth, transplant into rows, or a bed, at six inches plant from plant. Cut down all flower-stalks not intended for seed.

Subsect. 16. *Wood Sorrel.* — *Oxalis acetosella*, L. (*Eng. Bot.* 762.); *Decan. Pentag.* L.; and *Geraniæ*, J. *Oseille*, Fr.; *Sauerampfer*, Ger.; and *Acetosa*, Ital.

1367. This is an indigenous perennial plant, found in woods, and by hedge-sides, and in moist, shady situations. It has a scaly, bulbous, articulate root, and ternate, obcordate hairy leaves. The flowers rise from the root singly, are of a pale flesh color, and appear in April and May.

Use. The leaves form a very grateful addition to salading, and communicate an agreeable relish to dishes of mashed greens.

Culture. The plant is readily propagated by dividing the roots, and may be planted in a moist, shady situation in bog earth. Here, by preventing the plants from coming into flower, and cropping the herb of a part of the plantation two or three times in the season, a supply of fresh young leaves may be obtained from April to October.

Subsect. 17. — *Small Salads.*

1368. This title comprises principally the small herbs, or very young plants, which are used in the seed-leaves as salads; such as cress, mustard, radish, and rape; also the lamb-lettuce. Others, such as sorrel, are either pot-herbs or salad-herbs. Sometimes the white cabbage, lettuce, endive, and succory, are also sown, to be cut young, as small salads, early in the spring. The small salads are occasionally used by themselves, when there is a deficiency of the greater salad plants, the lettuce, endive, celery, &c. But when both kinds can be had, they are in general combined.

Culture. Sow very thick in drills, or on beds of very finely pulverized soil, watering in dry weather to accelerate germination and the succulency of the plants. Early in spring sow under glass, or in a warm sheltered situation, and in winter in pots and boxes to be placed in some of the forcing-houses, or in the stove; or sow in the borders of the forcing-houses, or in hot-beds or pits, &c. Observe, that a supply is wanted in most families throughout the year.

Gathering. Cut off the seed-leaves and about half their footstalks, as soon as the former are expanded; some prefer letting small salading grow till one or two of the proper leaves appear, in which case it is of a stronger flavor.

Sect. VIII. *Pot-Herbs and Garnishings.*

A very small portion of the kitchen garden, perhaps not above two or three poles, even in the largest, will suffice for rearing this tribe; and with the exception of parsley, marygold, and Indian cress, they are rarely found in those of the cottager.

Subsect. 1. *Parsley.* — *Apium Petroselinum*, L.; *Pent. Trig.* L.; and *Umbelliferæ*, J. *Persil*, Fr.; *Petersilie*, Ger.; and *Petroselino*, Ital.

1369. This is a hardy biennial, a native of Sardinia, and introduced in 1548. It is so common as to be naturalized in several places both of England and Scotland. The root-leaves are compound, and much curled in some varieties. The flowers are pale yellow, and appear in June; they have usually one leaflet at the origin of the universal umbel; and an involucre of from six to eight short folioles, fine almost as hairs, to the partial umbel.

"It may be right to notice, that the poisonous plant called fool's-parsley (*Æthusa Cynapium*), a common weed in rich garden soils, has sometimes been mistaken for common parsley. They are very easily distinguished: the leaves of fool's-parsley are of a darker green, of a different shape, and, instead of the peculiar parsley smell, have, when bruised, a disagreeable odour. When the flower-stem of the fool's-parsley appears, the plant is at once distinguished by what is vulgarly called its *beard*, three long pendent leaflets of the involucrum. The timid may shun all risk of mistake by cultivating only the curled variety. This last, it may be remarked, makes the prettiest garnish." *Neill.*

Varieties. These are:

The common plain-leaved; seldom cultivated.
The curled thick leaved; most esteemed.
The broad-leaved, or large-rooted Hamburgh; cultivated for its carrot-shaped root.

Use. The leaves of the two first varieties are used as pot-herbs at all seasons of the year; also as a garnish. The third kind is esteemed for its large white carrot-shaped root, drawn in autumn and winter, like parsnips, for the table; and occasionally to be used in medicine, being a good remedy for the gravel.

Culture of the Pot-Herb kinds. "One sowing in spring will mostly furnish young leaves all the year; though, to answer a constant demand, many persons make successive sowings from February to May. Some also sow early in autumn for young parsley in winter and spring; but such a supply is better provided by cutting down established plants. Sow in a single drill, along the edge of any compartment, or occasionally in rows nine or twelve inches asunder. Draw small drills, something less than an inch deep; in which drop the seed moderately thick, and cover a little above half an inch. The plants will come up in three or four weeks, and when two or three inches high may be gathered as wanted, all the summer, winter, and following spring, till May, when they will go to seed. Have always a young crop sown timely in the spring, to succeed the declining old plants. In gathering pot-herb parsley, cut close and regular. In summer, when the plants grow rank, yielding more leaves than can be used, cut them in close to the bottom, and they will shoot up stocky in a regular close growth. Observe also to do the same in autumn, about the end of September, that the plants may form heads of fresh young leaves before winter. On the approach of frosty weather, protect them with haulm or reed pannels, laid upon branches of birch or other light supports.

Culture of Hamburgh Parsley. "To obtain large roots, allot a compartment where the soil is deep, and has been well digged. Any common mould will suit, if dry and not too rank. Sow in February, March, or early in April, in one or more beds; either in drills nine inches asunder, or broast-cast, and rake in. The plants should be thinned to nine inches' distance, to give room for proper growth in the roots; for use in August, September, October, and thence till the following spring. On the approach of frost, take up some roots, and preserve them in sand. A sowing may be made in the third week in June, where young roots are wanted in winter.

To save Seed. "Permit some old plants to run to stalks in May: they will produce plenty of seed, ripening in July or August." *Abercrombie.*

SUBSECT. 2. *Purslane.* — *Portulaca oleracea*, L.; (*Plant. grass*, 123.) *Dodec. Monog.* L.; and *Portulaceæ*, J. *Pourpier*, Fr.; *Portulak*, Ger.; and *Porcellana*, Ital.

1370. This is an annual plant, a native of South America, and introduced in 1652. It has a round, smooth, rather procumbent stem, and diffused branches; the leaves somewhat wedge-shaped and fleshy; the flowers, yellow and sessile, appear in June and July.

Use. The young shoots and succulent leaves are esteemed cooling, and are used in spring and summer as an ingredient in salads, and as pot-herbs and pickles. The plant was formerly much more in request than at present.

Varieties. There are two varieties of the *P. oleracea* cultivated, the green and the golden. The latter is by some considered as a distinct species (*P. sativa*). It has rather larger leaves, and is less succulent than the P. oleracea.

Culture. Both sorts are raised from seed, and for a bed four feet by four feet, sown either broad cast or in drills, nine inches apart, one-eighth of an ounce will suffice. "Each variety is somewhat tender; the green, which is usually preferred, is perhaps rather the hardiest. An early crop may be sown in February or March, on a moderate hot-bed: the plants will require the aid of a gentle heat till the middle of May; when the seed may be sown in a warm border. If a continued succession is required, sow every month during summer, till August, or while the plant can be raised; generally in small drills, from three to six inches asunder. The plants will soon come up: they should remain where sown. In very dry hot weather, water thrice a week. The shoots may be gathered for use when they are from two to five inches in height, and are well furnished with leaves. Cut them off low, and the bottom part will soon sprout out again.

To save Seed. "Leave some of the first open-border plants to run; they will give ripe seed in autumn." *Abercrombie.*

SUBSECT. 3. *Tarragon.* — *Artemisia Dracunculus*, L. (*Blackw. t.* 116.); *Syng. Polyg. Super.* L.; and *Corymbiferæ*, J. *L'Estragon*, Fr.; *Dragun*, Ger.; and *Dragoncello*, Ital.

1371. This is a perennial plant, a native of Siberia, but cultivated in our gardens in the time of Gerarde, in 1548. Its branched stem rises a foot and a half high, and has narrow leaves, green on both sides. The smell of the plant is fragrant, and its taste aromatic.

Use. The leaves and tender tips are used as an ingredient in pickles. A simple infusion of the plant in vinegar makes a pleasant fish sauce. In France it is employed on account of its agreeable pungency, to correct the coldness of salad herbs; it is also put in soups, and other compositions.

Culture. "Avoid planting tarragon in a wet tenacious soil; as in that case the root is apt to perish in a severe winter. This herb may be propagated in the spring, by seed; or, more expeditiously, by off-set bottom slips, or sections of the root and top, planted in spring or autumn: also plentifully in summer, from June to August, by slips or cuttings of the spring stalks or branch shoots. The germs are to be planted in beds or borders from six to nine inches apart, and properly watered. They will quickly increase in a branchy head, for use the same year, to gather green, as wanted; and a portion may be dried and housed for winter. When the stems are running up for flower, if seed is not wanted to be saved, cut them down; which will force out fresh young shoots. It would be proper, towards the end of autumn, to transplant some full plants close under a south fence, to preserve them more effectually in winter, and cause an earlier production of young tops in spring.

To obtain Green Tarragon in Winter. "Plant some stocky roots in a hot-bed, or in pots placed in a hot-house." *Abercrombie.*

Subsect. 4. *Fennel.* — *Anethum Fœniculum*, L.; (*Eng. Bot.* t. 1208.) *Pent. Trig.* L.; and *Umbelliferæ*, J. *L'Aneth*, Fr.; *Dillkraut*, Ger.; and *Aneto*, Ital.

1372. This is a perennial plant, naturalized in England, and found in chalky soils. The plant rises with finely cut leaves, and capillary leaflets, on a smooth dark-green branched tubular stalk, to the height of five or six feet. On the summit are produced umbels of gold-coloured flowers, in July and August. The whole plant is aromatic, and has long been an inmate of the garden.

Use. The tender stalks of common fennel are used in salads; the leaves boiled, enter into many fish sauces; and raw, are garnishes for several dishes. The blanched stalks of the variety called *finochio* are eaten with oil, vinegar, and pepper, as a cold salad, and they are likewise sometimes put into soups.

The *Varieties* are:

The common, or sweet.
Dark green leaved.
Dwarf, or finochio. This variety is characterized by a tendency in the stalk to swell to a considerable thickness.

This thickened part is blanched by earthing up, and is then very tender. "Owing to the peculiar nature of this variety," Neill observes, "it is more tender than the common fennel, and often perishes in the course of the winter. Misled by this circumstance, several horticultural writers describe it as an annual species, under the appellation *A. segetum.*"

Propagation. They are all raised from seed, of which half an ounce is sufficient for a seed-bed four feet by six feet. Sometimes also, they are raised from offsets from the old plants, where only a few are wanted. "Sow in the spring in light earth, either in drills from six to twelve inches apart, or broad-cast and raked in. When the plants are three or four inches high, thin or transplant a quantity fifteen inches asunder. As the roots of old plants divide into side offsets, these may be slipped off in spring, summer, or autumn, and planted a foot apart. They will produce immediate leaves for present supply, and in continuance; or for an immediate larger supply of leaves, you may procure some established full roots, and plant as above; let them be well watered.

Subsequent Culture. "The same plants remain several years by the root: but as fennel sends up strong stems for seed in summer, these, or a part of them, should be cut down, to encourage a production of young leaves below, in succession. It is apt to spread more than is desirable, if suffered to seed. The swelling stems of the finochio variety, when of some tolerable substance, should be earthed-up on each side five or six inches to blanch them white and tender. This will be effected in ten days or a fortnight; and by successive sowings, or cutting down plants during summer, successive crops of blanched stalks may be had from June to December.

"*To save Seed.* Permit some of the best stalks to shoot; they will produce large umbels of seed in autumn." *Abercrombie.*

Subsect. 5. *Dill.* — *Anethum graveolens*, (*Blackw. t.* 545.) L.; *Pent. Trig.* L.; and *Umbelliferæ*, J. *L'Aneth*, Fr.; *Dill*, Ger.; *Aneto*, Ital.

1373. It is a hardy biennial plant, a native of Spain, and introduced in 1570. The plant is of upright growth, somewhat similar to fennel, but smaller. It has finely divided leaves, and a slender single stem, bearing an umbel of flowers at top, which appear in June and July. The whole plant is powerfully aromatic.

Use. The leaves are used to heighten the relish of some vegetable pickles, particularly cucumbers; and also occasionally in soups and sauces. The whole herb is also used in medical preparations.

Culture. It is raised from seed, of which half an ounce is sufficient for a bed three feet by four feet. "Sow annually in February, March, or April, or occasionally in autumn, as soon as the seed is ripe, to come up stronger in the spring, in any open compartment; either in drills, six to twelve inches apart; or broad-cast thinly, and raked in evenly. The plants should remain where raised; and may be thinned moderately, should they rise too thick. They will shoot up in stalks, with leaves and seed umbels in summer and autumn, for use in proper season.

To save Seed. "Leave some plants where raised: they will furnish plenty of seed in autumn. Or from self-sown seeds, many plants rise spontaneously in the spring." *Abercrombie.*

Subsect. 6. *Chervil.* — *Scandix Cerefolium*, L.; and *Chærophyllum sativum of Persoon's Synopsis Plantarum* (*Eng. Bot.* 1268.); *Pent. Dig.* L.; and *Umbelliferæ*, J. *Cerfeuil*, Fr.; *Gartenkerbel*, Ger.; and *Cerfoglio*, Ital. (*fig.* 327).

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1374. It is an annual plant, a native of various parts of the continent of Europe, and sometimes observed naturalized in our gardens in England. The plant rises from a foot to near two feet high; the leaves are of a very delicate texture, three times divided, and the flowers, of a whitish color, appear in June. There is a variety cultivated in the Paris gardens with beautifully frizzled leaves.

Use. The tender leaves are used in soups and salads; but are much less in demand now than formerly.

Culture. It is propagated from seed; and for a bed four feet by four, a quarter of an ounce is sufficient. "Sow a bed or two in August and September, as well to come in use at the end of the same autumn, as to stand for winter and spring. If a continued succession be required in spring and summer, begin to sow again in the last fortnight of February, and sow a portion every month till August, or twice a month in the midst of summer; as the plants of the spring and summer sowings soon run up for seed. Sow the seed in shallow drills, from six to nine inches apart, and earth in lightly; or sow occasionally broad-cast, and rake in evenly, just covering the seed. The plants are to remain where sown. When the leaves are two, three, or four inches in growth, they are proper for gathering. Cut them off close, they will shoot up again, and may be gathered in succession, though the plants of the spring and summer sowing soon spindle up into seed stalks, ceasing to produce young leaves, which are the useful parts.

To save Seed. "Leave some plants in the spring: they will shoot to stalks, and give ripe seed in July or August." *Abercrombie.*

Subsect. 7. *Horse-Radish.* — *Cochlearia Armoracia*, L. (*Eng. Bot.* 2223.); *Tetrad. Silic.* L.; and *Cruciferæ*, J. *Cranson*, or *Le Grand Raifort*, Fr.; *Merrettig*, Ger.; and *Ramolaccio*, Ital.

1375. This is a perennial plant, growing naturally in marshy places, and by the sides of ditches, in some parts of England. The leaves are very large, oblong, sometimes smooth, and at other times notched at the edges; on the stem they are sometimes deeply pinnatifid; the flowers are white, and appear in loose panicles in May and June. It has been long cultivated in gardens, and forms one of the most profitable articles raised by the market gardener.

Use. The root scraped into shreds is a well-known accompaniment of English roast beef. It is also used in winter salads, in sauces, and sometimes eaten raw.

Propagation and Culture. The following excellent instructions are by J. Knight:

"Horse-radish thrives best in deep, soft, sandy, loam, that is not very dry in summer, nor inundated in winter: the situation must be open. During winter, trench the ground three feet deep, and in the following February procure your sets, in the choice of which take the strongest crowns or leading buds from old plants, cutting them about two inches long. Mark out the ground in four feet beds and one-foot alleys; then take from the first bed nine inches of the top soil, laying it upon the adjoining bed; after which take out an opening at one end of the bed, in the common way of trenching, fifteen inches deep from the present surface; then level the bottom, upon which plant a row of sets across the bed, at nine inches apart each way, with their crowns upright; afterwards dig the next trench the same width and depth, turning the earth into the first trench over the row of sets: thus proceeding, trench after trench, to the end.

"Where more than the produce of one bed is required for the supply of the family for twelve months, the third bed is next to be planted, which treat as directed for the first, only observing to lay the earth on the fourth, and so on for any number of beds. Upon every alternate bed, which is not planted, a dwarf annual crop may be grown.

"The plants must be kept clear from weeds during summer; and as soon as the leaves decay in autumn, let them be carefully raked off with a wooden-toothed rake; in the following February, eighteen inches of the earth of the unplanted bed must be laid as light as possible, and equally over the beds that are planted; then trench and plant the vacant beds exactly in the same manner as before directed. The following autumn, the first planted horse-radish may be taken up, by opening a trench at one end of the bed to the bottom of the roots, so that the sticks or roots of horse-radish may be taken up entire and sound, which for size and quality will be such as have not generally been seen. The following February the one-year old crop will require additional earth as before directed, which must of course be taken from those beds which are now vacant, which, when done, if the ground appears poor, or unlikely to produce another vigorous crop, they must have a coat of manure." *Hort. Trans.* i. 207.

Preserving. Horse-radish, if dug up in autumn, may be preserved through the winter in sheds or cellars, among sand or dry earth.

Subsect. 8. *Indian Cress*, or *Nasturtium*. — *Tropæolum majus*, L. (*Bot. Mag.* 23.); *Octan. Monog.* L.; and *Geraniæ*, J. *Capucine*, Fr.; *Kapuzinerblume*, Ger.; and *Fior Cappucino*, Ital.

1376. This is a hardy annual, a native of Peru, introduced in 1686. The stalks, if supported, will rise eight or ten feet high; the leaves are peltate, or have their petiole fixed to the centre of the leaf; the flowers are very shewy, of a brilliant orange colour, and continue in succession from July, till destroyed by frost. In its native country, it endures several seasons; but here, being unable to sustain our winter, it is treated as an annual plant, and requires to be sown every year.

Use. The flowers and young leaves are frequently eaten in salads; they have a warm taste, like the common cress, thence the name of *nasturtium*. The flowers are also used as a garnish to dishes, in which they form a brilliant contrast with the flowers of borage. The berries are gathered green and pickled, in which state they form an excellent substitute for capers.

Varieties :

There is a variety with double flowers, which is propagated by cuttings, and requires to be treated as a green-house plant. The flowers are preferable for garnishing.

The *Tropæolum minus*, a native of Peru, and introduced in 1596, nearly a century before the other, is also sometimes cultivated for culinary purposes; but is of weakly growth, and by no means equal to the common in produce.

There is also a variety of this species with double flowers, propagated by cuttings, and preserved through the winter under glass; but, like the double variety of *T. majus*, it is more ornamental than useful.

Culture. The single varieties of both sorts are raised from seed, of which one ounce will sow twenty-five feet of drill. The plants will thrive in almost any soil, but a light fresh loam is best, as less likely to make the plants grow rank and luxuriant, and produce few berries, which one that is rich is apt to do. Care must be taken to select good sound seed, berries of the last year, for those of greater age will not grow at all, or not freely and regularly. "Sow in March or April, or not later than the beginning of May, in one small crop, of one, two, or three rows, for a moderate family. Either allot the large sort a situation in a single row, near a vacant fence, trellis, or wall, on which the runners may be trained; or divide an open compartment into rows, three or four feet asunder, to admit sticks for their support. Form drills an inch and half deep; in which deposit the seeds two or three inches apart, and earth them over evenly. When the plants begin to advance in runners, let them be trained to a fence or trellis. It is generally necessary, at first, to conduct the main runners, but they will afterwards climb unassisted.

Taking the Crop. "For pickling, let the berries just attain their full size, but pluck them while green, plump, and tender.

To save Seed. "Permit a sufficiency of the berries to remain till mature. In August and September, gather them as they ripen; spread them to dry and harden; then put them up for sowing next year." *Abercrombie.*

Subsect. 9. *Marigold.* — *Marigold*, or *Pot-marigold*, *Calendula officinalis*, L.; *Syng. Polyg. necess.* L.; and *Corymbiferæ*, J. *Souci du Jardin*, Fr.; *Ringelblume*, Ger.; and *Fiorrancio*, Ital.

1377. This is an annual plant, a native of France and Spain, and known in this country since 1573. It has a short divaricated stem, dividing into numerous branches, from one to two feet in height, and furnished with blunt lanceolate leaves. The yellow flowers proceed from the ends of the branches, and last from June till killed by the frost. It is one of the oldest and best known inhabitants of our gardens. "Its flowers," Gerarde observes, "having been formerly in much repute as comforters of the heart." Though little faith is now placed in its virtues, it still keeps its place in most cottage gardens, both in England and Scotland, though rarely applied to any culinary purpose.

Use. Marshal observes, that "the flower is a valuable ingredient in broths and soups, however much it may have got into disuse." The dried flowers are also used in domestic medicine.

The *Varieties* are:

The single orange flowered; most aromatic and proper for keeping.
The single lemon flowered; rather less aromatic.
The double flowered of both varieties.
The childing or proliferous; sends out small flowers from the margins of the calyx of the large central-flowers, cultivated chiefly for ornament.

Culture. Sow in February, March, or April, and for a seed-bed four feet by four feet, sown in drills a foot asunder, a quarter of an ounce will suffice; "or you may deposit the seed in autumn (September), to have it come up forwarder in the spring, though the spring-sowing will come up in very good time. Sow on a light dry soil, either in drills a foot asunder, or broad-cast; and rake in the seed. When the plants are up two or three inches in growth, thin them to about twelve or fifteen inches asunder, or they may be transplanted with that interval. They will grow freely in either method, and come into flower the following May or June, and continue flowering in plentiful succession throughout summer and autumn; to be cut for use as wanted. A store for winter should be gathered when in full flower, spread to dry out of the sun, and afterwards put up in paper bags.

To save Seed. "The flowers, as far as they are left to run, will in autumn produce a competency." *Abercrombie.*

Subsect. 10. *Borage.* — *Borago officinalis*, L.; *Pent. Monog.* L.; and *Boragineæ*, *B. P.* (*Eng. Bot.* 36.) *Bourrache*, Fr.; *Borragen*, Ger.; and *Borragine*, Ital.

1378. This is an annual, and sometimes a biennial plant, with the lower leaves oblong, alternate, and spread on the ground; the flower-stem rises nearly two feet high; and with the leaves are rough with white bristly hairs. The light blue flowers make a beautiful appearance, and are produced for several months in succession, beginning with May. It is a native, or naturalized in several parts of Britain.

Use. The young leaves and tender tops are used occasionally as salads, and to furnish a boiled dish in summer and autumn. The plant was formerly in high estimation as a cordial herb for driving away sorrow; but "very light surely," says Sir J. E. Smith, "were those sorrows that would be so driven away." The spikes of the flowers form an ingredient in negus and cool tankards, and the blossoms are occasionally employed as a garnish. The juice of the plant affords nitre, and the withered stalks have been observed to burn like match-paper.

Course of Culture. It is raised from seed, and for a bed four feet and a half by six feet, one ounce is requisite. "Sow every year in the spring, any time in February or March, till May, &c. for summer supply; and in any of the summer months, for youug borage in autumn, as the plants of the spring and early summer sowings soon run up to stalks in the same year; and in July or August and September, to furnish young leafy plants for winter and following spring. A small crop of each sowing will be sufficient for the supply of a family. This herb loves a dry soil. Sow either broad-cast, and raked in, or in small drills six to twelve inches asunder. Where the plants rise too close, thin them to that distance. Although this herb will grow when transplanted, it prospers best when it remains where sown. Where the young leafy tops and flower-spikes are in demand, permit the stem to run up.

To save Seed. "Leave some of the plants which first run: they will produce plenty of seed in autumn: and from self-sown seeds many young plants will come up spontaneously." *Abercrombie.*

Sect. IX. *Sweet Herbs.*

One or two plants of this class, as the lavender, peppermint, and some other mints, are extensively cultivated by market-gardeners for the druggists; but a very few square yards of the private kitchen-garden will suffice to cultivate as much of each as is ever wanted by any family. The thyme, mint, sage, and tansey, appear in single plants in the border of the cottager's garden.

Subsect. 1. *Thyme.* — *Thymus vulgaris*, L.; *Didy. Gymnos.* L.; and *Labiatæ*, J. *Thym*, Fr.; *Thimian*, Ger.; and *Timo*, Ital.

1379. There are two species cultivated for culinary purposes, the common, and the lemon-thyme.

Common or *Garden Thyme*, is the *Thymus vulgaris*, L.; a low evergreen under-shrub, a native of Spain and Italy, and cultivated in this country since 1548, and probably long before. It seldom rises above a foot high, has smaller flowers than the common wild thyme, and is more delicate in its flavor. There are two varieties, the *broad* and the *narrow leaved*, besides the *variegated*, grown for ornament.

Lemon Thyme is the *T. citriodorus*, P. S.; a very low evergreen shrub, trailing and seldom rising above four or six inches in height. It is readily distinguished from the former, and from wild thyme, of which it has generally been considered as a variety, by its strong smell of lemons, as the trivial name imports.

Use. The young leaves and tops are used in soups, stuffings, and sauces. For these purposes, the broad-leaved common is generally preferred; but the flavor of the yellow is much liked in peculiar dishes.

Culture. " To raise the plant from seed is the general and most eligible method. It is occasionally multiplied by parting the roots of stocky close plants, and by slips of the young shoots.

By seed. " Sow in March or April in a bed or border of light fine earth, either broadcast scattered thin, and raked in lightly, which is the general course, or in small shallow drills, six inches asunder: the young plants may either remain, or be transplanted in the summer, when two or three inches high. A portion may be drilled, for an edging to a border. Give occasional light waterings in dry, warm weather, both before and after the plants are up. As soon as they are from three to five inches in growth, in June or July, taking the opportunity of rain, thin some out, and plant six inches asunder, and water at planting. Others may be planted in a single row to form an edging to a border, either set close to form at once a full edging, or as far as three inches apart. Seedlings thus treated will come in for use the same year.

" Those who raise considerable supplies of thyme for the markets, usually sow large portions thickly in beds, to remain till of useful growth; then to be drawn off root and top together, at different seasons, as wanted; it is then tied in small bunches for market. Some persons also transplant considerable portions in spring and summer, to six, ten, or twelve inches' distance, to form a stocky full growth, to be drawn off in large bushy plants.

By Offsets. " Thyme is also propagated by slips of the branchy shoots in the spring, or early in autumn; but more effectually by sections of the stool, top and root together, or by removing rooted branches. To make branches quickly root, loosen the mould about any established bushy plants, in spring or summer, and lay some fresh earth a small depth upon the spreading shoots: they will all be well-rooted the same year for planting off. Plant in light rich earth: shade and water till rooted. In autumn, to provide against the effects of frost on exotic evergreens, dry and house a store for winter; either cutting the tops, or drawing entire plants.

To save seed. " It is produced abundantly, and ripens in summer and autumn. Gather the seed-spikes, spread them upon a cloth to dry; rub out clean, and put the seeds up for sowing the following year." *Abercrombie.*

Subsect. 2. *Sage.* — *Salvia officinalis*, L. (*Ger. Herb.* 623. *f.* 1.); *Dian. Monog.* L.; and *Labiatæ*, B. P. *Sauge*, Fr.; *Salbey*, Ger.; and *Salvia*, Ital.

1380. This is an evergreen under-shrub, a native of the south of Europe, and mentioned by Gerarde, in 1597, as an inhabitant of our gardens. It rises about two feet high, with wrinkled, green, cinereous leaves, white, or tinged with white or dusky purple. The flowers are terminal, in long spikes, of a blue color, and appear in June and July.

Use. " The leaves are used in stuffings and sauces for many kinds of luscious and strong meats; as well as to improve the flavor of various articles of cookery. The decoction called sage-tea is usually made from one variety, the small-leaved green or *sage of virtue*; but any of the others are equally fit for this purpose.

Varieties. " These are:

The common, or red. | The green. | The small-leaved green, or sage of virtue. | The broad-leaved, or balsamic.

Estimate of Sorts. " The red is the principal sort in culinary use, having the most agreeable and fullest flavor; the green is next in estimation with the cook: but the small-leaved is generally preferred to those to eat as a raw herb, and for decoctions; while the broad-leaved balsamic species is the most efficacious in a medical way, and is also a tea-herb. However, any of the sorts may be occasionally used for those alternate purposes.

Culture. " All the varieties may be propagated by slips or cuttings of the young shoots, taken from March to June; but most successfully in May and June, by detaching the young shoots of the same year. The outward shoots are to be preferred; slip or cut them off five or six inches long, stripping off the under-leaves, and preserving the top-leaves entire: plant them in a shady border, six inches asunder, inserting them quite down to the top-leaves, and water them. They will soon take root freely, especially the young shoots planted in May and June. In the advancing growth, if they spindle up in flower-stalks, pinch or cut that part down, that the plants may shoot out full and stocky from the bottom in close bushy growth for use the same year. In gathering sage for use, cut or slip off the young side and top-shoots neatly; and be careful not to stub too close, especially towards winter, and during that season. In July and the rest of summer, it is usual to gather some of young top growth to dry for winter. Keep the plants in regular bushy heads by cutting away disorderly growths, and the decayed flower-stalks in autumn. Keep them clear from weeds; and sometimes loosen the earth between and about the plants, with a hoe, garden-trowel, or small spade, in spring and autumn. Make a fresh plantation once in two, three, or four years, or as may be necessary by the plants becoming naked, stubby, and dwindling." *Abercrombie.*

Subsect. 3. *Clary.* — *Salvia sclarea*, L. (*Fl. Græc.* i. t. 27.); *Dian. Monog.* L.; and *Labiatæ*, B. P. *Orvale*, Fr.; *Scharlachkraut*, Ger.; and *Schiarea*, Ital.

1381. This plant is a hardy biennial, a native of Italy, introduced in this country in 1562. The lower leaves are very large, the stem is about two feet high, clammy to the feel; the flowers are in loose, terminating spikes, composing whorls, and of a pale blue colour.

Use. The leaves are sometimes used in soups, though some dislike its scent. Its flowers are used for a fermented wine, and the whole plant is, like sage, esteemed medicinal.

Culture. Clary is raised from seed, and sometimes from cuttings and slips. A small bed will supply most families; and, if raised from seed, a quarter of an ounce will suffice for a seed-bed to be transplanted from two feet by two. Sow in the last fortnight of March, or the course of April, in any bed or border thinly, and rake in the seed. In summer, when the plants are advanced two or three inches, transplant a portion of the strongest from twelve to eighteen inches apart, to allow competent room for the leaves to spread into full growth, when they will be fit for use the same year, and in continuation through winter until the following spring and summer.

To save Seed. In the spring, allot some old plants to run up into stalk: these will yield ripe seed in autumn.

Subsect. 4. *Mint.* — *Mentha*, L.; *Didyn. Gymnos.* L.; and *Labiatæ*, J. *Menthe*, Fr.; *Münze*, Ger.; and *Erba Santa Maria*, Ital. (*fig.* 328.)

1382. There are several species of this plant cultivated in gardens; all of them indigenous perennials. The principal are:

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Peppermint, *M. piperita*, L. (*Eng. Bot.* 687.) (*a*) This species may readily be distinguished by its subcamphorated odor, and blackish-purple flowers, which appear in August and September. It is found in watery places.

Use. Almost entirely for distillation, for which it is extensively cultivated in low, rich, soft, marshy lands, especially such as can be irrigated or flooded.

Spearmint, *M. viridis*, L. (*Eng. Bot.* 2424.) (*b*) This sort rises from two to three feet high, with sessile, lanceolate, naked leaves; the whole plant has a reddish-green hue; is occasionally found in marshy situations, and flowers in August. There is a narrow and a broad-leaved variety.

Use. The young leaves and tops are used in spring salads, and form an ingredient in soups they are also employed to give flavor to certain dishes, as peas, &c., being boiled for a time, and then withdrawn in the manner of garlic.

Pennyroyal Mint, *M. pulegium*, L. (*Eng. Bot.* 1206.) (*c*). *Pouliot*, Fr.; *Poley*, Ger.; and *Puleggio*, Ital.; is a trailing plant with small, smooth, ovate leaves. It is indigenous in watery pastures, and places subject to inundations. It flowers in September.

Use. In different branches of cookery, and also for distilling pennyroyal-water.

Culture. All "the species are raised by the same methods, viz. by parting the roots, by off-set young plants, and by cuttings of the stalks.

"By the roots. This is performed in spring or autumn. Having some full roots from any established beds, divide them as expedient; and drawing drills with a hoe, about two inches deep, and six inches asunder, place the roots in the drills, moderately close, and earth them over to an equal depth.

"By off-sets, in the spring. Procure these from established plants, and dibble them, in rows, six inches asunder.

"By cuttings of the young stalks in May, June, or advanced summer. Taking the opportunity of showery weather, cut them into lengths of five or six inches; and plant the cuttings by dibble, six inches apart, inserted half way into the earth.

Soil. Spearmint and peppermint like a moist soil; pennyroyal a strong loam.

Subsequent Culture. "Propagated in any of the above methods, the plants set in spring or summer will come into use the same year. Water new plants till they take root. Keep them clean from weeds. At the end of autumn, cut away any remaining stems; at which season, or in spring, spread a little loose earth thinly over the beds.

Taking the Crop. "For culinary use, or salads, gather both when the young green tops are from one inch to six inches in length, and in their advanced growth, throughout the summer. When nearly full grown in June, July, or August, or beginning to flower, gather a store for winter. Spread the heads thinly in some dry place, shaded from the sun, to be well dried: then, tied in bunches, house the store. When designed for distilling, let them attain full growth, coming into flower; then cut, and use the heads immediately.

"The pepper-mint, being principally used for distilling, and such of the pennyroyal as is wanted for the same purpose, should stand till they begin to flower; being then in highest perfection. Cut in dry weather and tie in bunches, and carry under cover, ready for immediate use. Cut full-grown stalks close to the bottom.

New Plantation. "All the species continue by the roots many years; but when the plants shoot dwindling, or weakly, make a fresh plantation in time.

Forcing Spear-mint. "Mint, in a young green state, may be obtained all winter, and early in spring, by planting some roots in a gentle hot-bed, or in pots or shallow pans, to be plunged therein. Plant the roots pretty thickly, and earth over an inch and a half deep; or some roots, thus planted in pots or boxes, may be placed in a stove. Plant for succession every three weeks, as forced roots soon decay."

In order to have young leaves and tops all the summer, cut down some advanced stalks every month, when new shoots will be thrown up; and to have dried balm for the winter, permit others to complete their growth, and come into blossom. These last are to be cut as soon as the dew is off in the morning, for in the afternoon, and especially during bright sunshine, the odour of the plant is found to be much diminished. Dry the crop thus gathered in the shade, and afterwards keep it in small bundles, compactly pressed down, and covered with white paper. By the common mode of hanging up balm and other herbs in loose bundles, the odor soon escapes.

The balm having a travelling root, the bed soon becomes covered, so as not to admit of further culture; hence, after four or five years' standing, a fresh plantation will require to be made.

SUBSECT. 5. *Marjoram.* — *Origanum*, L.; *Didy. Gymnos.* L.; and *Labiatæ*, J. *Marjolane*, Fr.; *Marjoran*, Ger.; and *Maggiorana*, Ital.

1383. Of this genus four different species are cultivated; the *Pot*, *Sweet*, *Winter*, and *Common*.

Pot Marjoram is the *O. Onites*, L. (*Bocc. Mus.* t. 38.); a hardy perennial undershrub, a native of Sicily, introduced in 1759. The stem rises more than a foot high, and is covered with spreading hairs; the leaves are small and acute, almost sessile, and tomentose on both sides. Though hardy enough to withstand our winters, it seldom ripens its seeds in this country. It is in flower from July to November, and is propagated from seed, but chiefly from rooted slips.

Sweet Marjoram is the *O. Marjorana*, L. (*Moris.* s. 11. t. 3. f. 1.); a hardy biennial, a native of Portugal, and introduced in 1573. It resembles the *O. Onites*, but the leaves have distinct petioles, and the flowers which appear in June and July, are collected in small close heads; and hence it is often called knotted-marjoram. As the seed seldom ripens in this country, it is generally procured from France. When in blossom, the herb is cut over, and dried for winter use, so that a sowing requires to be made every year.

The *Winter Sweet Marjoram* is the *O. Heracleoticum*, L. (*Lob. Ic.* 492.); a hardy perennial, a native of Greece, and introduced in 1640. The leaves of this species resemb e those of *O. Marjorana*; but the flowers come in spikes. It flowers from June to November; requires a sheltered dry soil, and seldom ripening its seeds in this country, is propagated by cuttings and slips.

The *Common Marjoram* is the *O. Vulgare*, L. (*Eng. Bot.* 1143.); a hardy perennial, a native of Britain, and found under thickets and copses on chalky soils. It bears a considerable resemblance to the last-named species. The flowers arise in subrotund panicles, in smooth-clustered spikes, of a reddish color, in July and August. This species is only used in cookery in default of one of the others.

Use. All the species, but especially the three first, are aromatics, of sweet flavor, much used as relishing herbs in soups, broths, stuffings, &c. The young tender tops and leaves together are used in summer in a green state; and they are dried for winter.

Culture. The three first species prefer a light dry soil; the other, a calcareous soil and shady situation. Though the *O. Marjorana*, or sweet marjoram, be a biennial in its native country, and here, when it receives the aid of a green-house through the winter, yet, in the open garden, it requires to be treated as an annual, and sown and reaped the same year. For a seed-bed three feet by three feet, a quarter of an ounce of seed is sufficient. Sow in April on a compartment of light earth, either in small drills, or broad-cast; or sow a portion in a hot-bed, if requisite to have a small crop forwarded. When the plants are one, two, or three inches high, thin the seed-beds; and plant those thinned out in a final bed, six inches apart, giving water; or, where larger supplies are required, some may remain thick where sown, to be drawn off by the root as wanted. The pot, winter, and common marjoram may be propagated from off-sets by parting the roots in spring and autumn. Plant in rows or in beds, allowing a square foot for each plant.

Gather the tops of all the sorts as wanted for summer use; and when in full blossom, in July or August, for preservation through the winter.

Subsect. 6. *Savory.* — *Satureja*, L.; *Didyn. Gymnos.* L.; and *Labiatæ*, J. *Sariette*, Fr.; *Saturei*, Ger.; and *Satoreggia*, Ital.

1384. Two species of this genus are cultivated, the winter and summer savory.

Winter Savory is the *S. Montana*, L. (*Sab. Hort.* 3. t. 64.) a hardy under-shrub, a native of the south of France and Italy, and known in this country since 1562. The shoots are furnished with two narrow stiff leaves, an inch long, placed opposite at each joint, and from the base of these a few small leaves proceed in clusters. It produces whitish flowers in May and June.

Summer Savory is the *S. Hortensis* (*Lam. Ill. It.* 504. f. 1.) A hardy annual, a native of Italy, and known in this country since 1652. The branches are slender, erect, and about a foot high; leaves opposite, and about an inch in length. It flowers in June and July.

Culture. "The perennial is generally propagated by slips, or cuttings, of the young side-shoots, in April, May, June, or July; planted in a shady border, and watered; also by dividing the bottom off-set rooted shoots, the root and top-part together, planted as above. When the plants are a little advanced in branchy-top growth, they may be transplanted: set some in single plants, a foot apart; others, to form a close edging. Keep the ground clear of weeds: in spring and autumn loosen the earth a little about the plants, and trim off decayed and irregular parts. This herb may also be occasionally raised from seed in the spring, as directed below, for the summer savory. It continues useful summer and winter; and some may be gathered, when of full growth, in autumn, to dry for winter use.

"The annual is always raised from seed. In March or April, sow either in small drills, nine by six inches apart; or, on the smoothed surface, and rake in lightly. The plants may either remain, to be thinned, or some may be transplanted in June, nine by six inches asunder. This herb comes in for gathering from June until October. When a store is to be dried, draw it by the roots." *Abercrombie.*

Subsect. 7. *Basil.* — *Ocymum*, L.; *Didyn. Gymnos.* L.; and *Labiatæ*, J. *Basilic*, Fr.; *Basilikum*, Ger.; and *Bassilico*, Ital.

1385. The *Sweet*, or *Larger Basil*, is the *O. Basilicum*, L. (*Blackw.* t. 104.) A tender annual plant, highly aromatic, rising from six to twelve or fifteen inches high, and thickly covered with small oval leaves. It produces small white flowers in June and July; is a native of the East Indies, and was introduced to this country in 1548.

The *Bush*, or *Least Basil*, is the *O. Minimum*, L. (*Schk. Hand.* 2. t. 166.) An annual aromatic plant, a sort of diminutive of the other, forming a round orbicular bushy head, not half the size of the larger basil. It is a native of the East Indies, flowers in June and July, and was introduced to this country in 1573.

Use. The leaves and small brachiæ, or leafy tops, are the parts gathered; and on account of their strong flavor of cloves, they are often used in highly-seasoned dishes. A few leaves are sometimes introduced into salad, and not unfrequently into soups.

Culture. Both species are raised from seed, and for a seed-bed of three feet by one and a half, to furnish plants for a final plantation four feet by twelve, a quarter of an ounce will be sufficient. Sow on a hot-bed in the end of March, and plant out in a warm border of rich soil, the larger at eight or ten inches every way, and the lesser at six or eight inches square. Sometimes both sorts are sown in the open border; but so treated, they come up late and small. In transplanting from the hot-bed, take care to raise the plants in small tufts, or single plants, with balls attached; by which they receive no check, and if watered after planting, and in dry weather, will soon produce abundance of tops.

Seed can only be saved in England in warm dry seasons, and under the most favorable circumstances of situation and precocity. In general it is procured by the seedsmen from Italy.

SUBSECT. 8. *Rosemary.*—*Rosmarinus officinalis*, L. (*Flor. Græc.* 1. t. 14.); *Dian. Monog.* L; and *Labiatæ*, B. P. *Romarin*, Fr.; *Rosmarin*, Ger.; and *Rosmarino*, Ital.

1386. This plant is a hardy under-shrub, a native of the south of Europe, introduced in, or before, 1548. The plant is evergreen, rising sometimes six or eight feet high, though rarely. The leaves are sessile, linear, dark-green above, and greyish or whitish underneath; the blossoms are of a pale blue color. The whole plant is highly aromatic.

Use. The flowers and calyces form a principal ingredient in the distillation of Hungary water. Infusions of the leaves are made in some drinks. Sprigs of rosemary are used as a garnish; and were given in Shakspeare's time as tokens of remembrance: "There's rosemary; that's for remembrance," says the distracted Ophelia. In some parts of the west of England and in Wales, the sprigs are still distributed to the company at funerals, and often thrown into the grave upon the coffin of the deceased.

Varieties. These are:

- The Green, or common.
- The Gold-striped; and
- The Silver-striped.

Culture. "The green is hardiest as a plant, and is the sort generally used. The finest plants are raised from seed. Sow either broad-cast or in small drills, six inches apart. The green is also raised by planting slips or cuttings of the young shoots in spring and summer, in a shady border. Let these be taken off five, six, or seven inches long, detaching the under-leaves. Set them in a row from six to twelve inches apart, nearly two-thirds into the ground: water at planting, and occasionally afterwards, till they have struck. The plants will be strong and well-rooted by autumn, when they should be transplanted at proper distances. A light sandy soil assists exotic evergreens, that retain some of their original delicacy, to stand the winter; partly by preventing them from growing too luxuriantly, and partly by not being a conductor of frost. In their final situations, train the plants, either with a bushy head, of moderate growth; or, if near a fence, in a fan-like order. The striped sort may be propagated as above; or with most success, by layers of the young wood, as it is not so free to grow from cuttings. Being a little tender, it must be planted in a warm situation. It is retained chiefly as ornamental, on account of the variegation of its leaves. Rosemary is of several years' duration, continuing in full foliage at all seasons where the exposure is not too severe."

SUBSECT. 9. *Lavender.*—*Lavandula Spica*, L. (*Schk. hand.* 2. t. 157.); *Didyn. Gymnos.* L.; and *Labiatæ*, J. *Lavende*, Fr.; *Spiklavendel*, Ger.; and *Lavendula*, Ital.

1387. This is a hardy under-shrub, a native of the south of Europe, and introduced in 1658. The plant rises from two to four feet high, with hoary linear leaves, slightly rolled back at the edges; the flowers form terminating spikes, of a blue color, and appear from July to September. The leaves and flower are powerfully aromatic.

Use. It is rather a medicinal plant than one used in cookery; though a few plants are kept in every garden. Imitation scent-bottles are made by the ladies of the fragrant spikes. They are also put in paper-bags, and placed among linens to perfume them. Lavender-water, a well-known perfume, is distilled from the flowers; for which purpose the plant is extensively cultivated in different places, but more especially at Mitcham in Surrey, and Maidenhead in Berkshire.

Varieties. The narrow-leaved and the broad-leaved, both equally good.

Propagation and Culture. "It is propagated by cuttings and slips like rosemary: it likes a dry soil, and may be planted either in distinct plants two feet asunder, or to form a sort of hedge-row, in one or more lines, especially where large supplies of flowers are required for distilling. The plants will advance in a close branchy growth, from a foot and a half to two feet high, or more; and, when established, will produce plenty of flowers in July and August: gather them while in perfection, cutting the spikes off close to the stem. Then give the plants occasional trimming, taking off the gross and rampant shoots of the year, and the decayed flower-spikes. Neill observes, "If lavender be planted in a dry, gravelly, or poor soil, its flowers have a powerful odor, and the severity of our winters has little effect on it; while in a rich garden soil, although it grows strongly, it is apt to be killed, and the flowers have less perfume."

Subsect. 10. *Tansy.* — *Tanacetum vulgare*, L. (*Eng. Bot.* 1229.); *Syng. Polyg. Super.* L.; and *Corymbiferæ*, J. *Tanésie*, Fr.; *Rheinfarrn*, Ger.; and *Tanaceto*, Ital.

1388. This is a perennial plant, growing in many parts of Britain on the sandy banks of rivers. The stem rises to the height of two or three feet in its wild state, richly furnished with deep-green finely-divided leaves; the flowers are yellow, and appear in terminating corymbs in July and August. The leaves and flowers are aromatic.

Use. The young leaves are shredded down and employed to give color and flavor to puddings; they are also used in omelets and other cakes, and were formerly in much repute as a vermifuge.

Varieties. These are, the common; the curled, generally preferred; and the variegated, cultivated chiefly for ornament.

Culture. Tansy may be propagated in spring or autumn by rooted slips, or by dividing the roots into several sets: plant them in any compartment of the kitchen or physic garden, from twelve to eighteen inches asunder. The plant continues for several years, producing abundant tufts of leaves annually. As they run up in strong stalks in summer, these should be cut down to encourage a production of young leaves low on the stem.

To have young Tansy in Winter. Plant some roots either in a hot-bed or in pots placed therein, or in a pinery or forcing-house, at any time from November to March." *Abercrombie.*

Subsect. 11. *Costmary*, or *Alecost.* — *Tanacetum Balsamita*, L.; and *Balsamita vulgaris*, *H. K.* (*Schk. Hand.* 3. t. 240.); *Syng. Polyg. Superf.* L.; and *Corymbiferæ*, J. *Coq-des-jardins*, Fr.; *Frauenmünze*, Ger.; and *Costo ortense*, Ital.

1389. This is a hardy perennial plant, a native of Italy, and introduced in this country in 1568. The lower leaves are large, ovate, of a greyish color, and on long foot-stalks; the stems rise two or three feet high; they are furnished with leaves of the same shape, but smaller and sessile. The flowers are of a deep yellow color, and appear in corymbs in August and September. In indifferent seasons, or in cold situations, they scarcely expand, and the seeds very seldom come to maturity in this country. The whole plant has a peculiarly agreeable odor, and its name, costmary, intimates that it is the *costus*, or aromatic plant of the Virgin. There is a variety with deep-cut, hoary leaves, but it is less fragrant than the other.

Use. In France it is used in salads; and was formerly put into ale and negus; and hence the name of *alecost*. In this country, at present, it is but little used in the kitchen.

Propagation and Culture. It is a travelling plant, and readily propagated by parting the roots after the flowering-season, or in spring. It delights in a dry soil, and a plantation once made, will remain good for several years.

Sect. X. *Plants used in Tarts, Confectionary, and Domestic Medicine.*

Excepting the species of rhubarb used as a substitute for, or addition to, gooseberries in tarts, this class occupies only a few yards of the largest kitchen garden. It is also almost the only species worthy of introduction in that of the cottager, unless we except the cammomile.

Subsect. 1. *Rhubarb.* — *Rheum*, L.; *Ennean Trig.* L.; and *Polygoneæ*, J. *Rhubarbe*, Fr.; *Rhabarber*, Ger.; and *Rubarbaro*, Ital.

1390. There are three species of this plant in cultivation, the *rhaponticum*, *hybridum*, and *palmatum*, all perennials.

Rheum Rhaponticum, L. (*Sabb. Hort.* i. t. 34.) is a native of Asia, and was introduced in 1573. The leaves are blunt and smooth, veins reddish, somewhat hairy underneath; petioles grooved above and rounded at the edge. This species has been longest in cultivation.

R. hybridum, L. (*Murr. Com. Gott.* t. 1.) is also a native of Asia, introduced in 1778. The leaves are large, somewhat cordate, smooth, and of a light green. When under good cultivation, they often measure four or five feet in length, the footstalk included. This sort was first introduced as a culinary rhubarb by J. Dickson, V. P. H. S., about twenty years ago, and is esteemed more succulent than the *R. Rhaponticum*.

R. palmatum, L. (*Mill. Ic.* 2. t. 218.) is a native of Tartary, distinguished from all the others by its elegant palmate leaves. It has been known in this country since 1758, and is generally considered as the true Turkey or Russian rhubarb.

Use. The two first species are cultivated entirely, and the third in gardens, principally for the petioles of the root-leaves, which are peeled, cut down, and formed into tarts and pies in the manner of apples and gooseberries. The *R. Hybridum* affords the most abundant and succulent supply for this purpose.

Propagation and Culture. All the sorts may be raised either from seed or by dividing the roots. If from seed, which is the best mode, sow in light deep earth in spring; and the plants, if kept eight or nine inches asunder, will be fit for transplanting in autumn, and for use next spring. When the roots are divided, care must be had to retain a bud on the crown of each section: they may be planted where they are finally to remain.

When a plantation is to be made, the ground, which should be light and rather sandy, but well-manured, should be trenched three spits, or as deep as the subsoil will admit, adding a good manuring of well-rotted hot-bed dung. Then plant in rows three feet wide by two feet, in the rows for the *R. rhaponticum* and *palmatum*, and five feet wide by three feet, in the rows for the *R. hybridum*. No other culture is required than keeping the ground free of weeds, occasionally stirring it during summer with a three-pronged fork, and adding a dressing of well-rotted manure every autumn or spring, stirring the earth as deep as possible. Such a plantation will continue good many years.

Some never allow the flower-stalks to produce flowers; and others cut them over as soon as they have done flowering, to prevent the plants from being exhausted by the production of seeds. The former seems the preferable method, as the flower-stalks of plants cannot, like the leaves, be considered as preparing a reserve of nourishment for the roots.

Blanching. The advantages of blanching the stalks of rhubarb for culinary purposes have been pointed out by T. Hare, Esq. (*Hort. Trans.* ii.) " These are twofold, namely, the desirable qualities of improved appearance and flavor, and a saving in the quantity of sugar necessary to render it agreeable to the palate, since the leaf-stalks, when blanched, are infinitely less harsh than those grown under the full influence of light in an open situation." It may either be blanched by earthing up the roots early in spring, or earthen pots or covers (*fig.* 90.) may be used, as in blanching *Sea-cale.*

To force Rhubarb. Two methods are described in the *Hort. Trans.* vol. iii. The first is by D. Judd, of Edmonton, who states, that his first attempt was made by covering plants of the *Rheum hybridum* with common garden pots, number twelves, having their holes stopped. These were covered with fermenting dung; and the plants came very fine and quickly; but were much broken by the sides and tops of the pots. " After it was all well up, the dung and pots were entirely taken off, and large hand-glasses were substituted in their stead, thickly covered with mats every night, and in dull weather. This process I found greatly to improve their flavor, and it gave me a regular supply till that in the open air was ready for use. The following year I had large pots made on purpose, without holes, but these broke the shoots almost as much as the first, for this sort of rhubarb grows so very luxuriantly, that it is impatient of such confinement." He afterwards enclosed and covered his bed with open frame-work, around and on which, he placed the dung, and with this treatment, he says, " the rhubarb has come up very regularly, of excellent quality, and wants far less attention than was required by my former method; for the frame-work renders hand-glasses, or any other cover, unnecessary. Care should be taken to lay the dung in such a manner that the top may be partly or wholly taken off at any time for the purpose of gathering or examination, without disturbing the sides. That this is a superior method of forcing the *Rheum hybridum*, this year's experience has satisfied me; but still the forcing by pots will answer very well for any of the smaller growing species.

" I have never found any difference between using dung fresh from the stable, and that which had undergone fermentation, provided it was not suffered to heat violently after its application to the frame. I do not permit the internal heat of the hollow space, above the plants, to rise above 60°, between 55° and 60° being the proper medium.

" To those who dislike the trouble of either frames or pots, it may be useful to know that rhubarb will come in much quicker, by being covered about six inches thick, with light litter; care should be taken, in putting it on, and removing it, that no injury be done to the plants."

The next mode is by T. A. Knight, and appears to have been practised on the *R. Rhaponticum*. In this, as in almost every point of practice related by this philosophical horticulturist, he precedes it with a *rationale* or relation of the principles on which the practice is founded, and which deserves in this, as in every case, the attention of gardeners, as tending to enlarge their ideas, and enable them to generalize on vegetable physiology. He observes:

" The root of every perennial herbaceous plant contains within itself, during winter, all the organizable matter, which it expends in the spring in the formation of its first foliage and flower-stems; and it requires neither food nor light to enable it to protrude these, but simply heat and water: and if the root be removed entire, as soon as its leaves become lifeless, it will be found to vegetate, after being replanted, as strongly as it would have done, if it had retained its first position. These circumstances led me, in the last winter, to dig up the roots of many plants of the common rhubarb (which I had raised from cuttings in the preceding spring), and to place them in a few large and deep pots, each pot being made to receive as many as it would contain. Some fine sandy loam was then washed in, to fill entirely the interstices between the roots, the tops of which were so placed as to be level with each other, and about an inch below the surface of the mould in the pots, which were covered with other pots of the same size, inverted upon them: being then placed in a vinery (in a situation where nothing else could be made to thrive on account of want of light), and being copiously supplied with water, the plants vegetated rapidly and strongly; and from each pot I obtained three successive crops, the leaf-stalks of the two first being crowded so closely as nearly to touch each other over the whole surface of the pots. As soon as the third crop of leaves was broken off, and a change of roots became necessary, those taken from the pots were planted in the open ground, their tops being covered about an inch deep with mould, and I have reason to believe, from present appearances, that they will live and recover strength, if given a year of rest, to be fit for forcing again. Should they, however, perish, it is of very little consequence; as year-old roots, raised from cuttings or even from seeds, sowed in autumn in rich soil, will be found sufficiently strong for use.

" The heat of a hot-bed, a kitchen, or other room, and, on the approach of spring (probably at any period after the middle of January), a cellar, will afford a sufficiently high temperature; and the advantage in all cases will be that of obtaining from one foot of surface as much produce as in the natural state of growth of the plants would occupy twenty feet; and in the shady space of the vinery or peach-house, not applicable to other purposes, and without incurring any additional expense in fuel, or doing injury to the soil, a succession of abundant crops may be raised."

Taking the Stalks. Remove a little earth, and bending down the leaf you would remove, slip it off from the crown, without breaking or using the knife. The stalks are fit to use when the leaf is half-expanded; but a larger produce is obtained by letting them remain till in full expansion, as is practised by the market-gardeners. The stalks are tied in bundles of a dozen and upwards, and thus exposed for sale.

To save Seed. Leave one or two of the strongest flower-stalks to perfect their seeds, which they will do in July and August.

Subsect. 2. *The Pompion and Gourd.* — *Cucurbita*, L.; *Monœc. Monad.* L.; and *Cucurbitaceæ*, J. *Potiron and Pastisson*, Fr.; *Kürbiss*, Ger.; and *Popone*, Ital.

1391. Of this tribe there are six species in cultivation, natives of India and the East, all tender or half-hardy annuals, but producing fruit in the open air in Britain in the warmest period of our summers.

Cucurbita Pepo. The *pumpkin*, *pumpion*, or, more correctly *pompion*, is the *C. Pepo*, L. *Pastisson*, Fr.; a native of the Levant, and introduced in 1570. This is the melon or millon of our early horticulturists, the true melon being formerly distinguished by the name of musk-melon. Though commonly cultivated in gardens for curiosity, yet, in some of the country villages in England, the inhabitants grow it on dunghills, at the backs of their houses, and train the shoots to a great length over grass. When the fruit is ripe, they cut a hole in one side, and having taken out the seeds, fill the void space with sliced apples, adding a little sugar and spice, and then having baked the whole, eat it with butter. *Neill.* *Pumpkin pie*, Abercrombie says, is very common. On the continent, the fruit is a good deal used in soups, and also stewed and fried in oil or butter.

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The *Water Melon* is the *C. Citrullus* (*Rumph. Am.* 5. t. 146. and our *fig.* 329.) *Pasteque*, Fr.; *Wassermelone*, Ger.; and *Cocomero*, Ital. It is a native of the south of Europe, and introduced in 1597. It is rather more tender than the *C. Pepo*. This plant forms both the food and the drink of the inhabitants of Egypt for several months in the year; and is much used in the south of Italy. It requires nearly the same treatment as the common melon, but a larger frame to admit its more extended shoots to spread themselves. The fruit is large, green externally, white-fleshed, reddish towards the centre, succulent, and refreshing, but not very high-flavored. It is generally considered as the melon of the Jews, mentioned in various parts of the Bible.

The *Squash* is the *C. Melopepo*, (*Potiron*, Fr.; *Pfebin Kürbiss*, Ger.; and *Popone*, Ital.); a native of the Levant, and introduced in 1597. It is cultivated like the pompion, and the fruit is used in pies, or gathered when of the size of a hen's egg, dressed in salt and water, and sliced and served on a toast. It is also used for pickling. In North America it is cultivated as an article of food.

The *Warted-Gourd, C. verrucosa*, is a native of the Levant, and introduced in 1658. Its nature and uses are the same as those of the squash, and like it, it is cultivated in North America as an article of food.

The *Bottle-Gourd* or *false calabash, C. lagenaria* (*Rumph. Am.* 5. t. 144.), is a native of India, and introduced in 1597. Its culture and uses are the same as those of the two last sorts.

The *Orange-fruited Gourd, C. aurantia*, is a native of India, introduced in 1802, and rather more tender than the common pompion. It has been hitherto cultivated chiefly for curiosity, and when trained spirally round a pole, or against a wall, and loaded with its yellow fruit, it is very ornamental. The fruit may be used like those of the other sorts.

The *Vegetable Marrow, C. succado*, (*fig.* 390.) was introduced within these few years from Persia, where it is called *Cicader*. "The fruit," Sabine observes, (*Hort. Trans.* vol. ii. 255.) "is of an uniform pale yellow, or light sulphur color; when full grown, it is about nine inches in length, four inches in diameter, of an elliptic shape, the surface being rendered slightly uneven by irregular longitudinal ribs, the terminations of which uniting, form a projecting apex at the end of the fruit, which is very unusual in this tribe.

"It is useful for culinary purposes in every stage of its growth; when very young, it is good if fried with butter; when large or about half grown, it is excellent either plain boiled or stewed with rich sauce; for either of these purposes it should be cut in slices. The flesh has a peculiar tenderness and softness, from which circumstance it has, I suppose, received its name, much resembling the buttery quality of the *Beurré pears*, and this property remains with it till it is full-grown, when it is used for pies. It is, however, in its intermediate state of growth that I conceive it likely to be most approved. Compared with all the other kinds which I had growing, its superiority was decided; there were one or two which, in cooking, might be considered nearly as good, but these are bad bearers, and more difficult to cultivate, so that I consider the vegetable marrow without a rival." The culture of this species is the same as that of the others.

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Culture applicable to all the Species. They are propagated from seeds which are large, and require to be covered nearly an inch. "Sow in April in a hot-bed under a frame or hand-glass, to raise plants for transferring to the open garden at the end of May under a warm aspect; or for planting out in the middle of May on a trench of hot dung under a hand-glass or half-shelter: otherwise sow, at the beginning of May, under a hand-glass without bottom-heat, for transplanting into a favorable situation; or sow three weeks later (after the 20th) at once in the open garden, under a south wall, for the plants to remain. The smaller-fruited kinds do best trained to an upright pole or trellis. From time to time earth up the shanks of the plants. As the runners extend five feet or more, peg down at a joint, and they will take root. Water copiously whenever warm weather without showers makes the ground arid." *Abercrombie.*

Subsect. 3. *Angelica.* — *Angelica Archangelica*, L. (*Flor. Dan.* t. 206.); *Pent. Dig.* L.; *Umbelliferæ*, J. *Angelique*, Fr.; *Engelwürtz*, Ger.; and *Angelica*, Ital.

1392. This plant is a biennial, a native of England, being sometimes found in moist situations, and is also common in Lapland and Iceland. It was cultivated in Britain in 1568, and probably more early. It rises from three to five feet high, with very large pinnate leaves, the extreme leaflet three-lobed. The flowers are greenish, and produced in September; the roots long and thick, and they, as well as the whole plant, are powerfully aromatic. Though the plant is only a biennial, it may be made to continue several years, by cutting over the flower-stem before it ripens seed; in which case it immediately pushes out below.

Use. It was formerly cultivated on account of its leaf-stalks, which were blanched and eaten as celery: now they are used only when candied; and the young and tender stalks are for this purpose collected in May. Sometimes also the seeds and leaves are used in medical preparations.

Propagation and Culture. It delights in moist situations, or the banks of running water; but will grow freely in any soil and exposure. The plants are raised from seed, and, for a bed four feet and a half by six feet, sown in drills a foot apart, to be transplanted, half an ounce of seed will be requisite. "Sow in August, or as soon as the seed is ripe, as the plants will come up earlier and stronger than from a sowing in the spring. When the plants are advanced from four to six inches high, transplant them into rows two feet apart. They will soon strike root, and advance quickly in strong growth. In the second year, their strong erect branchy stalks will be several feet high, producing large umbels of seed, ripening in autumn, which, as well as the leaves of the plant, are used in medicine. But, for candying, the young shoots of the stems and stalks of the leaves are the useful parts: being cut, while green and tender, in May and June, they are made by confectioners into the sweetmeat called Angelica. In the second year, if seed is not wanted, cut the plants down in May, and the stool will send out side-shoots; by repeating this practice every year, the same plant may be long continued. Cuttings will also grow." *Abercrombie.*

SUBSECT. 4. *Anise.* — *Pimpinella Anisum*, L. (*Blackw.* t. 374.); *Pent. Trig.* L.; and *Umbelliferæ*, J. *Anis*, Fr. and Ger.; and *Anice*, Ital.

1393. This is an annual plant, a native of Egypt, and introduced to this country, according to Turner, in 1551. The lower leaves are divided into three lobes, deeply cut on the edges; the stem is a foot and a half high, dividing into several slender branches; the umbels large and loose, on rather long peduncles; the flowers are small, of a yellowish white, and appear from June to August.

Use. It is cultivated in Malta and Spain for its seeds, which are annually imported as medicinal, and for distillation and expression. In this country, it is occasionally grown in the garden to be used as a garnish, and for seasoning, like fennel.

Culture. The seeds require to be sown in April, in a warm border, in a dry light soil; or raised in pots on heat, and removed to a warm site in May, where it will blossom and ripen seeds in August in favorable seasons. It does not bear transplanting, but the plants, when too thick, are to be thinned out to three or four inches distance.

SUBSECT. 5. *Coriander.* — *Coriandrum sativum*, L. (*Eng. Bot.* 67.); *Pent. Dig.* L.; and *Umbelliferæ*, J. *Coriandre*, Fr.; *Coriander*, Ger.; and *Coriandro*, Ital.

1394. This is a hardy annual plant, originally introduced from the East, but now naturalized in Essex, and other places, where it has long been cultivated for druggists and confectioners. The plant rises about a foot high, with doubly pinnated leaves, and produces an umbel of white flowers in June. The whole plant is wholly aromatic.

Use. In private gardens, it is cultivated chiefly for the tender leaves, which are used in soups and salads. On a large scale, it is cultivated for the seed, which is used by confectioners, druggists, and distillers, in large quantities.

Culture. The plant delights in a sandy loam. It is raised from seeds, which may be sown in February, when the weather is mild and dry; and the quantity requisite for a bed four feet wide by six in length, to be sown in rows, is half an ounce; and when sown in drills, they may be nine inches apart, and the seed buried half an inch. "Where a constant succession is required, small successive monthly sowings will be necessary in spring and summer, as the plants in those seasons soon run to seed. There should be also small sowings in August and September, to stand the winter under the defence of a frame. The plants are to remain where sown." *Abercrombie.*

SUBSECT. 6. *Caraway.* — *Carum carui*, L. (*Eng. Bot.* 1503.); *Pent. Trig.* L.; and *Umbelliferæ*, J. *Carvi*, Fr.; *Kümmel*, Ger.; and *Carvi*, Ital.

1395. This is a biennial plant, a native of England, being occasionally found in meadows and pastures. It rises a foot and a half high, with spreading branches; the leaves are decompound; the leaflets in sixes; it produces umbels of white flowers in June.

Use. The plant is cultivated chiefly for the seed, which is used in confectionary and in medicine. In spring, the under leaves are sometimes put in soups; and in former times the fusiform roots were eaten as parsnips, to which Parkinson gives them the preference. In Essex, large quantities of the seed are annually raised for distillation with spirituous liquors.

Culture. It is raised from seed, of which a quarter of an ounce is sufficient for a seed-bed four feet by five. Sow annually, in autumn, soon after the seed is ripe: the seedlings will rise quickly, and should be thinned to a foot distance each way. In default of sowing in autumn, sow in March or April, either in drills or broad-cast; but the plants so raised, will not in general flower till the following year. When the seed is ripe, the plant is generally pulled up in gathering, especially in field-culture.

SUBSECT. 7. *Rue.* — *Ruta graveolens*, L. (*Lam. Ill.* 345. t. 1.); *Decan. Monog.* L.; and *Rutaceæ*, J. *Rue*, Fr.; *Raute*, Ger.; and *Ruta*, Ital.

1396. This is a perennial evergreen under-shrub, a native of the south of Europe but cultivated in this country since 1562, and probably long before. It is well known by its fœtid smell.

Use. The leaves are sometimes gathered as a medicinal simple, and are also given to poultry having the croup. In former days, it was called the *herb of grace*, from the circumstance of small bunches of it having been used by the priests for the sprinkling of holy water among the people.

Culture. It is easily propagated by seeds, cuttings, or slips of the young shoots in March, April, or May, planted in a shady border. The plant delights in a poor, dry, calcareous soil; in which it will continue for many years, and if cut down occasionally, always in full leaf and well furnished with young shoots. Letting it run to seed, weakens the plant and shortens its longevity.

Subsect. 8. *Hyssop.* — *Hyssopus officinalis*, L. (*Jac. Aust.* 3. t. 254.); *Didyn. Gymnos.* L.; and *Labiatæ*, J. *Hysope*, Fr.; *Jsop*, Ger.; and *Jsopo*, Ital.

1397. This is a hardy evergreen under-shrub, a native of the south of Europe, and introduced in 1548. The stems rise a foot and a half high; the leaves are lanceolate, short, and somewhat obtuse; it produces blue flowers from June to September. The whole plant has a strong aromatic odour.

Use. The leaves and young shoots are occasionally used as a pot-herb, and the leafy tops and flower-spikes are cut, dried, and preserved for medicinal purposes.

The *Varieties* are,

The white, | blue, and | red-flowered; but the blue is the original color, and most commonly cultivated.

Propagation and Culture. "It is raised by seed, by slips, and cuttings of the branches, and by slips of the root and top together.

"It likes a dry or sandy soil. When it is propagated by seed, sow in March or April a small portion, either broad-cast and raked in, or in small drills, six inches apart. The plants may mostly be transplanted into final beds in June or July, nine inches apart, or some may be planted as an edging; or you may also sow some seed for an edging to remain where sown. Give the edgings occasional trimming, in their established growth; cutting away also any decayed flower-spikes in autumn. You may take rooted off-sets from established plants in March, April, August, or September; cuttings from the stalks in April and May; also rootless slips of the young shoots in June or July. After May, shade for a time, or plant in a shady border. If for culinary purposes, the distance from plant to plant may be nine inches; in the physic garden, eighteen inches or two feet. Water at planting, and twice or thrice a week in dry weather till rooted." *Abercrombie.*

Subsect. 9. *Chamomile.* — *Anthemis nobilis*, L. (*Eng. Bot.* 980.); *Syng. Polyg. Superf.* L.; and *Corymbiferæ*, J. *Camomille*, Fr.; *Kamille*, Ger.; and *Camomilla*, Ital.

1398. This is a hardy perennial, which grows wild in various parts of England in gravelly pastures, and by road sides. The leaves are cut into threads, and the stem prostrate. The flowers are white in the rays and yellow in the disk, and appear in August and September. The whole plant is bitter and highly aromatic.

Use. It is cultivated on account of the flower, which is a safe bitter and stomachic, and much used under the name of chamomile-tea. The double-flowering variety, though more beautiful than the single-flowered, is less useful; the aromatic principle not residing in the floscules of the ray, the multiplication of which constitutes the double flower. The double sort, however, is most cultivated by growers for the market, on account of its greater bulk and weight.

Varieties. There are: the common single, and the double-flowered.

Soil and Culture. This herb delights in a poor sandy soil. "Both kinds are propagated by parting the roots, or by slips of the rooted off-sets, or of the runners. Detach them with roots, in little tufty sets, in March, April, or May; and plant them from eight to twelve inches asunder, giving water; repeat waterings occasionally till they root; they will soon overspread the bed, and produce plenty of flowers the same year in July and August, and continue several years productive.

Taking the Crop. "The flowers should be gathered in their prime, in June or July, just when full-blown. Let them be spread to dry in a shady place; then put them in paper bags, and house them for use." *Abercrombie.*

Subsect. 10. *Elecampane.* — *Inula Helenium*, L. (*Eng. Bot.* t. 1546.); *Syng. Polyg. Super.* L.; and *Corymbiferæ*, J. *Inule*, Fr. and Ger.; and *Inula*, Ital.

1399. This is a perennial plant, found in moist pastures in the south of England, and one of the largest herbaceous plants we have, rising from three to five feet high; the lower leaves embrace the stem, are ovate and wrinkled, a foot long and four or five inches broad in the middle. It produces large heads of yellow flowers in July and

August. The root is thick, fusiform, and aromatic. It was formerly in great repute, and the plant was cultivated in village gardens throughout Europe. In private gardens it still keeps its place in the physic-herb corner.

Use. In France and Germany, the root is candied, and used as a stomachic, for strengthening the tone of the viscera in general. As a medicinal plant, it possesses the general virtues of alexipharmics.

Culture. It is propagated by off-sets in autumn, after the plant has done flowering: these, if planted in a deep soil, rather moist, or in a shady situation, will be fit for use the end of the second year. Roots of this age are said to be preferable to those of older plants.

SUBSECT. 11. *Liquorice.* — *Glycyrrhiza glabra*, L. (*Lam. Ill.* t. 625. f. 2.); *Diadel. Decan.* L.; and *Leguminosæ*, J. *Reglisse*, Fr.; *Süsholz*, Ger.; and *Reglizia*, Ital.

1400. This is a hardy perennial plant, a native of the south of Europe, and introduced into this country in 1562. The roots run very deep into the ground, and creep to a considerable distance, sending up strong herbaceous stalks, four or five feet high; the leaves are composite, and consist of four or five ovate leaflets terminated by an odd one; these and the stalks are clammy, and of a dark green. The flowers come out in axillary spikes, of a blue color, in July and August. Stowe informs us, that the planting and growing of *licorish* begun about the first year of Queen Elizabeth.

Use. It is cultivated on a large scale for the brewers and druggists, and in gardens for the saccharine juice obtained from the root by decoction, and used as an emollient in colds, fevers, &c.

Propagation and Culture. "Liquorice is propagated by cuttings of the roots. On account of the depth to which the root strikes, when the plant has room to flourish, the soil should have a good staple of mould thirty inches or three feet in depth. Taking the small horizontal roots of established plants, cut them into sections six inches long; having traced out rows a yard asunder, plant the sets along each row, at intervals of eighteen inches, covering them entirely with mould. For the first year, you may cultivate a light crop of lettuce or onions between the rows. During the summer, keep the plot clear from weeds; and when the subordinate crop comes off, hoe and dress the ground. At the close of autumn, or as a winter dressing, fork or dig between the rows, to stir and refresh the surface; and cut down the decayed stems.

Taking the Crop. "After three or four years' growth, the main roots will be of a mature size, and fit for consumption or the market. In the course of the following winter, begin to dig them up, opening a trench close to the first row, as deep as the roots, then, with the spade, turn out all the roots clean to the bottom; so proceed from trench to trench, and prepare the ground for some other crop." *Abercrombie.*

SUBSECT. 12. *Wormwood.* — *Artemisia Absinthium*, L. (*Eng. Bot.* 1230.); *Syng. Polyg. Super.* L.; and *Corymbiferæ*, J. *Absinthe*, Fr.; *Wermuth*, Ger.; and *Assenzio*, Ital.

1401. This is a perennial plant, well known, and frequent in calcareous commons and by road-sides in England. It rises from two to four feet high, covered with minutely-divided hoary leaves. The flowers appear in small pendulous hemispherical bunches in August. The whole plant is intensely bitter and aromatic.

Use. The seeds are used as stomachics, and the herb was formerly much used as a vermifuge. The growth of this plant, Neill, observes, "should be encouraged in poultry-walks, it being found beneficial to them. The distillers in Scotland, sometimes employ it in place of hops, and for their use, small fields of it are occasionally sown."

Propagation and Culture. By seed, cuttings, or dividing the root: the latter is the easiest mode, and the future treatment may be the same as for rue or hyssop. The sea-wormwood, *A. maritima*; the Roman, *A. pontica*, and the tartarian, *A. santonica*, are propagated chiefly by cuttings, and may be treated like the common species.

SUBSECT. 13. *Blessed-Thistle.* — *Centaurea benedicta*, L. (*Zorn* icon. 122.); *Syng. Polyg. Frust.* L.; and *Cynarocephalæ*, J. *Centaurée sudorifique*, Fr.; *Cardo benedicten*, Ger.; and *Cardo santo*, Ital.

1402. This is an annual plant, a native of Spain and the Levant, and introduced in 1548. The leaves are long, elliptical, rough, runcinate, and variously serrated. The calyx is woolly, and the flowers yellow, appearing from June to November.

Use. An infusion of the leaves is sometimes used as a stomachic, and is said to procure the return of appetite, where the stomach was injured by irregularities. A strong infusion promotes perspiration, and increases all the secretions. It was formerly used in cases of cancer; but at present is considered of little medical value.

Culture. The seed is to be sown in autumn, in any light earth, and in a warm situation. Thinned and kept free from weeds, the plants will flower the following June and July, and if not gathered, will produce seeds in August and September. Gather the herb when in flower, and take great care in drying it and keeping it in a dry airy place, to prevent its rotting or getting mouldy, which it is very apt to do.

Subsect. 14. *Balm.* — *Melissa officinalis,* L.; *Didyn. Gymnos.* L.; and *Labiatæ,* J. *Melisse,* Fr.; *Melisse,* Ger.; and *Melissa,* Ital.

1403. This is a hardy perennial, with square stems, which rise two feet high or more, furnished with large rough ovate leaves, growing by pairs at each joint. It is a native of Switzerland and the south of France; produces flowers of a purplish color from June to October, and was introduced to this country in 1573. There is a variety with hairy leaves.

Use. It is now little used, unless for making a simple balm-tea, which affords a grateful diluent drink in fevers, and for forming a light and agreeable beverage under the name of *balm wine.*

Propagation. It is readily propagated by parting the roots, preserving two or three buds to each piece, or by slips, either in autumn or spring.

Culture. Plant the slips or sets in any bed of common earth, by dibble or trowel, and from eight inches to a foot apart, giving water, if dry weather. Those of the spring-planting will soon grow freely for use the same year; and afterwards will increase by the root into large bunches of several years' continuance, furnishing annual supplies from March to September.

Sect. XI. *Plants used as Preserves and Pickles.*

Some of this class are tender annuals, requiring to be reared to a certain stage of growth in hot-beds or stoves, as the capsicum and love-apple; others are marine plants, as the samphires, more generally gathered wild than cultivated in the garden. The remainder are chiefly common garden plants, used also for other purposes, as the red cabbage, Indian cress, &c. The whole occupy but a few square yards of the largest kitchen-garden; and, excepting the red cabbage, few of them are seen in that of the cottager for the purposes of this section.

Subsect. 1. *Love-Apple.* — *Solanum Lycopersicum,* L.; *Lycopersicum esculentum,* Dunal (*Rumph. Amb. 5. t. 154. f. 1.*); *Pentan. Monog.* L.; and *Solaneæ,* J. *Tomato,* Fr.; *Liebes Apfel,* Ger.; and *Pomo d'Oro,* Ital.

1404. This is a tender annual, a native of South America, and introduced in 1596. The stem, if supported, will rise to the height of six or eight feet; the leaves are pinnate, and have a rank, disagreeable smell when handled; the flowers are yellow, appearing in bunches in July and August, and followed by the fruit in August and September. The fruit is smooth, compressed at both ends, and furrowed over the sides; it varies in size, but seldom exceeds that of an ordinary golden pippin.

Use. When ripe, the fruit, which has an acid flavor, is put into soups and sauces, and the juice is preserved for winter use like ketchup; it is also used in confectionary, as a preserve; and, when green, as a pickle. Though a good deal used in England in soups, and as a principal ingredient in a well-known sauce for mutton; yet, our estimation and uses of the fruit are nothing to those of the French and Italians, and especially the latter. Near Rome and Naples, whole fields are covered with it, and scarcely a dinner is served up in which it does not in some way or other form a part.

Varieties. Those in general cultivation are:

The large, small, cherry, and pear-shaped red;
And the large, and small, or cherry-shaped yellow.

Estimate of Sorts. "The first sort is in most estimation for domestic purposes, and should be cultivated accordingly; while a few plants of the other kinds may be raised for variety of the fruit.

Propagation and Culture. The plants must be raised and forwarded in a hot-bed, under glass, from about the vernal equinox till May. Sow in any general hot-bed about the end of March, or beginning or middle of April; and as to quantity of seed, one ounce will produce sixty plants. As soon as the plants are about two inches high, if they are intermediately pricked into another hot-bed, or into that where raised, singly into small pots placed in the hot-bed, they will grow more stocky, and can be more successfully transplanted. About the middle or end of May, transplant them, each with a ball of earth, into a south border, to have the full sun, that the fruit may ripen in perfection. Some may be planted close to a south wall, if vacant spaces can be had; but as they draw the ground exceedingly, do not set them near choice fruit-trees. Give water. During the first week or fortnight, if the nights be cold, defend them with hand-glasses, or by whelming a large garden-pot over each plant; or transplant upon holes of hot dung, earthed to six inches depth, and cover with hand-glasses. When they begin to run, train them to stakes, or, where planted near a wall or pales, nail up the branches.

J. Wilmot plants at the foot of a bed sloping steeply to the south, and trains the runners on it by pegging them down. They frequently strike root at the joints; he "tops them as soon as their branches meet, clears off all the lateral shoots, and thins the leaves by which the fruit is exposed and well ripened. In the fine season of 1818, each plant so treated produced, on an average, twenty pounds' weight of fruit." *Hort. Trans.* iii. 346.

The fruit begins to ripen in August; gathered in October, and hung up in bunches in any dry apartment, it will continue good for use in November.

To save Seed. "Gather some of the best ripe fruit in autumn; clear out the seed; wash and cleanse it from the pulp, and dry it thoroughly; then put it up in papers or bags, for use next spring." *Abercrombie.*

Subsect. 2. *Egg Plant.* — *Solanum Melongena*, L. (*Pluk. Phyt.* 226. f. 2.); *Pent. Monog.* L.; and *Solaneæ*, B. P. *Melongène*, Fr.; *Tollapfel*, Ger.; and *Melanzana*, Ital.

1405. This is a tender or green-house annual, a native of Africa, introduced in 1597. The plant rises about two feet high, with reclining branches; the flowers appear in June and July, of a pale violet color, followed by a very large berry, generally of an oval shape, and white color, much resembling a hen's egg; and in large specimens, that of a swan.

Use. In French and Italian cookery, it is used in stews and soups, and for the general purposes of the love-apple.

The *Varieties* are:

The oval-shaped white
The globular shaped white
The purple, or violet-colored, of both forms.

Culture. The plants are raised from seed, which may be sown, in March or April, in a hot-bed, in light, rich earth. After they have shown two or three proper leaves, they may either be pricked out in another hot-bed, or planted in small pots, to be shifted in rotation, till in size, N° 16. in which they will produce their fruit. If the plants, instead of being shifted into fruiting-pots, are planted against a wall, or in a warm border in June, they will fruit in the open air, if the season is not unusually wet and cold.

To save Seed. Gather one or two ripe berries of each sort, large and well formed, and preserve them entire, till the seed is wanted for sowing.

Subsect. 3. The *Capsicum.* — *Capsicum*, L.; *Pent. Monog.* L.; and *Solaneæ*, B. P. *Piment*, Fr.; *Spanischer Pfeffer*, Ger.; and *Peberone*, Ital.

1406. Of this genus there are three species in cultivation.

The *Annual Capsicum*, or *Guinea-Pepper*, is the *C. annuum*, L. (*Knorr. Thes.* 2. t. C. 6.), an annual plant, which, though a native of India, endures the open air in this country during summer. It was introduced in 1548, and was cultivated in Gerarde's time. It rises about two feet high, producing long, linear, dark-green leaves, on a branchy stem. The flowers are white, and appear in June and July, succeeded by berries, varying in shape and color, and either long-podded, red and yellow; short-podded, red and yellow; round short-podded, red and yellow; or heart-shaped, red and yellow.

The *Cherry-Pepper*, *C. cerasiforme*, (*Hort. Kew.*), is an annual plant, a native of the West Indies, which also stands our summer. It was introduced in 1759, has the same general character of foliage as the Guinea-pepper, and flowers from June to September. It is characterised by its small, cherry-shaped fruit, which is sometimes heart-shaped, bell-shaped, or angular, and in color red or yellow.

The *Bell-Pepper*, *C. grossum*, (*Besl. Eyst. Aut.* 1. t. 11. f. 1.), is a stove biennial, a native of India, and introduced in 1759. It is of humble growth, flowers in July, and produces large red or yellow berries. It will endure the open air in summer, but requires a place in the stove during the winter and spring months.

Use. The green pods, or inflated berries, of all these varieties, are used for pickling. They are sometimes also used in their ripe state, when they form a spice of the hottest quality, known by the name of Cayenne pepper. The berries of the last-named species are deemed better for pickling than the others, the skin being thick, pulpy, and tender.

Culture. All the three species, with their varieties, are raised from seed; a small parcel, or the produce of two pods, will be a sufficient quantity of each, or of any one variety for ordinary supply. Sow all the *annual* sorts at the end of March, "or beginning or middle of April, in a moderate hot-bed, under a frame. Cover the seed a quarter of an inch deep. When the plants are two or three inches in growth, prick some into a new slender hot-bed, to forward them for final transplanting; or, in default of this, prick them into a bed of natural earth, at the beginning of May, if fine, settled, warm weather; defend them with a frame, or awning of mats, at night and in cold vicissitudes. Give water lightly at planting, and occasionally afterwards in moderate supplies, to assist their fresh rooting and subsequent growth. At the beginning of June, when the weather is settled warm, transplant them into the open garden, in beds of light rich earth, from twelve to eighteen inches apart, giving water. They will thus advance freely, flower in July or August, and produce plenty of pods from August till the end of September. Under the deficiency of a hot-bed or stove, or for succession, annual capsicums may be raised in a bed of light rich earth, under a hand-glass; but the sowing must be deferred to fine warm weather in May. Give the plants air in the day, but cover them close at night, till danger from frost is over. At the close of June, transplant as above. The perennial species must be wintered in the stove."

To save Seed. Leave one or two of the largest and handsomest shaped pods to ripen in autumn; after gathering them, the best way is to hang them up in a dry place, and not take out the seed till wanted for sowing in spring.

Subsect. 4. *Caper.* — *Capparis Spinosa*, L. (*Bot. Mag.* 291.); *Polyan. Monog.* L.; and *Capparides*, J. *Câprier*, Fr.; *Kapernstrauch*, Ger.; and *Cappero*, Ital. (*fig.* 331.)

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1407. This is a trailing shrub, a native of the south of Italy and Sicily, where it abounds on rocks, ruins, and old walls: it has been long cultivated in France, and was introduced in this country in 1596, as a stove-plant. The shoots rise two or three feet, and then fall down and trail on the ground. The leaves are kidney-shaped, the flowers white, appearing from May to August. Though this plant is usually to be found only in stoves and green-houses in England, yet there is reason to believe it may be naturalized. It is cultivated, Neill observes, in the neighbourhood of Paris, with no other protection than that of being trained against a low wall, and the shoots in winter laid down and covered with litter or fern, like those of the fig. In the garden at Camden-house, Kensington, a caper-tree stood alive in the open air for near a century; it had a south-east aspect, and was well sheltered from the north; it had no covering, and was generally much injured by the frost; but the roots of this plant being particularly strong and vivacious, it made strong shoots, and produced flower-buds every year. It is probable, therefore, that a plantation, so situated, if covered every autumn with litter, mats, or ferns, would succeed. Such a plantation, not trained on walls, but planted in an open quarter, would, like those near Toulon, in France, have the general appearance of a plantation of brambles, and might be yearly covered with very little trouble. Neill suggests, that a hardy variety might possibly be obtained by repeatedly raising from seed, at first in Guernsey or Jersey, and the plant thus gradually inured to this country.

Use. The part used is the flower-bud, which forms a well-known pickle, and an article of considerable commerce from Sicily, and other islands in the Mediterranean.

Propagation and Culture. It may either be raised from seed, cuttings, or pieces of the root. The authors of the *Cours complet d'Agricultur* prefer the mode by cuttings, and direct them to be cut a foot long, and planted in autumn. The autumn following, they will be fit to remove to a general plantation. They describe two modes of culture; one, that of planting in walls, where no farther care is wanting, but that of gathering the buds; and the other, that of planting in quincunx in open quarters, like other fruit-shrubs: the latter mode is greatly to be preferred.

Substitutes for Capers. The flower-buds of the marsh-marigold (*Caltha palustris*, L.) form a safe substitute for capers; and likewise the young seed-pods of the common radish; and the unripe seeds of the nasturtium, or Indian cress. A species of spurge, common in gardens, (*Euphorbia Lathyris*), is vulgarly called caper-bush, from the resemblance of its fruit to capers; but it is acrid and poisonous, like the other plants of this genus.

Subsect. 5. *Samphire, three species of different genera.*

1408. *Common Samphire* is the *Crithmum Maritimum*, L. (*Eng. Bot.* 819.); *Pent. Dig.* L.; and *Umbelliferæ*, J. *Perce-pierre*, or *Saint Pierre*, Fr.; *Meerfenchel*, Ger.; and *Finnochio marino*, Ital. (*fig.* 332. *a*). It is a perennial plant, a native of Britain, and found on rocky cliffs by the sea, and in dry stone-walls. The root-leaves are triternate, those of the stem lanceolate and fleshy; the flowers appear on a stem of about eighteen inches high in August, and are of a yellow color. The name samphire is a corruption of *sampier*, and this again a corruption of the French name *Saint Pierre*.

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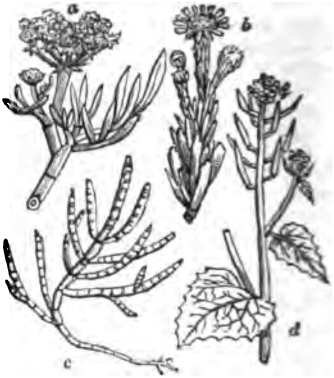

Use. Samphire forms an excellent pickle, and a frequent addition to salads. In taste, it is crisp and aromatic, and constitutes a light and wholesome condiment. It is generally gathered in places where it is found native; and the allusion to the practice by Shakspeare, in his description of Dover cliff, is well known. The plant is also used medicinally.

Culture. It is propagated by parting the roots, or by sowing the seed in April; but is rather difficult of cultivation. Marshall says, "it likes a cool situation; but yet prefers a sandy or a gravelly soil, and plenty of water. Some," he adds, "have found it to do best in pots, set for the morning sun only."

J. Braddick placed it in a sheltered dry situation, screened from the morning sun; protected it by litter during winter, and in spring sprinkled the soil with a little powdered barilla: "This I do," he says, "to furnish the plant with a supply of soda, since in its native place of growth, it possesses the power of decomposing sea-water, from which it takes the fossil alkali, and rejects the muriatic acid. With this treatment it has continued to flourish at Thames Ditton for some years, producing an ample supply of shoots, which are cut twice in the season." *Hort. Trans.* ii. 232.

Golden Samphire is the *Inula Crithmifolia*, L. (*Eng. Bot.* 68.); *Syng. Polyg. Super.* L.; and *Corymbiferæ*, J. *L'Inule perce-pierre*, Fr.; *Goldene Meerfenchel*, Ger. (*fig.* 332. *b*). It is a perennial plant, found on sea-shores, generally within salt-water mark. It is occasionally gathered and brought to Covent-garden market, under the name of *golden samphire*; but has not, we believe, been introduced in the garden. It is used for the same purposes as the common samphire.

Marsh Samphire is the *Salicornia Herbacea*, L. (*Eng. Bot.* t. 415.); *Dian. Monog.* L.; and *Chenopodeæ*, B. P. *Salicorne*, Fr.; *Glasschmalz*, Ger.; and *Erbacali*, Ital. (*fig.* 332. *c*). It is an annual plant, a native of Britain, and not uncommon in salt-marshes, and other aits and islets of low land overflown by the sea. It is occasionally gathered and brought to market; and is used for pickling, and in salads, like the two plants above described. This and the former species might be cultivated in the garden, by imitating a small portion of salt-marsh.

Sect. XII. *Edible Wild Plants, neglected, or not in Cultivation.*

1409. We have introduced this section as highly deserving the study of the horticulturist; partly to increase his resources, partly to induce such as have leisure to try how far these plants may be susceptible of improvement by cultivation; but principally to enable the gentleman's gardener to point out resources to the poor in his neighbourhood, in seasons of scarcity.

There can be no doubt, that all vegetables not absolutely poisonous, may be rendered edible by proper preparation. Many sorts, for example, are disagreeable from their acrid and bitter taste; but this might be, in a great degree, removed by maceration, either in cold or hot water. The vegetable matter once reduced to a state of insipidity, it is easy to give it taste and flavor, by adding salt of some sort, which is an article never scarce through the influence of bad seasons; or by vinegar, or oils, or fats; by the addition of other vegetables of agreeable tastes and flavors, as of thyme, mint, celery-seed, onions, &c.; or by the addition of torrified vegetable matter; as of the powder of roasted-carrot, parsnip, potatoe, or dandelion-roots, or of beans, peas, or wheat; or if it can be had, of toasted bread, which will render almost any thing palatable, and prolong the pleasure of eating many of the best things.

Gooseberry, birch, beech, willow, and other leaves, we are told, were formerly eaten as sallads, and there can be little doubt that aboriginal man would eat any green thing that came in his way, till he began to improve. It may be worth while for man in his present multiplied and highly civilized state, to reflect on these things, with a view to resources in times of famine, or in travelling or voyaging, or touching at or settling in new or uncultivated countries. See *Parry's Voyage to the Polar Regions*, 4to. 1821.

Edible wild plants may be classed: as greens and pot-herbs, roots, legumes, salads, teas, and plants applied to miscellaneous domestic purposes.

Subsect. 1. *Greens and Pot-herbs from Wild Plants.*

1410. *Black Bryony. Tamus communis*, L. (*Eng. Bot.* 91.); *Diœc. Hex.* L.; and *Smilaceæ*, J. A twining perennial, growing in hedges, and commonly considered a poisonous plant; but the young leaves and tops are boiled and eaten by the country people in spring.

Burdock. Arctium lappa, L. (*Eng. Bot.* 1228.); *Syng. Pol. Æq.* L.; and *Cynarocephalæ*, J. A well-known perennial, the tender stalks of which many people eat boiled as asparagus. *Bryant.*

Charlock. Sinapis arvensis, L. (*Eng. Bot.* 1748.); *Tetrad. Siliq.* L.; and *Cruciferæ*, J. A common annual weed in corn-fields. The young plant is eaten in the spring as turnip-tops, and is considered not inferior to that vegetable. The seeds of this have sometimes been sold for feeding birds instead of rape; but being hot in its nature, it often renders them diseased.

Chickweed. Alsine media, L.; *Stellaria media*, E. B. (*Eng. Bot.* 537.); *Decan. Trig.* L.; and *Caryophylleæ*, J. This common garden weed is said to be a remarkably good pot-herb, boiled in the spring.

Fat-hen. Chenopodium urbicum, (*Eng. Bot.* 717.); and *C. album*, (*Eng. Bot.* 1723.); *Pent. Dig.* L.; and *Chenopodeæ*, J. Both these plants are annuals, common among rubbish of buildings, dunghills, &c. Boiled, and eaten as spinach, they are by no means inferior to that vegetable. Several other native, but less common species of this genus, may be applied to the same use.

Ox-tongue. Picris hieracioides, L. (*Eng. Bot.* 972.) *Syn. Pol. Æq.* L.; and *Cichoraceæ*, J. This annual, common in clayey pastures and wastes, when boiled, affords a good green. In France and Italy, a species named *P. vulgare*, and probably the same as the above, is grown and used as a salad, and is said to resemble succory. *Bon Jard.* 1820. p. 170.

Sauce-alone, or *Jack by the Hedge*, is the *Erysimum Alliaria*, L. (*Eng. Bot.* 796.); *Tetrad. Siliq.* L.; and *Cruciferæ*, J. (*fig.* 332. *d*). A biennial plant; found by hedges where the soil is dry and rich. The stem rises two or three feet high, with heart-shaped leaves of a yellowish green colour; the flowers are white, and appear in May. The whole plant, as the trivial name imports, scents strongly of garlic. It is occasionally used as a salad; boiled as a pot-herb, or introduced in sauces. Neill observes, that, "when gathered as it approaches the flowering state, boiled separately, and then eaten to boiled mutton, it certainly forms a most desirable pot-herb; and to any kind of salted meat, an excellent green."

Sea Orache. Atriplex littoralis, L. (*Eng. Bot.* 708.); *Poly. Monœ.* L.; and *Chenopodeæ*, B. P. This is an annual, and is eaten in the same manner as the chenopodium, as greens or spinach.

Sea Beet. Beta maritima, L. (*Eng. Bot.* 285.); *Pent. Dig.* L.; and *Chenopodeæ*, J. This biennial is common on various sea-shores, and is also used like the orache, fat-hen, and white beet.

Spotted Hawkweed. Hypocheris maculata, L. (*Eng. Bot.* 225.); *Syng. Pol. Æq.* L.; and *Cichoraceæ*, J. The leaves of this perennial are eaten as salad, and also boiled as greens.

Stinging Nettle. Urtica dioica, L. (*Eng. Bot.* 1750.); *Monœc. Pent.* L.; and *Urticeæ*, J. This perennial, found in dry rubbishy soils and in hedges, is but seldom seen in places where the hand of man has not been at work, and may therefore be considered a sort of domestic plant. Early in February, the tops will be found to have pushed three or four inches, furnished with tender leaves; in Scotland, Poland, and Germany, these are gathered as a pot-herb for soups, or for dishes like spinach; and their peculiar flavor is by many much esteemed. No plant is better adapted for forcing; and in severe winters, when most of the Brassica tribe have been destroyed, it forms an excellent resource. Collect the creeping roots, and plant them either on a hot-bed, or in pots to be placed in a forcing-house, and they will soon send up abundance of tender tops: these, if desired, may be blanched, by covering with other pots. We have known the nettle forced by being planted close to the flue in a vinery, so as to produce excellent nettle kail and nettle spinach in the last week of January.

Wild Rocket is the *Sisymbrium officinale*, (*Eng. Bot.* 725.); *Tetrad. Siliq.* L.; and *Cruciferæ*, J. A common annual, of a yellowish hue, from two to three feet high, with the leaves runcinated, and the seed-pods inclined upwards, close to the stalk. It is sometimes used as a pot-herb; and the tender young leaves, in salading, greatly resembling mustard in its taste and flavor.

Willow Herb. Epilobium angustifolium, L. (*Eng. Bot.* 1947.); *Oct. Monog.* L.; and *Onagrariæ*, J. The young and tender shoots are eaten as asparagus, and the leaves are a wholesome green.

Sow-Thistle is the *Sonchus oleraceus*, (*Eng. Bot.* 843.); *Syng. Polyg. æqu.* L.; and *Cichoraceæ*, J. A hardy annual, and a well-known weed in rich garden and field soils. There is a prickly and smooth variety, both abounding in a milky bitter juice. The tender tops of the smooth variety are in some countries boiled and used as greens, or mashed as spinach: hence the origin of the Linnaean trivial name *oleraceus*.

Subsect. 2. *Roots of Wild Plants Edible.*

1411. *Arrowhead. Sagittaria sagittifolia*, L. (*Eng. Bot.* 84.); *Monœ. Poly.* L.; and *Alismaceæ*, B. P. The roots of this aquatic perennial are said to be very similar to those of the West India arrow-root, (*Maranta Arundinacea*, L.) They are sometimes dried and pounded, but are reported to have an acrid unpleasant taste; but this might, it is believed, be got rid of by washing the powder in water.

Bitter Vetch, or Mouse Peas. Orbous tuberosus, L. (*Eng. Bot.* 1153.); *Diad. Decan.* L.; and *Leguminosæ*, J. The tubers, are said to be chewed by the Scotish Highlander as a substitute for tobacco. Boiled till a fork will pass through them, and dried slightly and roasted, they are served up in Holland and Flanders in the manner of chesnuts, which they resemble in flavor. *J. Dickson* (*Hort. Trans.* ii. 359.) recommends cultivating them in a bed or border of light rich soil, paved at the depth of twenty inches, to prevent their roots from running down. Plant the tubers six inches apart, and three inches below the surface; the second year some will be fit to gather, and by taking only the largest, the bed will continue productive for several years, adding some fresh compost every year.

Earth-Nut. Bunium bulbocastanum, L. (*Eng. Bot.* 988.); *Pent. Dig.* L.; and *Umbelliferæ*, J. The roots of this bulbous perennial are eaten raw, and are considered a delicacy here, but thought much more of in Sweden, where they are an article of trade: they are eaten also stewed as chesnuts.

Meadow-sweet. Spiræa Filipendula, L. (*Eng. Bot.* 284.); *Icos. Di. Pentag.* L.; and *Rosaceæ*, J. The tubers of this perennial, common in most meadows where the soil is inclined to peat, or boggy, are ground and made into bread in Sweden.

Pilewort. Ranunculus ficaria, L.; (*Eng. Bot.* 584.) *Polyan. Polyg.* L.; and *Ranunculaceæ*, J. The young leaves, in spring, are boiled by the common people in Sweden, and eaten as greens. The roots are sometimes washed bare by the rains, so that the tubercles appear above ground; and in this state have induced the ignorant, in superstitious times, to fancy that it has rained wheat, which these tubercles somewhat resemble. *Derham's Physico-Theology.*

Saloop. Orchis Morio, L. (*Eng. Bot.* 2059.); *Gynan. Monan.* L.; and *Orchideæ*, B. P. The powder of the roots is used in forming the beverage called saloop. Though imported chiefly from Turkey, yet the roots of this country, either gathered wild, or cultivated for use, might answer the same purpose.

Silver-Weed. Potentilla Anserina, L. (*Eng. Bot.* 861.); *Icos. Polyan.* L.; and *Rosaceæ*, J. The roots of this plant taste like parsneps, and are frequently eaten in Scotland either roasted or boiled. In the islands of Tiras and Col they are much esteemed, as answering, in some measure, the purposes of bread, they having been known to support the inhabitants for months together during a scarcity of other provisions. They often tear up their pasture-grounds with a view to get the roots for their use; and as they abound most in barren and impoverished soils, and in seasons when other crops fail, they afford a most seasonable relief to the inhabitants in times of the greatest scarcity. *Lightfoot's Fl. Scot.*

Solomon's-Seal. Polygonatum vulgare, D. (*Eng. Bot.* 280.) The roots are dried, ground, and made into bread; and the young shoots are boiled and eaten as greens.

Subsect. 3. *Leguminous Wild Plants Edible.*

1412. *Sea-peas. Pisum maritimum*, L. (*Eng. Bot.* 1046.); *Diad. Decan.* L.; and *Leguminosæ*, J. (*fig.* 333.). These peas have a bitterish disagreeable taste, and are therefore rejected when more pleasant food is to be got. In the year 1555, however, when there was a great famine in England, the seeds of this plant were used as food, by which, according to Turner, thousands of families were preserved. The bitter of these seeds might in all probability be removed by steeping and kiln-drying, as in preparing for the mill peas which are to be split.

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Wild Vetches. Lathyrus, Vicia, and *Ervum*, L.; *Diad. Decan.* L.; and *Leguminosæ*, J. The seeds of all the British species of these genera may be used as peas. They are found in hedges, woods, and corn-fields, and are most prolific in dry seasons.

Subsect. 4. *Salads from Wild Plants.*

1413. *Ladies' Smock. Cardamine pratensis,* L. (*Eng. Bot.* 776.); *Tetrad. Siliq.* L.; and *Cruciferæ,* J. The leaves of this plant afford an agreeable acrid salad, greatly resembling the American cress.

Stone-crop, or *Orpine. Sedum Telephium,* L. (*Eng. Bot.* 1319.); *Decan. Pentag.* L.; and *Sempervivæ,* J. *Trique Madam,* Fr. The leaves are eaten in salads like those of purslane, to which, by the French, it is considered equal.

Sea Bind-weed. Convolvulus Soldanella, L. (*Eng. Bot.* 314.) *Pent. Monog.* L.; and *Convolvulaceæ,* B. P. This plant abounds on sea-coasts, where the inhabitants gather the tender stalks, and pickle them. It is considered to have rather a cathartic quality.

Sweet Cicely. Scandix Odorata, L. (*Eng. Bot.* 697.); *Pentan. Dig.* L.; and *Umbelliferæ,* J. The leaves of this plant used to be employed like those of chervil. The green seeds ground small, and used with lettuce or other cold salads, give them a warm agreeable taste. The smell of the plant attracts bees, and the insides of empty hives are often rubbed with it before placing them over newly-cast swarms to induce them to enter.

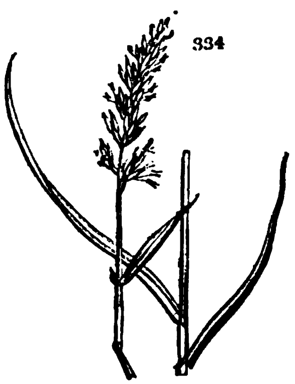
Buck's-horn Plantain, or *Star of the Earth. Plantago coronopus,* L. (*Eng. Bot.* 892.) *Tetrand. Monog.* L.; *Plantagineæ,* B. P. *Corne de Cerf,* Fr.; *Krähenfuss,* Ger.; and *Coronopo,* Ital. This is a hardy annual, a native of Britain, found in sandy soils. It is a low spreading plant, with linear pinnated leaves, and a round stalk: producing short spikes of starry flowers from May to August. It was formerly cultivated as a salad herb, and used like the common cress; but is now neglected in English gardens, perhaps on account of its rank and disagreeable smell. It is still, however, regularly sown in French gardens. It is raised by seed, which may be sown the first week in March; and after the plants have come up, they should be thinned so as each may occupy from five to nine square inches. To insure a succession of tender leaves, cut off the flowers as they appear.

Ox-eye Daisy. Chrysanthemum leucanthemum, L. (*Eng. Bot.* 601.); *Syng. Polyg. Super.* L.; and *Corymbiferæ,* J. *Marguerite grande,* Fr.; *Grosse Wucherblume,* Ger.; and *Leucanterno,* Ital. This is a perennial plant, common in dry pastures. The leaves, which spring immediately from the root, are obovate with footstalks; from these a stem arises from two to three feet high, furnished with oblong, embracing pinnatifid leaves. The flowers are large, with yellow disks and white rays, and appear in June and July. The young leaves were much used in Italy in salads in *Bauhin's* time; and they are mentioned by Dr. Withering as being fit for this purpose. The plant is easily propagated by dividing the roots after the flowering season. To produce succulent tender leaves, it should be placed in soft, rich, moist earth.

Subsect. 5. *Substitutes for Chinese Teas from Wild Plants.*

1414. *Speedwell. Veronica spicata,* L. (*Eng. Bot.* 2.) *Dian. Monog.* L.; and *Scrophularinæ,* B. P. This plant is sometimes used as a substitute for tea; and is said to possess a somewhat astringent taste like green tea (*Camellia viridis.*).

Spring-Grass. Anthoxanthum odoratum, L. (*Eng. Bot.* 647.) *Dian. Dig.* L.; and *Gramineæ,* B. P. (*fig.* 334.) This is a highly odoriferous grass, a decoction of which is said to bear a considerable resemblance to tea.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The leaves of the black currant afford a very good substitute for green tea; and those of *Saxifraga crassifolia* are said, by Took, (*Russ. Emp.*) to be used as tea in Siberia. *Betonica officinalis,* (*Eng. Bot.* 1142.) is said to have the taste and all the good qualities of foreign tea without the bad ones.

Subsect. 6. *Wild Plants applied to various Domestic Purposes.*

1415. *Butterwort. Pinguicula Vulgaris,* L. (*Eng. Bot.* 70.); *Diand. Monog.* L.; and *Lentibulariæ,* B. P. The inhabitants of Lapland and the north of Sweden give to milk the consistence of cream by pouring it warm from the cow upon the leaves of this plant, and then instantly straining it, and laying it aside for two or three days till it acquires a degree of acidity. This milk they are extremely fond of; and once made, they need not repeat the use of the leaves as above, for a spoonful or less of it will coagulate another quantity of warm milk, and make it like the first, and so on, as often as they please to renew their food. *Lightfoot's Flor. Scot.* p. 77.

Cow-parsnip. Heracleum Sphondylium, L. (*Eng. Bot.* 939.); *Pent. Dig.* L.; and *Umbelliferæ*, J. The inhabitants of Kamschatka, about the beginning of July, collect the foot-stalks of the radical leaves of this plant, and, after peeling off the rind, dry them separately in the sun; and then tying them in bundles, they lay them up carefully in the shade. In a short time afterwards these dried stalks are covered over with a yellow saccharine efflorescence, tasting like liquorice, and in this state they are eaten as a delicacy. The Russians, not content with eating the stalks thus prepared, contrive to get a very intoxicating spirit from them, by first fermenting them in water with the greater bilberry (*Vaccinium uliginosum*), and then distilling the liquor to what degree of strength they please; which Gmelin says, is more agreeable to the taste than spirits made from corn. *Lightfoot's Fl. Scot.*

Heath. Erica Vulgaris, L. (*Eng. Bot.* 1013.); *Octan. Monog.* L.; and *Ericeæ*, J. Formerly the young tops are said to have been used alone to brew a kind of ale; and even now, the inhabitants of Isla and Jura continue to brew a very potable liquor, by mixing two-thirds of the tops of heath with one of malt. *Lightfoot's Fl. Scot.*

For more minute details respecting the plants enumerated in this section, and various others which might be used as food, or in domestic economy, see *Bryant's Flora Diætetica*, and *Lightfoot's Flora Scotica, Hudson's Flora Anglica*, and the local floras of all parts of Europe.

1416. The following are the principal poisonous plants, natives or growing in Britain: those marked thus (*) are also the most valuable plants in the native *materia medica:* the whole, for obvious reasons, ought to be known at sight by every gardener:

Bitter Poisons, for which acids, astringents, wines, spirits, and spices are useful correctives. Chelidonium, majus, Cicuta virosa*, Colchicum autumnale*, Œnanthe crocata, Prunus Laurocerasus

Acrid Poisons, which should be counteracted by powerful astringents, as bark, and afterwards the stomach restored by soft, mucilaginous matters, as milk, fat broth, &c. Aconitum Napellus, and Lycoctonum, Actæa spicata, Rhus Toxicodendron

Stupifying Poisons to be counteracted by vegetable acids and emetics. Æthusa cynapium, Atropa Belladonna, Datura Stramonium*, Hyoscyamus niger, Lactuca virosa, Solanum Dulcamara*, and Nigrum

Fetid Poisons, to be attacked by ether, wine or acids. Conium maculatum* Digitalis purpurea*, Helleborus fœtidus, Juniperus Sabina, Scrophularia, aquatica

Drastic Poisons, to be corrected by acids alkalies, and astringents. Asclepias syriaca, Bryonia alba, Euphorbia Lathyris and amygdaloides, Mercurialis perennis and annua, Periploca græca, Veratrum album.

The Poisonous Fungi will be found in the next section.

Sect. XIII. *Edible Fungi.*

Only one species of this singular tribe has yet been introduced to the garden, though there can be no doubt the whole would submit to, and probably be improved by, cultivation. All of them are natives of Britain, and may be gathered wild at certain seasons, so that though they do not enter into the plot of the cottager, they are, or may be, enjoyed by him. In Poland and Russia, there are above thirty edible sorts of fungi in common use among the peasantry. They are gathered in all the different stages of their growth, and used in various ways: raw, boiled, stewed, roasted; and being hung up and dried in their stoves or chimneys, form a part of their winter stock of provisions. Fungi, however, are not equally abundant in Britain, owing to the general cultivation of the soil; and therefore the good sorts being little familiar to the cottager, most of them are passed over as deleterious. Indeed the greatest caution is requisite in selecting any species of this tribe for food; and though we have given a catalogue both of the good and bad sorts of mushrooms, we can advise none but the botanist to search after any but the common sort, *Agaricus Campestris*, as food.

Subsect. 1. *The Cultivated Mushroom.—Agaricus Campestris*, L.; and *Sowerby;* and *A. Edulis of Bulliard* (*Eng. Bot. Fungi*, t. 1.); *Cryptogamia Fungi*, L.; and of the natural order of *Fungi, Gymnocarpi*, Persoon. *Champignon Comestible*, Fr.; *Essbare Blätterschamme*, Ger.; and *Pratajuolo*, Ital. (*fig.* 335.)

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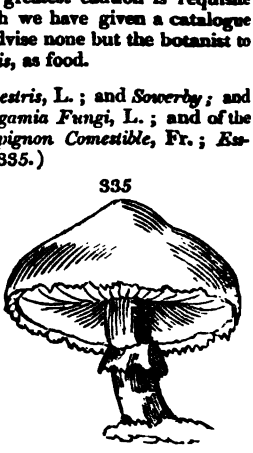

1417. This is a well-known native vegetable, springing up in open pastures in August and September. It is most readily distinguished, when of middle size, by its fine pink or flesh-colored gills, and pleasant smell; in a more advanced stage, the gills become of a chocolate color, and it is then more apt to be confounded with other kinds of dubious quality; but that species which most nearly resembles it, is slimy to the touch, and destitute of the fine odour, having rather a disagreeable smell: further, the noxious kind grows in woods or on the margins of woods, while the true mushroom springs up chiefly in open pastures, and should be gathered only in such places.

Use. The garden-mushroom is eaten fresh, either stewed or boiled; and preserved as a pickle, or in powder, or dried whole. The sauce, commonly called *ketchup* (supposed, by Martyn, from the Japanese, *kit-jap*), is, or ought to be, made from its juice, with salt and spices. Wild mushrooms, from old pastures, are generally considered as more delicate in flavour, and more tender in flesh, than those raised in artificial beds. But the young, or button mushrooms, of the cultivated sort, are firmer and better for pickling; and in using cultivated mushrooms, there is evidently much less risk of deleterious kinds being employed. *Neill* and *Martyn*.

Species. The following catalogue of edible and poisonous mushrooms is taken from *Sowerby*'s splendid work on *English Fungi*.

Edible Sorts.	
Agaricus campestris.	Common field or cultivated mushroom
A. violaceus.	Violet, or bluet
A. cinnamomeus.	Cinnamon
A. lactifluus.	Milky
A. chantarellus.	Chantarelle
A. pratensis.	Champignon
A. aurantiacus.	Orange
A. solitarius.	Solitary
A. procerus.	The grisette of the French, or Tall.
A. deliciosus.	Sweet mushroom
A virgineus.	Mousseron mushroom
A. orcades.	Fairy-ring, or Scotch bonnets.
Dangerous Sorts.	
A. campestris var.	Dangerous variety of cultivated mushroom.
A. clypeatus.	Long-stalked
A. muscarius.	Reddish
A. piperatus.	Pepper
A. campanulatus.	Bell
A. mamosus.	Nipple
A. aurantiacus var.	Dangerous variety of orange mushroom
A. necator	
A. virosus.	Poisonous, or toad-stool.

General criteria of wholesome and deleterious Fungi. Unwholesome fungi will sometimes spring up even on artificial beds in gardens; thus, when the spawn begins to run, a spurious brood are often found to precede a crop of genuine mushrooms. The baneful quality of the toad-stool (*A. virosus*) is, in general, indicated by a sickly nauseous smell, though some hurtful sorts are so far without any thing disagreeable in the smell, as to make any criterion, drawn from that alone, very unsafe. The wholesome kinds, however, invariably emit a grateful, rich scent.

Antidote to poisonous sorts. All fungi should be used with great caution, for even the *champignon* and edible garden mushrooms possess deleterious qualities when grown in certain places. All the edible species should be thoroughly masticated, before taken into the stomach, as this greatly lessens the effects of poisons. When accidents of this sort happen, vomiting should be immediately excited, and then the vegetable acids should be given; either vinegar, lemon-juice, or that of apples; after which, give ether and antispasmodic remedies, to stop the excessive bilious vomiting. Infusions of gall-nut, oak-bark, and Peruvian bark, are recommended as capable of neutralizing the poisonous principle of mushrooms. It is, however, the safest way not to eat any of the *good* but *less common* sorts, until they have been soaked in vinegar. Spirit of wine and vinegar extract some part of their poison; and tanning matter decomposes the greatest part of it. *Botanist's Companion*, vol. ii. p. 145.

Culture. For the culture of the common *Mushroom*, see chap. vii. sect. 14. (1288.) With respect to the other *edible* sorts, as already observed, they are seldom gathered for use in Britain, excepting by experienced botanists; and none of them, as far as we know, have yet been brought under cultivation. We think, however, that some of them, as the *A. aurantiacus*, *A. deliciosus*, and *A. pratensis*, might very readily, and without danger, be introduced to the garden; treating them like the garden mushroom, or imitating the climate of the season of the year in which they are found in perfection, and the soil, situation, and exposure, &c. where they are found in greatest abundance, and of the best quality. In the first instance it would, perhaps, be preferable to propagate from seed, in order to make sure of the species. In the present improved state of horticulture, if this branch of culture were once attempted, it would soon be rendered available by every gardener who can cultivate the common mushroom.

SUBSECT. 2. *Morel.* — *Phallus Esculentus*, L.; the *Helvella Esculenta*, of *Sowerby*, (tab. 51.); and *Morchella Esculenta* of *Persoon*; *Cryptogamia Fungi*, L.; and *Gymnocarpi*, *Persoon*. In French, German, and Italian, not distinguished from the Champignon by any popular name, (*fig*. 336.)

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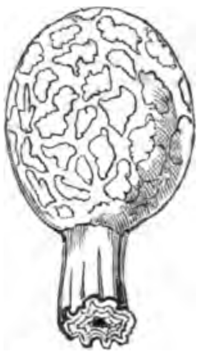

1418. The stem is cylindrical, solid, or hollow; white and smooth; the cap is hollow within, and adhering to the stem by its base, and latticed on the surface with irregular sinuses. The height is about four inches. It rises in the spring months, in wet banks, in woods, and in moist pastures. It is in perfection in May and June, and should not be gathered when wet with dew, or soon after rain. Gathered dry, they will keep several months.

Use. Morels are used, either fresh or dried, as an ingredient to heighten the flavor of gravies or ragouts, &c.

Culture. Though this vegetable has not yet been introduced in garden culture, like the mushroom, there can be no doubt of the attempt being attended with success. The spawn should be collected in June, and planted in beds or ridges, differently composed, and some laid up for use in dry and moist envelopments, in order, by experiment, to come to the best mode of cultivation. *Lightfoot* says, he has raised the *Phallus from seed*.

Subsect. 3. *Truffle* or *Subterraneous Puff-ball.* — *Tuber Cibarium*, Sowerby, (tab. 309.); *Cryptogamia Fungi*, L.; and *Angiocarpi*, Per. *Truffe*, Fr.; *Trüffel*, Ger.; and *Tartufo nero*, Ital. (*fig.* 337.)

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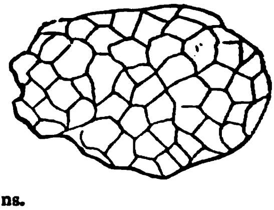

1419. This is a subterraneous fungus, growing naturally some inches below the surface in different parts of Britain; and very common in the downs of Wiltshire, Hampshire, and Kent, where dogs are trained to scent it out. The dogs point out the spot by scraping and barking; and the truffles, which are generally found in clusters, are dug up with a spade. The truffle is globular, seldom the size of a hen's-egg, without any root, and of a dark colour, approaching to blackness. The surface is uneven and rough; the flesh firm, white while young, but when old, it becomes black, with whitish veins.

Use. They are used, like the mushroom, in stuffings, gravies, and other high-seasoned culinary preparations. They are generally procured from Covent Garden market, as they bear carriage to any distance.

Culture. "No attempt," Neill observes, "it is believed, has hitherto been made to cultivate truffles; but of the practicability of the thing there seems no reason to doubt. In their habits of growth, indeed, they differ essentially from the mushroom; but it is certainly possible to accommodate the soil and other circumstances to the peculiar nature of the fungus. It has been said, that the tubercles on the surface of truffles are analogous to the eyes or buds of potatoes, and that they have been propagated, like potatoes, by means of cuts furnished with tubercles; it may however be suspected, that the pieces thus planted contained ripe seeds. Truffles, we may add, seem to delight in a mixture of clay and sand; and a moderate degree of bottom heat, such as is afforded by a spent hot-bed, might probably forward their vegetation." *Ed. Encyc.*

Sect. XIV. *Edible Fuci.* — *Cryptogamia Algæ*, L.; and *Fucaceæ*, Lamouroux. *Varec*, Fr.; *Meergrass*, Ger.; and *Fuco*, Ital.

1420. We shall shortly enumerate these vegetables, because some of them are occasionally used as condiments by families living near the sea-coast; and because they furnish articles of resource for the local poor, especially in seasons of scarcity. There are numerous species; all of which, in common with every other class of sea-weeds and zoophytes, are employed in gardening as manures; and in general economy for making kelp or *alkali.* The following are the principal of the British species, which are considered edible by the inhabitants of sea shores.

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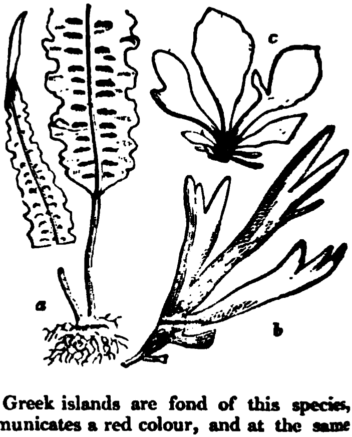

Fucus saccharinus. Sweet Fucus, or Sea-belt, (*fig.* 338. *a.*) Lightfoot mentions, that the common people on the coast of England sometimes boil this species as a pot-herb. Anderson says, the Icelanders boil it in milk to the consistence of pottage, and eat it with a spoon. They are also said to soak it in fresh water, dry it in the sun, and then lay it up in wooden vessels; it soon becomes covered with a white efflorescence of salt, which has a sweetish taste, and in this state they eat it with butter. They also feed their cattle with this species.

F. palmatus, L. Dulse, (*fig.* 338. *b.*) Both the tender stalks and young fronds are eaten recent from the sea, commonly without any preparation; they are sometimes considered as forming a salad, but more generally are used as a whet. Dulse formerly was frequently fried and brought to table. It is said, that the inhabitants of the Greek islands are fond of this species, adding it to ragouts and olios, to which it communicates a red colour, and at the same time imparts some of its rich and gelatinous qualities. The dried leaves, infused in water, exhale an odour somewhat resembling that of sweet violets, and they communicate that flavor to vegetables with which they are mixed. Lightfoot mentions, that in the Isle of Skye, in Scotland, it is sometimes used in fevers, to promote perspiration, being boiled in water, with the addition of a little butter. It grows not uncommonly on rocks which are barely uncovered at the ebb of the tide; but is more frequent as a parasite on *F. nodosus*; and it occurs also on the stems of *F. digitatus*, attaining in this situation a considerable size, perhaps twelve or fifteen inches long, while, in general, it is only about six or eight inches. It is soft and limber, and does not become rigid by drying, being of a more loose texture than many other sea-weeds.

F. edulis, L. Red Dulse, (*fig.* 338. *c.*) is by many preferred to the *F. palmatus*, especially for roasting in the frying-pan. Like that species, its smell somewhat resembles sweet violets. It is of a deep opake, red colour, giving out a purple dye.

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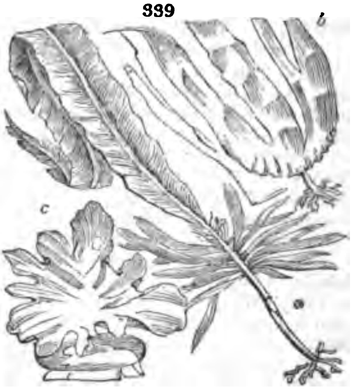

F. esculentus, L. Badderlocks, or Henware, (*fig.* 339. *a.*) The mid-rib, stripped of its membrane, is the part chiefly eaten. In Orkney, the *pinna* are also eaten, under the name of *mickles*.

F. ciliatus, L. Ciliated Dulse; and *F. digitatus*, Fingered-Dulse, sea-girdle, and hangers (*fig.* 339. *b.*) are sometimes gathered and eaten like *F. edulis*, *palmatus*, and other species.

In Scotland, the stem of the *F. digitatus* is used for making handles to pruning knives. A pretty thick stem is selected, and cut into pieces about four inches long. Into these, while fresh, the blades are stuck, and as the stem dries, it contracts and hardens, closely and firmly embracing the hilt of the blade; when these handles have become hard and shrivelled, and tipt with metal, they are hardly to be distinguished from hartshorn.

F. pinnatifidus, L. Pepper Dulse. In Scotland, it is eaten along with the *F. palmatus*, and in Iceland it is used instead of spice. This species is common to Scotland, Iceland, the Red Sea, and the shores of Egypt.

F. natans, L. Floating Fucus. The succulent fronds, Turner mentions, are selected and pickled like samphire; and the young shoots are eaten as a salad, seasoned with juice of lemons, pepper, and vinegar.

Ulva Lactuca, L. (*fig.* 339. *c.*) Lettuce-leaves, or oyster-green. The thin, green, pellucid membranes of which this vegetable is composed, are eaten raw, as a salad, and esteemed a great delicacy by such as have been accustomed to the use of marine vegetables.

Supplies. No sub-marine production has hitherto been cultivated in the garden; though it might be worth while to try what could be done by a stone-cistern of salt-water, and other contrivances, (Part iii. b. ii. c. v.) In the mean time, families in any part of Britain or Ireland, desirous of enjoying these vegetables, might have them regularly forwarded from the sea-shores, especially from such as are rocky. There are very few species known to be absolutely poisonous.

We may add, as matter of curiosity, that the transparent edible nests of the East Indian swallows, so much in repute at the luxurious tables of the rich, are now generally believed to be almost entirely composed of gelatinous fuci; and more especially of the *F. lichenoides* (*Turner*, t. 118.) The plant is also in high estimation for the table in India.

Chap. IX.

Horticultural Catalogue. — Hardy Fruit-trees, Shrubs, and Plants.

The hardy fruits of a country may be considered in reference to the vegetable appendages of the table, as next in utility to bread, corn, and culinary esculents. The excellent meats which they afford to the second course, and their contributions to the dessert, give them a peculiar value in the domestic economy of all those whose condition in life rises above the care of mere subsistence; and there are some sorts, as the gooseberry and apple, which happily, either are or may be within the reach of the most humble occupier of a cottage and garden. Many fruits are as wholesome as they are pleasant; and some greatly assist the cure of particular diseases. Cider, perry, and the various wines which may be made from the juices of fruits, are acceptable offerings to the social circle, when made in the best manner, and form important articles of commerce. We shall arrange the *Hardy Fruits* as

Kernel Fruits or Pomes; including the apple, pear, quince, medlar, service.

Stone Fruits; as the peach, nectarine, almond, apricot, plumb, and cherry.

Berries; as the mulberry, barberry, elderberry, gooseberry, currant, raspberry, strawberry, cranberry, &c.

Nuts; as the walnut, chesnut, filbert.

Native and neglected Hardy Fruits, deserving cultivation, or useful in domestic economy, as the sloe, bird cherry, mountain-ash, &c.

Sect. I. *Kernel Fruits.*

The principal of these are the apple and pear, too well known for their important uses to require any eulogium. In this section are also included the quince, medlar, and service.

Subsect. 1. The *Apple.* — *Pyrus Malus*, L. (*Eng. Bot.* 179.); *Icos. Di.-Pentag.* L.; and *Rosaceæ*, J. *Pomme*, Fr.; *Apfel*, Ger.; and *Pomo* or *Melo*, Ital.

1421. This is a spreading tree with the branches more horizontal than in the pear-tree; the leaves ovate; the flowers in terminating umbels, produced from the wood of the former year; but more generally from very short shoots or spurs from wood of two years' growth. The fruit is roundish, umbilicate at the base, and of an acid flavor. In its wild state, it is termed the crab, and is then armed with thorns, with smaller leaves flowers and fruit, and the pulp of the latter extremely acid. It is a native of most countries of Europe in its wild state; and the improved varieties form an important branch of culture in Britain, France, and Germany, for the kitchen, the table, and for the manufacture of cyder.

From whence we at first received the cultivated apple is unknown; but in all probability it was introduced by the Romans, to whom twenty-two varieties were known in Pliny's time, (20) and afterwards the stock of varieties greatly increased at the Norman conquest. According to Stow, carps and pepins were brought into England by Mascal, who wrote on fruit-trees in 1572.

The apple-tree is supposed by some to attain a great age. Haller mentions some trees in Herefordshire that attained a thousand years, and were highly prolific; but Knight considers two hundred years as the ordinary duration of a healthy tree, grafted on a crab stock, and planted in a strong tenacious soil. Speechly (*Hints*, 58.) mentions a tree in an orchard at Burton-joyce, near Nottingham, of about sixty years old, with branches extending from seven to nine yards round the bole, which, in 1792, produced upwards of 100 pecks of apples. Of all the different fruits which are produced in Britain, none can be brought to so high a degree of perfection, with so little trouble; and of no other are there so many excellent varieties in general cultivation, calculated for almost every soil, situation, and climate, which our island affords. Very good apples are grown in the Highlands and Orkneys, and even in the Shetland Isles, (*Caled. Hort. Mem.* vol. ii.) as well as in Devonshire and Cornwall: some sorts are ripe in the beginning of July, and others, which ripen later, will keep till June. Unlike other fruits, those which ripen latest are the best.

1422. *Use.* For pies, tarts, sauces, and the dessert, the use of the apple is familiar to every one. The fermented juice forms cyder, a substitute both for grape-wine and malt-liquor. In confectionary, it is used for comfits, *compôtes*, marmelades, jellies, pastes, tarts, &c. In medicine, verjuice, or the juice of crabs, is used for sprains, and as an astringent and repellent: and, with a proper addition of sugar, Withering thinks a very grateful liquor might be made with it, little inferior to Rhenish wine. Lightfoot affirms that the crab mixed with cultivated apples, or even alone, if thoroughly ripe, will make a sound, masculine wine. The apple, when ripe, is laxative; the juice is excellent in dysentery: boiled or roasted apples fortify a weak stomach. Scopoli recovered from a weakness of the stomach and indigestion from using them; and they are equally efficacious in putrid and malignant fevers with the juice of lemons or currants. In perfumery, the pulp of apples, beat up with lard, forms pomatum: and Bosc observes, (*N. Cours d'Agricultur, &c. in loco*,) that the prolonged stratification of apples with elder-flowers, in a close vessel, gives the former an odor of musk extremely agreeable. In dyeing, the bark produces a yellow color; and, in general economy, the wood of the tree is used for turning, and various purposes, where hardness, compactness, and variegation of color, are objects.

Criterion of a Good Apple. Apples for the table are characterised by a firm juicy pulp, elevated poignant flavor, regular form and beautiful coloring; those, for kitchen use, by the property of falling, as it is technically termed, or forming in general a pulpy mass of equal consistency, when baked or boiled, and by a large size. Some sorts of apples have the property of falling when green, as the Keswick, Carlisle, Hawthornden, and other codlins; and some only after being ripe, as the russet tribes. Those which have this property when green, are particularly valuable for affording sauces to geese early in the season, and for succeeding the gooseberry in tarts. For cyder, an apple must possess a considerable degree of astringency, with or without firmness of pulp, or richness of juice. The best kinds, Knight observes, are often tough, dry, and fibrous; and the Siberian Harvey, which he recommends as one of the very best cyder-apples, is unfit either for culinary purposes or the table. Knight has found that the specific gravity of the juice of any apple recently expressed, indicates, with very considerable accuracy, the strength of the future cyder. Considering the various uses of the apple, we agree with Speechly in regarding it as a fruit "of more use and benefit to the public in general, than all the other fruits, the produce of this island, united."

1428. *Varieties.* Tusser, in 1573, mentions in his list of fruits, "apples of all sorts." Parkinson, in 1629, enumerates fifty-seven sorts. Evelyn, about thirty years afterwards, says, (*Pomona*, pref.) "It was through the plain industry of one Harris, a fruiterer to Henry VIII., that the fields and environs of about thirty towns in Kent only, were planted with fruit from Flanders, to the universal benefit and general improvement of the county." Gibson (*Churches of Dove and Homelacy*,) mentions that Lord Scudamore, ambassador to the court of France, in the time of Charles I., collected in Normandy scions of cyder apple-trees, and when he returned to England, encouraged the grafting them throughout the county of Hereford. Hartlib, in 1650, speaks of "one who had two hundred sorts of apples," and "verily believes there are nearly 500 sorts in this island." Ray, in 1688, selected from the information of the most skilful gardeners about London, a list of 78 sorts. Succeeding writers have been enabled greatly to increase the list, partly from the almost continual accession of sorts received from the continent during intervals of peace, but principally from the great numbers raised from seeds. A variety of apple, like those of most other plants, appears to have only a limited duration; and hence on taking a retrospective view of the lists of sorts, given by Parkinson, Evelyn, and other authors, many of them are not now to be found, or are so degenerated or diseased, as no longer to deserve the attention of the planter. "The moil," Knight observes, "and its successful rival, the red-streak, with the musts and golden-pippin, are in the last stage of decay, and the stire and foxwhelp are hastening rapidly after them." After making a great variety of experiments for several years, and after many attempts to propagate every old variety of the apple, this author observes, (*Tr. on Apple and Pear*, 15.) "I think I am justified in the conclusion, that all plants of this species, however propagated from the same stock, partake in some degree of the same life, and will attend the progress of that life, in the habits of its youth, its maturity, and its decay; though they will not be any way affected by any incidental injuries the parent tree may sustain after they are detached from it."

Knight next directed his attention to raising new varieties from seeds, and has, by crossing one sort with another, and by having constantly several thousands of seedlings rearing, from which, as they show fruit, to select the best sorts, succeeded in producing several new varieties of apples, much esteemed for the table and the press. Of several of these sorts, and how obtained, accounts will be found in the work above quoted, and in the *Horticultural Transactions*, and a compend of their history and properties will be found in our table (*next page*). Several eminent horticulturists, in different districts, are now engaged in a similar manner; and there can be little doubt a valuable accession will, in a few years, be made to this class of fruits. Some, however, as Williamson (*Hort. Trans.* iii. 291.) and Speechly (*Hints*, 188.), consider that the deterioration of the apple and other fruits may be owing to the climate, and that the return of genial summers would restore to us from old trees as good fruit as heretofore.

A numerous list of varieties may be considered as puzzling to the inexperienced person who has to select for a garden or an orchard; but if each of these varieties were correctly figured and described, including the character and habits of the tree, as well as the leaves, shoots, blossoms, and fruit, the list could not be too extensive of a fruit so universally grown and liked as the apple; for almost every garden and orchard differs in soil, climate, aspect, or situation; and, consequently, to be planted in the best manner, must require a corresponding difference in the varieties of each species of fruit with which it is to be planted. Sabine, however, (*Hort. Trans.* iii. 263.) considers that the stock of apples requires reduction rather than increase, and observes that one of the chief objects to which the attention of the Horticultural Society is at present directed, is to make a judicious selection.

A great variety of apple-trees in a bearing state may be seen in different nurseries both in Britain and Ireland, but especially near London; from these, in the autumn, the fruit may be tasted from the trees, and either young plants newly *worked*, or plants in a state of bearing, fixed on and marked, to be taken up at the proper season. The advantages of this mode, especially to such as possess but a small garden, are too obvious to require comment.

No well-arranged catalogue of apples has yet been published, because, in general, only a limited number of sorts fall under the eye and experience of one individual. Such a work seems more likely to be accomplished by public bodies, and is worthy of their attention. In the mean time, we present the best arrangement in our power of sorts readily procured from British nurseries, including most of the newly originated varieties, of which accounts have been published, and grafts distributed, among the commercial gardeners.

1424. A DESCRIPTIVE CATALOGUE OF APPLES propagated in most British Nursery Gardens, arranged as Dessert, Dessert and Kitchen, Kitchen and Cyder Fruits.

I. DESSERT APPLES. — PIPPINS. *Pepins* or Seedlings. — Common Character of this Tribe: middle size or under; round, often flattened; prevailing colors when ripe, yellow and green; not early ripe, but good for keeping. Tree less hardy and less prolific than many other sorts. In general it may be observed, that the form of the fruit and its external appearance is less removed from that of a handsome and large crab, than the fruit of many of the other tribes. The sorts are here placed in the order of their keeping.

No.	*Name.*	*Synonym.*	*How, when, and where originated, procured, or abounding.*		*Where figured.*	*Described.*	*Size.*	*Figure.*	*Color.*	*Ripe in*	*Lasts till*	*Consistence and flavor.*	*Bearer.*	*Character of the tree, and general reputation of the fruit.*
1.	Old golden	-	An old decaying variety	-	Lang. Pom. t.74.	Forsyth, 62.	Small	Roundish	Golden yellow	October	February	Firm flesh, and sweet.	Middling	One of the most ancient and excell. of Brit. apples, and fit both for the dessert & for cyd.
2.	Franklin's golden	-	A sub-variety of golden	1780.	-	Forsyth, 48.	Medium	Conical	Gold and dark spots	Nov.	March	Firm, highly aromatic	Middling	
3.	Hughes' new gold.	-	A French apple	1803.	Hook. Pom. t.26.	Neill, En.H.108	Small	Flat	Yellow	October	March	Firm, aromatic	Middling	Excellent fruit; tree delicate
4.	*Downton	-	Seedling by Knight	1804.	Pom. Hor. t. 9.	Hort. Tr. i. 145.	Small	Round	Yellow	October	March	Firm, sweet	Small	Excellent juicy, ranks next the golden pippin both for the dessert and for cyder
5.	Elton	Knight's golden p.	Seedling by Knight	1802.	-	Salisb. Or. 130.	Medium	Round	Gold with spots	October	February	Firm, sweet	Great	Good for dessert or cyder
6.	Balgonie	Fife golden pippin	Esteemed Scotch apple	-	-	Neill, En.H.108	Medium	Round	Yellow and green	October	May	Firm, aromatic	Great	Hardy and very juicy
7.	Borsdorf	German p. queen's	Much esteemed Germ. fruit	-	Lang. Pom. t.77.	Hort. T. iii. 123.	Medium	Conical	Yellow and green	Sept.	February	Firm, aromatic	Middling	Excellent table fruit
8.	Kentish	Old Kentish apple	A decaying variety	-	Lang. Pom. t.72.	Forsyth, 786.	Large	Conical	Yellow and red	Chtmas.	February	Firm and sweet	Middling	Luxuriant tree
9.	Newtown	Reinette de Canada	Of American origin	1790.	-	Forsyth, 118.	Large	Conical	Y. spotted white & red	October	Mid. of May	Firm, juicy, sweet	Middling	Luxuriant tree
10.	New red	New scarlet	-	-	-	Forsyth, 120.	Medium	Round	Orange	October	March	Firm and sweet	Middling	Weakly tree
11.	French	Pigeonette de Rou.	Of French origin	-	Lang. Pom. t.76.	-	Medium	Conical	Dark-red and yellow	October	March	Firm and aromatic	Indiff.	The tree weak and drooping
12.	Orleans	-	-	-	-	Forsyth, 134.	Small	Flat	Dark-red	October	February	Firm, juicy	Dwarf	Fruit resembles the Orleans plum
13.	Fearns	-	-	-	Hook. Pom. t.45.	Forsyth, 51.	Small	Conical	Scarlet and yellow	October	March	Firm, juicy, aromatic	Indiff.	Slender tree
14.	Orange	-	A vigorous variety	-	P. Heref. t. 8.	Forsyth, 133.	Medium	Conical	Gold and red	October	March	Firm, juicy, and sweet	Middling	Very shewy at table, large tree
15.	North's new scarl.	-	Seedling	-	-	Hort. Tr. ii. 104.	Medium	Round	Gold and pale-red	October	March	Firm and aromatic	Middling	Excellent fruit, vigorous tree.
16.	Lisbon	-	-	-	-	Forsyth, 97.	Medium	Conical	Red and reddish-yell.	Nov.	February	Firm, sharp	Good	Tree, hardy and large
17.	King of the pip.	-	-	-	-	Forsyth, 88.	Large	Conical	Gold streak, white, red	January	March	Firm, juicy	Good	Hardy upright tree
18.	Kirton	Cracked pippin	A Scotch apple	-	Lang. Pom. t.74.	Forsyth, 84.	Medium	Flat	Gold and russet	Sept.	January	Firm, sweet	Good	Small tree, but hardy
19.	Paradise	-	-	-	-	Forsyth, 135.	Medium	Flat	Red and green	October	February	Firm, juicy	Good	Grows mealy when too ripe; tree small
20.	Queen's	-	-	-	-	Forsyth, 148.	Small	Round	Yellowish-green	January	May	Firm, aromatic	Middling	Small tree; fruit grows mealy
21.	New England	-	An American apple	1780.	-	Forsyth, 117.	Large	Angular	Green and brown	October	March	Firm, sweet	Good	Large vigorous tree
22.	Lemon	-	-	-	-	Forsyth, 102.	Large	Oval	Golden-yellow	October	March	Firm and juicy	Good	Vigorous tree
23.	Padley's	-	New Seedling	1800.	-	Hort. Tr. i. 69.	2 to 3 l.	Oval	Prickly and freckled.	Sept.	February	Richly perfumed	Good	Hardy tree; excellent fruit
24.	*Brindgwood	-	Seedling by Knight	1800.	-	Hort. Tr. i. 69.	Small	Round	Reddish-green	Sept.	March	Rich and sweet	Good	Hardy tree
25.	Whitmore	-	-	-	-	Forsyth, 188.	Large	Round	Strk. white, red & yell.	Nov.	May	Firm, sweet	Good	Luxuriant tree
26.	Yellow ingestrie	Resembles gold. p.	Seedling of Knight	1800.	-	Hort. Tr. i. 227.	Medium	Round	Yellow	October	February	Firm, juicy	Good	Large handsome tree
27.	Red ingestrie	Resembles gold. p.	Seedling of Knight	1800.	-	Hort. Tr. i. 227.	Medium	Round	Red	October	February	Firm, juicy	Good	Large handsome tree
28.	Wormsley	-	-	-	Hook. Pom. t.22.	Hort. Tr. i. 229.	Large	Conical	Yellow and red	October	February	Firm, juicy	Good	Vigorous tree
29.	Wood's new transparent	-	From seed of the golden at Huntington	1798.	-	Hort. Tr. ii. 105.	Small	Flat	Green and yellow	October	February	Firm, juicy	Great	Hardy tree and valuable fruit
30.	Cockles	-	-	-	-	Forsyth, 27.	Small	Round	Russet white, red, and yellow	January	April	Firm and sweet	Middling	Tree of low growth

DESSERT APPLES. — PEARMAINS. — Common Character: full at the footstalk, in general larger than Pippins.

No.	*Name.*	*Synonym.*	*How, when, and where originated, procured, or abounding.*		*Where figured.*	*Described.*	*Size.*	*Figure.*	*Color.*	*Ripe in*	*Lasts till*	*Consistence and flavor.*	*Bearer.*	*Character of the tree, and general reputation of the fruit.*
31.	Summer	-	-	-	Knoop. Pom. t.76	Forsyth, 165.	Medium	Conical	Green-striped with red	August	October	Soft, juicy, and sweet	Good	Hardy tree; fruit soon mealy
32.	Golden	-	-	-	-	Forsyth, 58.	Large	Roundish	Deep-red and yellow	August	October	Soft and sweet	Good	Hardy tree, not large; an esteemed fruit
33.	Kernel	-	-	-	-	Forsyth, 85.	Small	Ovate	Streaked white, red	January	May	Firm and juicy	Middling	Rather a tender tree
34.	Kirke's scarlet	-	-	-	-	Forsyth, 91.	Medium	Oval	Scarlet, red, & yellow	January	June	Firm and juicy	Middling	Small tree; fruit much esteemed
35.	Old English	-	-	-	-	Forsyth, 130.	Medium	Conical	Red and yellow	January	March	Firm and juicy	Good	Medium-sized tree and hardy
36.	Loans	-	-	-	Lang. Pom. t.76.	Forsyth, 98.	Large	Oval	Dull-green & brill. red	Sept.	May	Firm and sharp	Good	Medium-sized tree; fruit apt to grow mealy
37.	Spanish	-	-	-	-	Forsyth, 176.	Medium	Oblong	Carnation & dark-red	Sept.	May	Firm and sharp	Good	Large tree; shewy fruit
38.	Lamb abbey	-	From seed of Newtown p.	1805.	Hort. Tr. iii. t.10.	Hort. Tr. iii. 269	3 in. by 2	Oval pyr.	Yell. green & red spots	Sept.	April	Crisp and aromatic	Great	Handsome tree and excellent fruit

A DESCRIPTIVE CATALOGUE OF APPLES — Dessert Apples *continued.*

RENNETS. *Reinettes, or Little Queens.* — Common Character: speckled with white; shape roundish, and resembling a Pippin.

No.	Name.	Synonym.	How, when, and where originated, procured, or abounding.		Where figured.	Described.	Size.	Figure.	Color.	Ripe in	Lasts till	Consistence and flavor.	Bearer.	Character of the tree, and general reputation of the fruit.
39.	Golden	Reinette dorée	Of French origin		Lang. Pom. t. 74.	Forsyth, 56.	Medium	Flattish	Red and yellow	Sept.	February	Firm and juicy	Good	Medium-sized tree; shewy fruit
40.	Grey	Grise	Of French origin		Duh. t. 9.	Forsyth, 156.	Medium	Round	Grey	October	March	Firm and sweet	Good	Medium-sized tree; and hardy
41.	Hollow-eyed Cornwall					Forsyth, 75.	Small	Flattish	Green, yellow, & russet	October	April	Firm and aromatic	Great	Small tree; much esteemed fruit

DESSERT APPLES. — QUEENINGS. A sub-variety of Rennets.

No.	Name.	Synonym.	How, when, and where originated, procured, or abounding.		Where figured.	Described.	Size.	Figure.	Color.	Ripe in	Lasts till	Consistence and flavor.	Bearer.	Character of the tree, and general reputation of the fruit.
42.	Summer		An esteemed Scotch apple			Neill, Gen. Rep.	Medium	Angled	Greenish-white	August	November	Soft and juicy	Great	Very hardy, large tree
43.	Kernel					Forsyth, 147.	Large	Angled	Deep-red and white	October	April	Firm and tender	Great	Hardy, large tree; fruit fit for cyder as well as the dessert

DESSERT APPLES. — RUSSETS. — Common Character. Russet color; round in shape; generally good keeping Apples.

No.	Name.	Synonym.	How, when, and where originated, procured, or abounding.		Where figured.	Described.	Size.	Figure.	Color.	Ripe in	Lasts till	Consistence and flavor.	Bearer.	Character of the tree, and general reputation of the fruit.
44.	Leathercoat	Royal russet				Forsyth, 163.	Large	Round	Russet and red	October	April	Firm and aromatic	Great	Hardy, large tree
45.	Dredges					Forsyth, 33.	Small	Round	Russet streak. with red	Nov.	Midsum.	Firm and juicy	Good	Hardy, medium-sized tree

DESSERT APPLES. — NONPAREILS. *Nonpareilles.* A sub-variety of Russets, generally high-flavored.

No.	Name.	Synonym.	How, when, and where originated, procured, or abounding.		Where figured.	Described.	Size.	Figure.	Color.	Ripe in	Lasts till	Consistence and flavor.	Bearer.	Character of the tree, and general reputation of the fruit.
46.	Pitmaston		From seed	1815.	Hort. Tr. iii. t. 10.	Hort. Tr. 267.	3 in. by 2½	Flat and compress.	Dull green russ. & yel.	October	May	Firm and aromatic	Good	Delicate, slender-twigged tree
47.	Wrights					Forsyth, 195.	Large	Flattened	Brownish green	Nov.	June	Firm and aromatic	Great	Delicate, slender-twigged tree
48.	Early					Forsyth, 110.	Small	Flat	Reddish russet	Sept.	February	Firm and juicy	Good	Tender tree
49.	Scarlet		From seed at Esher, about	1780.	Hook. Pom. t. 12.	Hort. Tr. ii. 104.	Medium	Flattened	Russet and red	Sept.	March	Firm and aromatic	Great	Hardier-tree than most sorts
50.	Royal					Forsyth, 161.	Small	Flattish	Green and red	January	April	Firm and juicy	Great	Slender twigged tree
51.	Macdonald's Scot.		From seed in Scotl. about	1806.		Cal. Mem. ii. 96.	Small	Round, fine eye.	Greenish and red	Dec.	April	Firm and quick acid	Good	More hardy tree than most varieties

DESSERT APPLES. — CALVILLES. *Calvels.* — Common Character: above middle size; whitish-green, but slightly tinged with red.

No.	Name.	Synonym.	How, when, and where originated, procured, or abounding.		Where figured.	Described.	Size.	Figure.	Color.	Ripe in	Lasts till	Consistence and flavor.	Bearer.	Character of the tree, and general reputation of the fruit.
52.	Summer white				Lang. Pom. t. 75.	Forsyth, 20.	Small	Ovate	Whitish green	Sept.	October	Soft, and juicy acid	Great	Hardy, medium-sized tree
53.	Summer red				Lang. Pom. t. 75.	Forsyth, 20.	Small	Ovate	Reddish and white	Sept.	November	Soft, juicy, and sweet	Great	Hardy, medium-sized tree
54.	Autumn	Calville d'automne			Duh. iii. t. 2.	Forsyth, 100.	Large	Oblong	Reddish grown	October	January	Crisp, juicy, & vinous	Good	Hardy tree; great favourite in France

DESSERT APPLES. — CODLINS. — Common Character. Conical ribbed; small-sized; light-green, generally early Apples, great bearers, and readily propagated by cuttings.

No.	Name.	Synonym.	How, when, and where originated, procured, or abounding.		Where figured.	Described.	Size.	Figure.	Color.	Ripe in	Lasts till	Consistence and flavor.	Bearer.	Character of the tree, and general reputation of the fruit.
55.	*Spring grove				Hort. Tr. i. t. 12.	Hort. Tr. i. 197.	Small	Conical	Pale green	July	September	Soft, juicy	Great	Hardy tree; fruit chiefly used in the kitchen
56.	*Hawthorndean		Scot. apple in great esteem			Neill Gen. Rep.	Large	Flat. con.	Pale green	August	January	Soft, juicy, acid	Great	Very hardy tree; bears well in pots

DESSERT APPLES. — BURKNOTTS. *Little Codlings.* A sub-variety of Codlings; fruit small, twigs nodose.

No.	Name.	Synonym.	How, when, and where originated, procured, or abounding.		Where figured.	Described.	Size.	Figure.	Color.	Ripe in	Lasts till	Consistence and flavor.	Bearer.	Character of the tree, and general reputation of the fruit.
57.	Glocesters. creeper					Hort. Tr. ii. 104.	Small	Conical	Light green	August	December	Soft and sweet	Great	Dwarf tree; prop. by cuttings or suckers
58.	Brown burntisland	Brown burrknott	From seed in Scotland, say	1760.		Cal. Mem. ii. 310	Small	Conical	Pale green	Sept.	January	Soft and juicy	Great	Medium-sized tree; prop. by cuttings
59.	*Golden Harvey	Brandy apple	An esteemed Herefords. fr.		Pom. Her. 8.	Hort. Tr. i. 229.	Large	Roundish	Yellow and red	Nov.	May	Firm, juicy, vinous	Good	Handsome hardy large tree
60.	July flower	Norfolk apple				Hort. Tr. ii. 74.	Medium	Conical	Yellow and green	Sept.	February	Firm, juicy	Good	Large shewy tree
61.	Ord's apple	Newtown pippin	An American fruit	1801.	Hor. T. ii. t. 19.	Hort. T. ii. 285.	3 in. long 2¼ broad	Conical	Green and red	Christ.	March	Firm, juicy, vinous	Good	Large hardy tree; shewy fruit
62.	Alexander		Russian, or Ukraine fruit		Hor. T. ii. t. 28.	Hort. T. ii. 407.	16 by 14 in. round weighs 19 oz.	Obtusely conical	Red and green	Nov.	January	Firm, vinous	Medium	Large hardy tree; most magnificent fruit

A DESCRIPTIVE CATALOGUE OF APPLES—Dessert Apples *continued.*

Sorts with names which are either descriptive, indicative, local, or arbitrary.

No.	Name.	Synonym.	How when, and where originated, procured, or abounding.		Where figured.	Described.	Size.	Figure.	Color.	Ripe in	Lasts till	Consistence and flavor.	Bearer.	Character of the tree, and general reputation of the fruit.
63.	Beauty of Kent	- - - -	- - - -	-	- - -	Forsyth, 4.	Large	Conical	Red, streak. with yell.	Sept.	April	Firm, vinous	Good	Large hardy tree; shewy fruit
64.	Belle grisseldine	- - -	Of French origin	-	- - -	Forsyth, 5.	Medium	Flattish round	Yellow and red	Sept.	March	Firm and juicy	Medium	Spreading tree; shewy fruit
65.	Best poole	Bess or Bessy pool	A Welch apple	-	- - -	Forsyth, 7.	Medium	Roundish	Pale green and red	January	April	Firm, crisp, vinous	Good	Large hardy tree
66.	Black	- - - -	- - - -	-	- - -	Forsyth, 8.	Medium	Conical	Dark mahogany	Christ.	April	Firm, sweet	Great	Medium-sized tree; singular fruit
67.	Bache's fine small	- - - -	- - - -	-	- - -	Forsyth, 10.	Small	Ovate	Red and green	January	May	Firm, juicy	Good	Small spreading tree
68.	Cadbury pound	- - -	- - - -	-	- - -	Forsyth, 16.	Medium	Oblong	Light green	January	March	Firm, crisp, vinous	Great	Large tree; esteemed fruit
69.	Carnation	- - - -	- - - -	-	- - -	Forsyth, 17.	Medium	Ovate	Gr. red striped & car.	January	May	Firm and vinous	Good	Large tree; very showy fruit
70.	Dredge's fair maid	Dredge's wishford	A Wiltshire seedling, say	1765.	- - -	Forsyth, 35.	Medium	Roundish	Green and red streaks	Christ.	March	Firm and tender	Great	Handsome tree; showy fruit
71.	Dredge's Q. Char.	- - - -	A Wiltshire seedling, say	1770.	- - -	Forsyth, 36.	Medium	Oval flat.	Gold color and red	Christ.	February	Firm, & highly arom.	Good	Medium sized, hardy tree
72.	Dredge's fame	- - -	A Wiltshire seedling, say	1770.	- - -	Forsyth, 37.	Above medium	Round, flat	Greenish yellow; and streaked with red	Nov.	March	Firm, highly aromatic	Great	Handsome tree; esteemed fruit
73.	Elton's yel. kernel	- - - -	- - - -	-	- - -	Forsyth, 40.	Medium	Round	Yellow	January	March	Firm and vinous	Good	Free-growing tree
74.	Fameuse	Niege, or snow	From Canada about	1790.	- - -	Forsyth, 44.	Large	Conical	Dark red and yellow	October	February	Soft, juicy	Great	Hardy tree; flesh white as snow
75.	Fennouillet gris	Anis, fennel, anise	French apple	-	Lang. P. t. 75.	Forsyth, 45.	Medium	Ovate, flattened	Grey	Sept.	Christmas	Tender, spicy	Good	Small tree; fruit tastes like fennel
76.	Flower of Kent	- - - -	- - - -	-	- - -	Forsyth, 46.	Large	Round	Yellow	Sept.	April	Tender and vinous	Good	Large tree; showy fruit
77.	Gillyflower	- - - -	- - - -	-	- - -	Forsyth, 55.	Large	Ovate	Red and yell. with gr.	Sept.	March	Crisp and vinous	Good	Medium sized tree; showy fruit
78.	Golden knob	Eamore castle	English seedling	-	- - -	Forsyth, 61.	Small	Roundish	Gold color and russet	October	April	Firm and juicy	Medium	Hardy tree
79.	Godolphin	- - - -	From Lord Godolphin's g.	1792.	- - -	Forsyth, 63.	Large	Oblong	Streaked w. red & yell.	Sept.	December	Tender, spicy	Good	Large spreading tree
80.	Hall-door	- -	A Kentish apple	-	- - -	Forsyth, 69.	Large	Flat	Streaked with red and greenish yellow	January	March	Firm, acid	Good	Large tree; showy fruit
81.	June-eating	Jennetin, Geniton	- - - -	-	Lang. Pom. t. 74.	Forsyth, 79.	Small	Roundish	Yellow and red	July	September	Tender, juicy	Good	Small tree of low growth
82.	King	- -	- - - -	-	- - -	Forsyth, 89	Medium	Conical	Red and yellow	October	April	Tender, juicy	Good	Medium sized tree
83.	Lady's finger	- - - -	- - - -	-	- - -	Forsyth, 95.	Medium	Conical	Red and yellowish	Nov.	May	Firm and juicy	Good	Small spreading tree
84.	Margil	- - -	An Oxfordshire apple	-	Hook. P. t. 33.	Forsyth, 112.	Small	Round	Red and yellow	Nov.	March	Firm and aromatic	Great	Delicate-twigged small tree; highly esteemed fruit
85.	Margaret	Red june-eating	- - - -	-	Lang. P. t. 74.	Forsyth, 113.	Small	Conical	Yellow streaked w. red	August	October	Tender and sweet	Great	Slender-twigged but hardy tree
86.	Norfolk storing	- - - -	Norfolk apple	-	- - -	Forsyth, 126.	ab. med.	Conical	Dark red and green	January	May	Firm and juicy	Great	Hardy, spreading tree
87.	Nortf. greening	- - -	- - - -	-	- - -	Forsyth, 127.	Medium	Reg. oval	Pale green and red	January	April	Firm and sharp	Good	Spreading tree; esteemed fruit
88.	Oak-peg	Oaken pin	- - - -	-	- - -	Forsyth, 129.	Medium	Ovate	Gr. streak. with white	January	July	Firm, juicy	Medium	Hardy, rather slender tree
89.	Pomroy	Ring apple	Of French origin	-	Lang. P. t. 79.	Forsyth, 143.	Medium	Round	Green and yellow	July	September	Soft, subacid	Medium	Spreading low tree
90.	Violette	Violet	A French fruit	-	Duh. n. 7.	Forsyth, 142.	Large	Conical	Pale gr. streak. w. red	October	February	Soft, sugary, and violet	Indiffer.	Handsome medium-sized tree
91.	Poor man's profit	- - -	- - - -	-	- - -	Forsyth, 145.	un. med.	Oval	Green and brown	August	November	Soft, juicy	Great	Hardy large tree; very prolific
92.	Quince	- - - -	- - - -	-	- -	Forsyth, 149.	Medium	Roundish	Yellow and a little red	January	April	Firm and sharp	Good	Medium-sized tree; fruit like a quince
93.	Red.hay	- - -	Herefordshire fruit	-	- - -	Forsyth, 154.	Large	Oblong	Streaked w. dark red	October	March	Firm, juicy	Medium	Handsome growing tree; beautiful fruit
94.	Royal George	- - - -	- - - -	-	- - -	Forsyth, 160.	Large	Oval	Yellow and green	January	June	Firm, sugary	Great	Handsome tree; fruit apt to grow mealy
95.	Sykehouse	- - -	A Yorkshire apple	-	Hook. P. t. 40.	Forsyth, 168.	Medium	Round	Orange red and yell.	January	April	Firm and juicy	Great	Large spreading tree; showy fruit
96.	Spice	- - - -	- - - -	-	- - -	Forsyth, 172.	Medium	Angular	Yellow	January	March	Firm and sugary	Great	Medium-sized tree
97.	Skerme's kernel	- - -	- - - -	-	- - -	Forsyth, 173.	Medium	Conical	Streak. w. red & yell.	July	April	Firm and aromatic	Good	Large spreading tree
98.	Spanish onion	- - - -	- - - -	-	- - -	Forsyth, 177.	be. med.	Round	Russet and dull red	October	March	Firm and sweet	Good	Hardy, spreading tree
99.	*White court pendu	Corps pendu. hanging body	- - - -	-	- - -	Forsyth, 183.	Medium	Long	Yellowish	January	March	Firm and sugary	Good	Spreading tree; fruit hangs down
100.	Ward	- - -	- - - -	-	- - -	Forsyth, 184.	un. med.	Flat	Fine red and yell. gr.	January	July	Firm and juicy	Good	Slender-twigged branchy tree
101.	Wheeler's extreme	Pomme grêlé	English seedling		- - -	Forsyth, 187.	un. med.	Flat	Russ. cloud. with red	Christ.	April	Crisp and sugary	Great	Hardy vigorous tree
102.	Fig-apple	- -	- - - -	-	- - -	Neill, En.H.108	Small	Ovate	Greenish yellow	Sept.	January	Crisp and sweet	Great	Very dwarf tree; fig-shaped fruit
103.	Pomme d'Apis	Apius's apple, coreless apple	French fruit	-	- - -	Neill, En.H.108	Very sm.	Roundish	Yellow and bright red	October	July	Firm, juicy	Great	A very small tree; fr. without seeds or core
104.	Pom. de deux ans.	Apple of 2 seasons	French variety		- - -	Neill, En.H.108	Small	Roundish	Pale Green	Sept.	January	Soft, sweet	Good	Small tree; with blossoms, and fruit at the same time

A DESCRIPTIVE CATALOGUE OF APPLES—*continued.*

DESSERT AND KITCHEN APPLES.—Those marked with an asterisk (*) among the Dessert Fruits may be also included.—PIPPINS. *Pepins.*

No.	*Name.*	*Synonym.*	*How, when, and where originated, procured, or abounding.*		*Where figured.*	*Described.*	*Size.*	*Figure.*	*Color.*	*Ripe in*	*Lasts till*	*Consistence and flavor.*	*Bearer.*	*Character of the tree and general reputation of the fruit.*
105.	Ribstone	-	Yorkshire seedling	1750.	Hook. P. t. 3.	Hort. T. iii. 140.	Ab. med.	Round & flattened	Green and bright red	November	March	Firm, highly aromatic	Great	Hardy free-growing tree, thrives in all situations and climates; one of the best of British apples
106.	Kerry	-	Irish fruit	-	Hook. P. t. 20.	Neill, E.H. 108.	Medium	Roundish	Greenish yellow	October	February	Firm and juicy	Good	
107.	Bland's summer	-	-	-	-	Forsyth, 9.	Medium	Ovate	Gold and green	September	Christmas	Firm and crisp	Good	Hardy large tree; esteemed fruit
108.	Holland	-	-	-	Lang. P. t. 79.	Forsyth, 73.	Medium	Flattish	Yellow and green	October	April	Crisp and sugary	Good	Medium-sized tree; esteemed fruit
109.	Hollow-eyed	-	-	-	-	Forsyth, 74.	Medium	Deep eye, ovate	Yel. streaked with red	October	June	Firm and juicy	Good	Hardy spreading tree
110.	Grumas	-	-	-	-	Forsyth, 67.	Small	Roundish	Yellow and green	January	April	Firm and sugary	Great	Rather a delicate tree; fruit good
111.	Lucas	-	-	-	-	Forsyth, 107.	Medium	Cylindr.	Orange	October	May	Firm and juicy	Good	Handsome spreading tree; showy fruit
112.	Garcey	-	-	-	-	Forsyth, 51.	Be. med.	Conical	Green, yellow, and red	November	May	Crisp and aromatic	Good	Free-growing, upright tree
113.	London	Five-crowned pip.	-	-	-	Forsyth, 99.	Large	Round & flattened	Green, str. with red	November	April	Crisp and sugary	Great	Handsome spreading tree
114.	Isle of Wight	-	-	-	-	Forsyth, 81.	Medium	Roundish	Greenish-yellow	October	March	Firm and aromatic	Great	Hardy drooping tree
115.	Kern. of the Kent.	Kentish seedling	English seedling, say	1765.	-	Forsyth, 84.	Ab. med.	Ovate	Light gr. and red	November	February	Soft, sugary	Good	Large tree; fruit apt to grow mealy
116.	Pearsons	-	Nottingham apple	1780.	-	Forsyth, 139.	Small	Roundish	Yellow and gold	January	April	Soft, sweet	Great	Free upright growing tree; fruit becomes mealy in March
117.	Russet	Grey pip., brown p.	-	-	-	Forsyth, 161.	Medium	Roundish	Gold and russet	October	March	Firm, juicy	Great	Hardy upright tree
118.	*Warwickshire	Warwick golden p.	Resembles the golden pip.	-	-	Hort. T. ii. 104.	Small	Round	Gold and green	November	March	Firm, aromatic	Good	Delicate slender-twigged tree; fruit fit both for table and cyder
119.	Broad-eyed	-	-	-	-	Forsyth, 13.	Large	Flat broa. eye	Greenish-yellow	October	May	Firm, sugary	Good	Large free-growing tree
120.	Dalmahoy	-	Esteemed Scotch apple	-	-	Forsyth, 29.	Small	Roundish	Green	November	May	Firm, aromatic	Great	Hardy, but slender tree; excellent fruit
	DESSERT AND KITCHEN APPLES.—PEARMAINS.													
121.	Royal	-	-	-	Knoop. P. t. 12.	Forsyth, 162.	Large	Roundish	Red and yellowish gr.	November	June	Firm and sweet	Great	Medium-sized free-growing tree
122.	Winter	Herefordshire	A Herefordshire fruit	-	Lang. P. t. 78.	Forsyth, 191.	Medium	Ovate	Green and red	September	May	Firm and sugary	Great	Large tree; much-esteemed fruit
123.	Red	-	-	-	-	Forsyth, 151.	Small	Ovate	Deep-red and yellow	October	April	Firm and juicy	Good	Handsome tree; good fruit
124.	Pickering's	-	-	-	Lang. Pom. t. 77.	Forsyth, 51.	Small	Oval	Green, str. with red	October	March	Firm and sweet	Good	Free-grower and hardy
125.	Herefordshire	-	-	-	-	Forsyth, 3.	Large	Round	Pale-green spotted	October	April	Firm and sugary	Great	Large tree, upright-twigged
126.	Baxter's	-	-	-	-	Forsyth, 6.	Large	Oblong	Green and red	October	June	Firm and sugary	Good	Handsome tree; esteemed fruit
127.	Bell's	-	-	-	-	Forsyth, 25.	Medium	Oblong	Dull gr. and russet	October	May	Firm, juicy	Great	Handsome free-growing tree
	DESSERT AND KITCHEN APPLES.—RENNETS. *Reinettes*													
128.	English	-	-	-	Duh. t. 12.	Forsyth, 41.	Medium	Ovate	Yellowish green	October	March	Firm and juicy	-	Free growing tree
129.	French	White rennet	-	-	Lang. P. t. 76.	Forsyth, 53.	Large	Roundish	Pale-yellow	October	February	-	-	Delicate tree
130.	Dwarf	Grey	-	-	-	Neill, E.H. 108.	Medium	Round	Grey	November	March	Firm and aromatic		
131.	Monstrous	-	-	-	Lang. P. t. 78.	Forsyth, 115.	Very lar.	Oblong	Red and dark green	Christmas	April	Firm and juicy		
132.	Canadian	Rein. de Trianon	-	-	-	Neill, E. H.	Large, eye sm.	Ovate	Pale green	November	February	-	-	Vigorous tree; showy fruit
133.	Mother	-	-	-	-	Forsyth, 116.	Medium	Round	Yellow and brown	November	March	Firm and crisp		
134.	Lord Cambden's	-	-	-	-	Forsyth, 106.	Large	Flatd. ov.	Russet and red	October	April	-	-	Handsome tree; esteemed fruit
135.	Spice	-	-	-	-	Forsyth, 175.	Small	Round	Green and red	October	March	Crisp and aromatic		
136.	Trevoider	-	-	-	-	Forsyth, 182.	Small	Round	Yellow and red	Christmas	May	Firm	-	Very hardy tree
	DESSERT AND KITCHEN APPLES.—RUSSETS.													
137.	Cornish	-	-	-	-	Forsyth, 24.	Bel. med.	Flat, rou.	Russet, and some gr.	January	June	Firm and juicy	Good	Upright growing tree; valuable fruit
138.	Golden	-	-	-	-	Forsyth, 57.	Medium	Round	Yellow russet	October	May	Firm and good	Good	Spreading tree
139.	*Harvey's	-	-	-	-	Forsyth, 72.	Large	Ovate	Green russet	Christmas	May	Firm and sweet	Great	Upright tree
140.	Wheeler's	-	-	-	-	Forsyth, 185.	Medium	Roundeye	Brown russet	November	April	Firm and crisp	Good	Upright slender twigs; good fruit
141.	Sharp's	-	-	-	-	Forsyth, 178.	Bel. med.	Frust. of a cone	Brown and red streak.	October	May	Firm	Good	Upright tree, and spreading when old
142.	Wine	-	-	-	-	Forsyth, 186.	Medium	Conical	Dark russet	Christmas	May	Firm and aromatic	Good	Upright slender tree; esteemed fruit

No.	Name.	Synonym.	How, when, and where originated, procured, or abounding.		Where figured.	Described.	Size.	Figure.	Color.	Ripe in	Lasts till	Consistence and flavor.	Bearer.	Character of the tree, and general reputation of the fruit.
143.	Kentish	Burknott codlin					Bel.med.	Conical	Pale green	August	January	Soft and sugary	Great	Vigorous tree; useful fruit
144.	Carlisle	Keswick codlin				Cal. Mem. 376.	Small	Coni. rib.	Whitish-green	August	Christmas	Soft and sub-acid	Great	Hardy tree, propagated by cuttings
145.	*Spring-grove	No. 55.												Fruit used green for sauce, or ripe for the desert
146.	*Hawthorndean	No. 56.												
147.	French					Forsyth, 50.	Large	Coni. rib.	Yellowish-green	August	January	Soft and sweet	Great	Hardy small tree, prop. by cutt.; usef. fru.

DESSERT AND KITCHEN APPLES.—Sorts with names which are either descriptive, indicative, local, or arbitrary.

No.	Name.	Synonym.	How, when, and where originated, procured, or abounding.		Where figured.	Described.	Size.	Figure.	Color.	Ripe in	Lasts till	Consistence and flavor.	Bearer.	Character of the tree, and general reputation of the fruit.
148.	Bigg's nonsuch		New variety, say	1750.		Hort. Tr. i. 70.	2 to 3 in. long	Conical	Yel. variegat. with red	September	Christmas	Firm and high	Good	Free-grower; excellent fruit
149.	Minier's dumplin		New variety, say	1765.		Hort. Tr. i. 70.	3 to 3½ broad	Round & flattened	Deep gold and red	Christmas	April	Firm and juicy	Good	Medium-sized tree
150.	Aromatic					Hort. Tr. ii. 74.	Medium	Ovate	Yellow and red	Christmas	May	Firm and aromatic	Medium	Slender tree; esteemed fruit
151.	Baltimore		American apple		Hort. Tr. iii. t. 4.	Hort.Tr.iii.420.	14½ in. in circum. weight 1lb. 7oz.							
152.	Eve		An Irish fruit			Cal. M. ii. 506.	weighs 7 oz.	Obt. coni.	Fine red and green	October	January	Soft, juicy	Indiffer.	Vigorous tree; magnificent fruit
153.	Pomroy					Forsyth, 11.	Large	Round	Red and green	October	July	Soft, juicy	Great	Hardy tree, propag. by cuttings; usef. fruit
154.	Bovey red streak					Forsyth, 12.	Medium	Flat	Red and green	January	March	Firm, sweet	Good	Large tree; shewy fruit
155.	Cat's-head							Flat small eye	Deep red and white	January	April	Firm, sub-acid	Good	Free-grower; esteemed fruit
156.	Cockagee					Forsyth, 21.	Large	Oblong	Grey, yel. and bri. red	January	May	Soft, sweetish	Great	Large vigorous tree; shewy fruit
157.	*Court pendu					Forsyth, 22.	-	-	Red and yellow	October	December	Soft and sharp	Great	Vigor. tree; fru. good for tab. bak. or cyder
158.	Dredge's beauty of Wilts	Red anise	New variety, say	1750.		Forsyth, 32.	Ab. med.	Oval	Bri. yel. spot. with red	October	March	Firm and juicy	Great	One of the best apples yet known in point of general utility
159.	Dredge's white lily		New variety, say	1750.		Forsyth, 34.	Medium	Round	Red and yellow	November	March	Firm and sugary	Good	Free-growing tree; esteemed fruit
160.	Dumplin		Old Norfolk apple			Forsyth, 38.	Ab. med.	Flatti. ro.	Streaked with red	Easter	March	Solid and vinous	Medium	Vigorous tree
161.	Golden mundi					Forsyth, 59.	Small	Round	Green and red	October	January	Firm and sweet	Good	Spreading low tree
162.	Golden Gloucester					Forsyth, 60.	Medium	Ovate	Gold and red	Christmas	March	Firm and sweet	Good	Spreading hardy tree
163.	Hallingbury					Forsyth, 70.	Large	Flat, rib.	Red and yellow	October	March	Firm and sub-acid	Indiffer.	Vigorous tree
164.	Hampsh. nonsuch					Forsyth, 71.	Large	Conical	Gr. yel. strea. with red	September	December	Firm and vinous	Great	Large upright tree; valuable fruit
165.	Hedge					Forsyth, 76.	Medium	Conical	Red and straw color	October	April	Firm and sweet	Great	Upright tree
166.	Hubbard's	Russet pearmain				Forsyth, 78.	Ab. med.	Roundish	Dark russet	January	April	Firm and sweet	Medium	Upright slender-twigged tree
167.	Kirk's seedling		New variety, say	1770.		Forsyth, 90.	Larg. ro.	Slen. st.	Red and yellow	Christmas	May	Firm, sugary	Great	Vigorous tree
168.	Kentish fill-basket	Kentish codling				Forsyth, 93.	Large	Conical	Pale green	August	October	Soft and acid		
169.	Long-laster					Forsyth, 101.	Medium	Angl. co.	Fine yellow and red	October	May	Solid and sweet		
170.	May gennet					Forsyth, 110.	Bel.med.	Conical	Gre. yel. str. with red	October	April	Firm and sugary		
171.	Major Hemming					Forsyth, 111.	Medium	Round	Light green & brown	November	March	Firm and juicy		
172.	Nonsuch					Forsyth, 121.	Medium	Roundish	Green and reddish	September	October	Soft, sweet	Great	Small tree; cooks say the fruit makes but a small proportion of sauce
173.	Nine-square		A Gloucestershire fruit			Forsyth, 122.	Large	Angular	Red and yellow	October	April	Firm, juicy		
174.	Norfolk colman					Forsyth, 123.	Medium	Conical	Mahog. and dark gree.	Christmas	August	Firm		
175.	Norfolk beaufin					Forsyth, 124.	Ab. med.	Flatti. ro.	Deep red and pale gr.	Christmas	August	Firm and savory	Great	Hardy upr. tree; fr. in gr. rep. in the kitch.
176.	Pigeonette		From Brittany		Duh. t. 26.	Forsyth, 138.	Bel.med.	Conical	Pink red	October	March	Solid, sub-acid	Medium	Hardy tree, slender spray
177.	Pomme grise		From Canada, say	1790.		Forsyth, 140.	Medium	Ovate	Russet and red	September	Christmas	Soft and sweet	Indiffer.	Vigorous tree
178.	Mindhul crab		A Lancashire seedling, say	1790.		Forsyth, 114.	Medium	Roundish	Yel. with brown spots	September	April	Firm, sharp	Great	Upri. vigor. tr.; fru. usef. for every purpose
179.	French crab					Forsyth, 49.	Large	Ovate	Deep green and red	Christmas	Christmas	Firm, sharp	Great	Handsome upright tree; and most valu. fr.
180.	Red-streak	Longleat red strea.	Seedling of Wiltshire, say	1785.		Forsyth, 153.	Medium	Round	Yel. streaked with red	September	October	Soft and acid	Good	Free-growing spreading tree
181.	Red-sweet		A Cornwall fruit			Forsyth, 157.	Small	Ovate	Red and green, yellow	November	March	Firm and sharp	Medium	Vigorous tree; good fruit
182.	Yorksh. greening					Forsyth, 196.	Ab. med.	Conical	Dull red and green	January	August	Firm and sharp	Great	Large, spreading tree

A DESCRIPTIVE CATALOGUE OF APPLES—*continued.*

KITCHEN APPLES.—PIPPINS. *Pepins.*

No.	Name.	Synonym.	How, when, and where originated, procured, or abounding.		Where figured.	Described.	Size.	Figure.	Color.	Ripe in	Lasts till	Consistence and flavor.	Bearer.	Character of the tree, and general reputation of the fruit.
183.	Pound					Forsyth, 144.	Large	Conical	Greenish-yellow	January	April	Firm and sharp	Indiffer.	Vigorous tree, large leaves
184.	Griddleton	Girdleston				Forsyth, 66.	Large	Angular	Green	October	March	Firm and sharp	Good	Vigorous tree
185.	Williams		A new variety, say	1800.		Hort. Tr. i. 69.	2 to 2½in. long	Conical	Pale yellow and red	September	Christmas	Soft and juicy	Good	Upright-growing tree
186.	Spencer					Forsyth, 179.	Medium	Oblong	Yellowish-green	Christmas	June	Firm and austere	Good	Hardy, free-growing tree
187.	Carberry					Forsyth, 18.	Large	Ovate	Deep green and red	October	March	Firm and austere	Great	Hardy, spreading tree
	KITCHEN APPLES.—RENNETS. *Reinnettes.*													
188.	Kitchen					Forsyth, 112.	Large	Obt. coni.	Greenish-red	November	March	Firm and sharp	Great	Slender-twigged, but hardy tree
189.	Lincolnshire		An esteem. Lincolns. fruit			Forsyth, 112.	Large	Ovate	Brownish-green	December	July	Firm and austere	Great	Vigorous large-leaved tree
	KITCHEN APPLES.—RUSSETS.													
190.	Piles					Forsyth, 137.	Medium	Ro.& flat.	Gold and russet	Christmas	May	Firm, acid	Great	Hardy tree; much esteemed fruit
191.	Great					Forsyth, 65.	Large	Roundish	Russet, strea. with red	December	March	Firm, acid	Good	Hardy tree
192.	Adams		A Yorkshire apple			Forsyth, 1.	Small	Round	Russet and yellow	January	March	Firm and juicy	Good	Vigorous, spreading tree
193.	Caraway					Forsyth, 19.	Small	Roundish.	Russet and yellow	January	May	Firm and acid	Indiffer.	Slender-twigged, but hardy tree
	KITCHEN APPLES.—CODLINGS.													
194.	Common white				Lang. P. t. 74.	Forsyth, 23.	Small	Conical ribbed	Pale green	October	February	Soft and acid	Great	Hardy, free-growing tree; prop. by cuttings; fruit used either raw or ripe
195.	Keswick					Cal.Mem.i. 374.	Small	Ribbed & conical	Red and light green	July	Christmas	Soft and sub-acid	Very gr.	Hardy tree; most prolific of any; propagat. by cuttings; and fruit used raw or ripe
196.	Stoup					Forsyth, 150.	Large	Obl.& rib.	Pale green and red	October	May	Firm and acid	Great	Hardy, large tree, valuable fruit
	KITCHEN APPLES.—Sorts with names which are either descriptive, indicative, local, or arbitrary.													
197.	Burknott	Original ap. mother apple, golden or calin apple	An esteemed Scotch apple resembling the Ribstone pippin		Cal. Mem. i. t. 2.	Cal.Mem.i. 257.	Medium	Flatly orbiculate	Green, yell. and red	October	February	Firm and sub-acid	Very gr.	Hardy, dwarf-tree; prop. by cuttings; bears well in pots
198.	Golden Harvey	Brandy												
199.	*Canfroome		A new variety esteemed in the cyder countries, say	1760.		Hort.Tr.i.t.229.	Small	Conical	Red and green	October	March	Firm and austere	Great	Hardy, upright tree
200.	*Bovey	See No. 154.												
201.	*Cockagee	See No. 156.												
202.	Dymmock red					Forsyth, 50.	bel. med.	Round	Red and yellow	January	March	Firm and sub-acid	Good	Hardy, spreading tree
203.	Dredge's seedling					Forsyth, 31.	Large	Oblong	Red streak. with yell.	October	February	Firm and acid	Good	Free-growing, broad-leaved tree
204.	*Dutch queening					Forsyth, 39.	Large	Oblong	Red and green	January	March	Firm and austere	Great	Spreading hardy tree
205.	Embroidered					Forsyth, 42.	ab. med.	Ovate	Broad streak of red	October	February	Firm and sour	Good	Vigorous tree, broad leaves
206.	Everlasting					Forsyth, 43.	bel. med.	Conical	Streaked with green and red	October	February	Firm and austere	Good	Hardy, slender-twigged tree
207.	French Spaniard													
208.	Green dragon		From Enmore castle, say	1780.		Forsyth, 52.	Large	Hexagonal prism	Green and red	September	February	Firm and juicy	Indiff.	Vigorous, broad-leaved tree
209.	*John		Devons. and Herefords. fr.			Forsyth, 80.	Medium sm.foots.	Round	Green, and a little red	December	March	Firm and acid	Good	Vigorous, spreading tree
210.	Kernel redstreak					Forsyth, 83.	Medium	Conical	Red and yellow	December	April	Firm and juicy	Great	Handsome, spreading, broad-leaved tree
211.	Kirke's scarlet admirable	Hollingbury				Forsyth, 92.	Large	Ovate sm. eye	Scarlet and yellow	January	March	Firm and sharp	Indiff.	Handsome tree; shewy fruit.

A DESCRIPTIVE CATALOGUE OF APPLES—*continued.*

KITCHEN APPLES.—Sorts with names which are either descriptive, indicative, local, or arbitrary—*continued.*

No.	*Name.*	*Synonym.*	*How, when, and where originated, procured, or abounding.*		*Where figured.*	*Described.*	*Size.*	*Figure.*	*Color.*	*Ripe in*	*Lasts till*	*Consistence and flavor.*	*Bearer.*	*Character of the tree and general reputation of the fruit.*
212.	Long seam	- - -	- - - -	-	- - -	Forsyth, 103.	Large	Angular	Light green	November	February	Firm and austere	Good	Hardy tree
213.	Lord Cheney's gr.	- - -	New seedling, resembles the Yorkshire greening	1760.	- - -	Forsyth, 104.	Medium	Conical	Dark gr. & chocolate	Christmas	June	Firm and austere	Good	Hardy, free-growing, small-leaved tree
214.	Lord Arundel	- - -	A French fruit	-	- - -	Forsyth, 105.	Large	Angular	Green and dingy red	Christmas	May	Firm and austere	Indiffer.	Elegant tree, small leaves
215.	*Maiden's blush	- - -	- - - -	-	- - -	Forsyth, 108.	Small	Roundish	Dark mahogany	October	March	Firm and acid	Good	Hardy, upright-growing tree
216.	Mansfield	- - -	Notting. and Yorks. apple	-	- - -	Forsyth, 109.	Large	Oblong	Green and bright red, with dark spots	December	February	Firm and austere	Good	Hardy, slender-twigged tree
217.	*New red must	- - -	- - - -	-	- - -	Forsyth, 119.	Large	Round	Pale red and green	December	February	Firm and acid	Great	Hardy, spreading tree; much esteemed in the cyder countries
218.	Norfolk Paradise	- - -	A favorite apple in Norwich market	-	- - -	Forsyth, 125.	Large	Roundish	Dark red and green	January	August	Firm and austere	Great	Hardy, broad-leaved tree
219.	*Old red must	- - -	- - - -	-	Pom. Her. t. 4.	Forsyth, 131.	Large	Ovate	Pale red and green	January	June	Firm and acid	Great	Fine showy tree
220.	*Pawsan	- - -	- - - -	-	Pom. Her. t. 15.	Forsyth, 136.	bel. med.	Conical	Greenish yellow	December	May	Firm and sharp	Great	Vigorous tree, broad leaves
221.	Transparent crab	Moscow apple	A Russian apple	-	Duh. p. 38.	Forsyth, 181.	Very sm.	Round	Transparent red	September	October	Soft, sub-acid	Good	Very small tree, fruit used for preserving; tree upright and small in size
222.	*Queening	- - -	A Gloucestershire fruit	-	- - -	Forsyth, 146.	Large	irregularly ridged	Dark red	October	April	Firm and sharp	Great	Vigorous, spreading tree
223.	*Redstreak	Herefordsh. redstr.	A Herefordshire fruit	-	Pom. Her. t. 1.	Forsyth, 152.	Medium	Oblong	Green, streak. with red	January	April	Firm and sharp	Good	Vigorous, upright tree
224.	Spaniard	- - -	A Cornw. apple; but said to be originally from Spain	-	- - -	Forsyth, 174.	ab. med.	Oblong	Greenish yellow	December	April	Firm and juicy	Indiffer.	Delicate tree; fine fruit
225.	Tankerton	- - -	- - - -	-	- - -	Forsyth, 180.	Large	Conical	Yellow and a little red	Christmas	February	Firm and acid	Good	Large tree and very useful fruit
226.	White must	- - -	- - - -	-	- - -	Forsyth, 188.	Medium	Flattish cone	Greenish yell. with red	January	June	Firm and austere	Good	Hardy, spreading tree
227.	Winter pomroy	- - -	- - - -	-	- - -	Forsyth, 192.	Large	Conical	Dark gr. str. with red	October	January	Firm and acid	Good	Upright, broad-leaved tree
228.	Winter box	- - -	- - - -	-	- - -	Forsyth, 193.	Medium	Conical, rough	Light green	Christmas	February	Firm and tart	Good	Hardy but slender-twigged tree
	CYDER APPLES.—Those marked with an asterisk* among the *Dessert and Kitchen Apples*, may also be included.													
229.	Siberian pippin	- - -	A seedling from Siberian crab & Loan's pearmain, by Knight	1806.	- - -	Kn. Tr. 176.	Small	Fla. orbic.	Yellow	Christmas	March	Firm and juicy	Great	Upright, small-leaved, hardy tree. Specific gravity of its juice 1079, which exceeds that of almost every apple formerly in cultivation as a cyder fruit
230.	Grange pippin	- - -	A seedl. by Knight, say	1802.	- - -	Hort. Tr. i. 229.	Small	Roundish	Yellow and red	October	February	Firm, juicy, acid	Great	
231.	Foxley	- - -	A seedling by Knight	1807.	- - -	Kn. Tr. 177.	Very sm.	Roundish	Orange and red	Christmas	March	Firm and juicy	Great	Upright, hardy tree
232.	Siberian Harvey	- - -	A new variety by Knight, say of	1807.	- - -	Hort. Tr. i. t. 229.	Small	Round	Bright red and green	Christmas	March	Firm and austere	Great	Elegant, upright, small-leaved tree
233.	Alban	- - -	A seedling by the Rev. T. Alban, of Herefords. in	1798.	- - -	Kn. Tr. 173.	Small	Round	Red and green	Christmas	February	Firm and very harsh	Indiff.	Delicate tree; specific gravity of juice, 1073
234.	Hogshead	- - -	- - - -	-	- - -	Forsyth, 77.	Small	Roundish	Deep red	January	March	Firm and austere	Great	Upright, handsome tree
235.	Stead's kernel	- - -	A Herefordshire seedling	1800.	- - -	Kn. Tr. 174.	Medium	Round	Yellow & russet spots	January	March	Firm and austere	Good	Small-leaved tree, specific gravity of juice, 1074
236.	Large stire	- - -	A Herefordshire apple	-	- - -	Forsyth, 96.	Small	Ovate	Yellow and red	November	February	Firm and sharp	Good	An upright-twigged tree
237.	Breinton seedling	- - -	A Herefordshire seedling	1801.	- - -	Kn. Tr. 172.	Small	Ovate	Yellow and red	January	March	Firm and juicy	Medium	A free-growing tree in a good soil; specific gravity of juice, 1067
238.	Brierly's seedling	- - -	A Herefordshire seedling	1803.	- - -	Kn. Tr. 173.	Small	Round	Yellow	January	March	Firm and austere	Good	A free-growing tree, specific gravity of juice 1050
239.	Hagloe	- - -	An esteemed Herefords. fruit	-	Pom. Her. t. 5.	Forsyth, 68.	bel. med.	Conical	Yellow	January	May	Firm and tart	Great	Upright, small-leaved tree
240.	Woodcock	- - -	A Herefordshire variety yet in a vigorous state	-	Pom. Her. t. 10.	Forsyth, 194.	Ab. med.	Conical	Dark red and yellow	January	March	Firm and austere	Great	Narrow-leaved, upright tree
241.	Yellow Siberian	- - -	From the Siberian crab and Loan's pearmain, by Knight	1805.	- - -	Kn. Tr. 175.	Very sm.	Round	Very yellow	January	March	Firm, austere	Great	Upright, handsome tree, and one of the very best cyder apples, specific gravity of juice, 1085.

1425. *Propagation and Culture.* The apple, like most other hardy trees, may be propagated by seeds, cuttings, suckers, layers, or engrafting: by seeds, for obtaining new varieties, and by the other modes for continuing such as are in esteem.

By Seeds. The first business here, is the choice of the seeds; which should be taken from fruits, having the properties it is desired to perpetuate or improve in the greatest degree. The sorts of apples proper for crossing or reciprocal impregnation, appear to be those which have a great many qualities in common, and some different qualities. Thus the golden-pippin has been crossed by other pippins or rennets, and not by calvils or codlings. A small sized apple crossed by a large sort, will be more certain of producing a new variety than the above mode; but will be almost equally certain of producing a variety destitute of valuable qualities; the qualities of parents of so opposite natures being, as it were, crudely jumbled together in the offspring.

Knight's mode of cutting out the stamens of the blossom to be impregnated, and afterwards, when the stigma is mature, introducing the pollen of the other parent, is unquestionably the most scientific mode of performing the operation. In this way he produced those excellent apples, the Downton, red and yellow Ingestrie, and Grange-pippins, from the same parents; viz. the seed of the orange-pippin, and the pollen of the golden-pippin. The brindgwood-pippin he produced from golden-pippin blossoms (divested of their stamens) dusted with the pollen of the golden-harvey apple.

The seeds may be sown in autumn, in light earth, covered an inch, and either in pots or beds. The end of the first year they should be transplanted into nursery rows, from six inches to a foot apart every way. Afterwards they should be removed to where they are to produce fruit; and for this purpose the greater the distance between the plants the better. It should not be less than six or eight feet every way. The quickest way to bring them into a bearing state, Williams, of Pitmaston, considers, (*Hort. Trans.* vol. i. 333.) is to let the plants be furnished with lateral shoots from the ground upwards; so disposed as that the leaves of the upper shoots may not shade those situated underneath, pruning away only trifling shoots. This mode of treatment occurred to him, on reflecting on Knight's Theory of the Circulation of the Sap. Observing the change in the appearance of the leaves of his seedling plants as the trees advanced in growth, he thought it might be possible to hasten the progress of the plants, and procure that peculiar organization of the leaf, necessary to the formation of blossom-buds, at a much earlier age. He in consequence adopted the mode above described, and succeeded in procuring fruit from seedling apples at four, five, and six years of age, instead of waiting eight, ten, and even fifteen years, which must be the case by the usual mode of planting close, and pruning to naked stems. Macdonald, an eminent Scotch horticulturist, has also succeeded in obtaining fruit from seedlings at an early period by grafting, already stated (892.) as one of the uses of that mode of propagation. In 1808, he selected some blossoms of the nonpareil, which he impregnated with the pollen of the golden pippin and of the Newton pippin. When the apples were fully ripe, he selected some of the best, from which he took the seeds, and sowed them in pots, which he placed in a frame. He had eight or nine seedlings, which he transplanted into the open ground, in spring 1809. In 1811, he picked out a few of the strongest plants, and put them singly into pots. In spring 1812, he observed one of the plants showing fruit-buds. He took a few of the twigs, and grafted them on a healthy stock on a wall; and in 1813 he had a few apples. This year (1816) his seedling yielded several dozens, and also his grafts; and he mentions, that the apples from the grafts are the largest. He is of opinion that in giving names to seedlings, raised in Scotland, the word "Scotch" should be mentioned.

Ringing has also been recommended by various authors, as inducing precocity, (987.) and particularly by Hempel, (*Hort. Trans.* v. i. app.) who says, he has proved it experimentally (989.) A very common practice among those who raise fruit-trees from seed, is, in the second or third season, to select such plants only as have broad and roundish leaves, throwing away the rest; experience having taught, that the former more frequently produce fruit of improved qualities, or at least larger, than those plants which have narrow-pointed leaves. The width and thickness of the leaf, T. A. Knight observes, "generally indicates the size of the future apple; but will by no means convey any correct idea of the merits of the future fruit. Where these have the character of high cultivation, the qualities of the fruit will be far removed from those of the native species; but the apple may be insipid or highly-flavored, green or deeply colored, and of course well or ill calculated to answer the purposes of the planter. An early blossom in the spring, and an early change of color in the autumnal leaf, would naturally be supposed to indicate a fruit of early maturity; but I have never been able to discover any criterion of this kind on which the smallest dependance can be placed. The leaves of some varieties will become yellow and fall off, leaving the fruit green and immature; and the leaves in other kinds will retain their verdure long after the fruit has perished.

"The plants whose buds in the annual wood are full and prominent, are usually more productive than those whose buds are small and shrunk in the bark; but their future produce will depend much on the power the blossoms possess of bearing the cold, and this power varies in the different varieties, and can only be known from experience. Those which produce their leaves and blossoms rather early in the spring are generally to be preferred, for though they are more exposed to injury from frost, they less frequently suffer from the attacks of insects; the more common cause of failure.

"The disposition to vegetate early, or late in the spring, is like almost every other quality in the apple-tree, transferred in different degrees to its offspring; and the planter must therefore seek those qualities in the parent tree which he wishes to find in the future seedling plants. The most effective method I have been able to discover of obtaining such fruits as vegetate very early in the spring, has been by introducing the farina of the Siberian crab into the blossom of a rich and early apple, and by transferring in the same manner the farina of the apple to the blossom of the Siberian crab. The leaf and habit of many of the plants, that I have thus obtained, possess much of the character of the apple, whilst they vegetate as early in the spring as the crab of Siberia, and possess, at least, an equal power of bearing cold; and I possess two plants of this family, which are quite as hardy as the most austere crab of our woods."

Abercrombie observes that, "as the codling is a sort found to change very little from seed, or not for the worse, new plants of it are sometimes raised by sowing the kernels, not by way of experiment for a new uncertain variety, but with some dependence on having a good sort resembling the parent."

1426. *By Cuttings.* Every variety of apple may be grown from cuttings; though some with much greater facility than others. All those of the burknott and codling tribes grow as well this way as by any other, and some allege, that the trees so raised are not liable to canker (*Hort. Trans.* vol. i. p. 120.), which is supposed to be owing to their "putting out no tap-root, but spreading their numerous fibres from the knot or burr horizontally." Even the golden-pippin may be continued in this way, and the trees have remained seven years in perfect health, when grafts taken not only from the same tree, but from the very branch, part of which was divided into cuttings, cankered in two or three years. "All apple-trees raised in this way," Biggs, observes, "from healthy one-year old branches, with blossom-buds upon them, will continue to go on bearing the finest fruit, in a small compass, for many years. Such trees are peculiarly proper for forcing, and not liable to canker." (*Hort. Trans.* vol. i. p. 65.)

The cuttings are to be chosen from the young wood of horizontal or oblique branches, rather than from upright ones; from six to eight inches or more in length, with a small portion of old wood at the lower end. Cut off the tip of the shoot, and all the buds, excepting two or three next the tip or upper extremity; then smooth the sections at the lower end, and insert them three or four inches in sandy loam, pressing the earth firmly to them, watering, and covering with a hand-glass. The proper time for this operation is early in February, and the glass should not be touched, excepting to give water, till the shoots have sprung an inch or two. Shade during the mid-day sun, and begin to harden by giving air in July; finally remove the glass in August; and in October transplant to nursery-rows, or in pots, according to future intention. With the burknott tribe, all that is necessary is to plant the cuttings in a shady border, and treat them like those of the gooseberry or currant.

By Layers. The success of this mode of propagation may be considered as certain; as it has nothing peculiar in its application to the apple, we need only refer to general directions (882) for performing the operation. The after treatment of the plants is the same with that for those originated by the foregoing or following modes.

By Suckers. This mode is generally confined to the paradise and creeping apple for stocks.

By Grafting and Inoculation. This may be said to be the universal practice in propagating the apple. The first consideration is the choice of stocks; of these, there are five sorts in common use. *Seedling apples;* used for full standards, and riders or wall standards. — *Seedling crabs;* for standards and half standards. — *Codling apples,* from layers or cuttings, for dwarfs and espaliers. — *Paradise apples,* from layers or cuttings; for low dwarfs and trained trees. — *Creeper apples,* from layers or cuttings; for the best dwarfs or bushes.

Stocks of Seedling Apples. The seeds should be selected from the fruit of vigorous growing young or middle-aged healthy trees; but when wanted in large quantities, they are procured from cyder-makers; private propagators will adopt the first mode. The sowing and after treatment is the same as for seedling crabs.

Seedling Crabs. "A preference," Knight observes, "has generally and justly been given to apple-stocks raised from the seeds of the native kind, or crab, as being more hardy and durable than those produced from the apple. The offspring of some varieties of the crab, particularly of those introduced from Siberia, vegetate much earlier in the spring than other trees of the same species; and thence the inexperienced planter will probably be led to suppose, that such stocks would accelerate the vegetation of other varieties in the spring, and tend to produce an early maturity of the fruit in autumn. In this, however, he will be disappointed. The office of the stock is, in every sense of the word, subservient; and it acts only in obedience to the impulse it receives from the branches: the only qualities, therefore, which are wanting to form a perfect stock, are vigour and hardiness.

Seeds, Sowing and Culture. In collecting the seeds to sow, it must be remembered, that the habits as well as the diseases of plants are often hereditary, and attention should be paid to the state of the tree from which the seeds are taken; it should be large and of free growth, and rather in a growing state than one of maturity or decay. The crab trees, which stand in cultivated grounds, generally grow more freely and attain a larger stature than those in the woods, and therefore appear to claim a preference. The seeds should be taken from the fruit before it is ground for vinegar, and sown in beds of good mould an inch deep. From these the plants should be removed in the following autumn to the nursery, and planted in rows at three feet distance from each other, and eighteen inches between each plant. Being here properly protected from cattle and hares, they may remain till they become large enough to be planted out; the ground being regularly worked and kept free from weeds.

Codling stocks are raised chiefly from layers, which, at the end of the season, are taken off, and planted in nursery rows two feet between the rows, and one foot plant from plant.

Paradise, or, as they are called by the French, *Doucin stocks*, are raised either from layers or suckers; and stocks from *creeping apples* (so named from their aptitude to throw up suckers), or the *Dutch paradise*, chiefly from the latter mode. They may be planted in nursery rows somewhat closer than the codling stocks.

All stocks require to stand in the nursery till they are from half an inch to an inch thick, at the height at which they are to be grafted; such as are intended for full standards or riders will, in general, require to grow three or four years before being fit for this operation; those for half standards two years, and those for dwarfs one year. The ground between them must be kept clear of weeds, and stirred every winter; the side-shoots of the plants, at least to the height at which they are intended to be grafted, rubbed off as they appear, and all suckers carefully removed. Where budding is adopted, the stocks may be worked at nearly half the diameter of stem requisite for grafting; and stocks for dwarfs planted in autumn or spring may be inoculated the succeeding summer. No great advantage, however, is gained by this practice, as such plants require to stand at least another year, before they have produced their bud shoots.

1427. *Soil and Situation of the Nursery.* "A difference of opinion appears always to have prevailed respecting the quality of the soil proper for a nursery; some have preferred a very poor, and others a very rich soil; and both perhaps are almost equally wrong. The advocates for a poor soil appear to me to have been misled by transferring the feelings of animals to plants, and inferring that a change from want to abundance must be agreeable and beneficial to both. But plants in a very poor soil become stunted and unhealthy, and do not readily acquire habits of vigorous growth, when removed from it. In a soil which has been highly manured, the growth of young apple-trees is extremely rapid; and their appearance, during two or three years, generally indicates the utmost exuberance of health and vigour. These are, however, usually the forerunners of disease, and the "canker's desolating tooth" blasts the hopes of the planter. In choosing the situation for a nursery, too much shelter, or exposure, should be equally avoided; and a soil, nearly similar to that in which the trees are afterwards to grow, should be selected, where it can be obtained. Pasture ground, or unmanured meadow, should be preferred to old tillage, and a loam of moderate strength and of considerable depth to all other soils." *Tr. on App. and Pear.*

Grafting. The first business is to select the scions, the principles of which have been already noticed (906.). At whatever season scions are to be inserted, Knight observes, "the branches, which are to form them, should be taken from the parent stock during the winter, and not later than the end of the preceding year: for if the buds have begun to vegetate in the smallest degree, and they begin with the increasing influence of the sun, the vigour of the shoots, during the first season, will be diminished, and the grafts will not succeed with equal certainty; though a graft of the apple-tree very rarely fails, unless by accidental injury, or great want of skill in the operator. The amputated branches must be kept alive till wanted, by having the end of each planted in the ground, a few inches deep in a shady situation."

Stocks destined to form standard trees, may either be grafted at the usual height at which the lateral branches are allowed to diverge, which is commonly six feet, or they may be grafted near the ground, and a single shoot trained from the graft, so as to form the stem of the tree. The propriety of grafting near the ground, or at the height of six or seven feet, will depend on the kind of fruit to be propagated, whether it be quite new and just beginning to bear, or a middle-aged variety. In new and luxuriant varieties, and these only should be propagated, it will be advantageous to graft when the stocks are three years old, as the growth of such will be more rapid, smooth, and upright than that of the crab, and there will be no danger of these being injured by beginning to bear too early."

"Middle-aged varieties will be most successfully propagated by planting stocks of six or seven feet high, and letting them remain ungrafted till they become firmly rooted in the places in which the trees are to stand. One graft only should be inserted in each stock; for when more are used, they are apt to divide when loaded with fruit, and to cleave the stock, having no natural bond or connection with each other. When the stocks are too large for a single scion, I would recommend that the grafts be inserted in the branches, and not in the principal stem." This practice is not uncommon in various parts of England; and is general in Germany, with free stocks, where, however, they often neglect to graft the trees; and thus, as Neill observes, produce an endless variety of sorts, some good, but most of them little better than crabs.

Stocks, intended to form *half standards*, are grafted at three or four feet from the ground; and those for *dwarfs* at eight or ten inches, or lower. Miller and Knight agree in recommending to graft near the gound where lasting and vigorous trees are wanted; but the practice of the continental gardeners, and the opinions of some in this country, are in favour of leaving a stem below the graft of not less than a foot in length.

The kind of grafting generally adopted for moderate-sized stocks is the *whip or tongue* method (895.), or the new mode of saddle-grafting (899.), adopted by Knight; and the general time for the apple is the end of February and greater part of March. Much depends on the season and situation; the guiding principle is, to make choice of the time when the sap of the stock is in full motion; while that of the scions, from having been previously cut off and placed in the shade, is less so.

The common season for budding the apple is July; as there is nothing peculiar to this tree in performing that operation, we refer to the general directions (909).

Transplanting Grafted Trees in the Nursery. "It has been recommended," Knight observes, "to remove grafted trees once or twice during the time they remain in the nursery, under the idea of increasing the number of their roots; but I think this practice only eligible with trees which do not readily grow when transplanted. I have always found the growth of young apple-trees to be much retarded, and a premature disposition to blossom to be brought on by it; and I could not afterwards observe that those trees, which had been twice removed, grew better than others. It has also been supposed that many small roots, proceeding immediately from the trunk, are in the future growth of the tree to be preferred to a few which are large; but as the large roots of necessity branch into small, which consequently extend to a greater distance, the advantages of more transplantations than from the seed-bed to the nursery, and thence to the garden or orchard, may reasonably be questioned."

1428. *The Choice of Sorts* depends on the object in view. The first thing an inexperienced gardener has to do is to consider the various domestic uses of the apple, and then determine what is wanted, according to the family or market to be supplied; the next thing is to consider how those wants may be supplied in his given soil, situation, and circumstances; and the last thing is to study the catalogue of sorts, and select accordingly.

In every garden and private orchard, apples for ten different purposes are desirable:

For *Summer Culinary use*, as the

Codlings, while not fully grown or imperfectly ripe, which are fit for using in June, July, and August.

For *Summer Eating* or *Table use*, as the

Jenetting, pomroy, &c. which ripen in the end of June or in July.
Margaret summer pearmain, &c. which ripen in July.
Kentish fill basket, Howthornden, &c. which ripen in August.

For *Autumn Baking*, as the

Codlings and Burknott's, red streaks, Eve apple, courtpendu, nonsuch, &c. which ripen in September.
Pile's russet, Carlisle codling, cat's head, embroidered, &c. which ripen in October.
Wormsley pippin, golden Harvey, queening, golden russet, which ripen in November.

For *Autumn Table use*, as the

Kirton and Dalmahoy pippins, Loan's pearmain, colville, Kent, godolphin, &c. which ripen in September.
Orange and ribstone pippins, grey rennet, fameuse, violet, &c. which ripen in October.
Franklin's golden, and Borsdorf pippins, Dredge's russet, margil, &c. which ripen in November.

For *Winter Culinary use*, as the

Minier's dumpling, Burknott, John apple, Mansfield tart, &c. which are fit to use in December.
Hall-door, royal pearmain, Dutch queening, Adam's russet, which are fit to use in January.
Brindgwood pippin, cockagee, tankerton, box apple, &c. which are fit to use in February.

For *Winter Table use*, as the

Golden and Kentish pippins, golden and Canadian rennets, brandy, &c. which are fit to eat in December.

The Norfolk storing, Hubbard's, Sykehouse, white courtpendu, &c. which are fit to eat in January.

Dredge's Queen Charlotte, Fearns, Skerm's kernel, and Dalmahoy pippins, Royal pearmain, &c. which are fit to eat in February.

For *Spring Culinary use*, as the

Quince, white colville, Lord Camden's rennet, winter pearmain, which keep till the end of March.

Spencer pippin, Trevoider rennet, Macdonald's Scotch nonpareil, Spaniard, &c. which keep till the end of April.

Norfolk paradise, Loan's pearmain, English rennet, &c. which keep till the end of May.

For *Spring Table use*, as the

Hollow-eyed, Cornwall rennet, Hughes's new golden pippin, &c. which keep till the end of March.

Cockle and Whitmore pippins, golden and Pile's russet, Wheeler's extreme, &c. which keep till the end of April.

Stone and spencer pippins, Royal George, Ward, &c. which keep till the end of May.

For *Summer Culinary use, till the apple season returns*, as the

Lord Cheney's green, Baxter's pearmain, stoup, codling, &c. which keep till the end of June.

Norfolk beaufin, Norfolk storing, French crab, which keep till the end of July.

For *Summer Table use, till the apple season returns*, as the

Dredge's fame, salmon peg, carnation, &c. which keep till the end of June.

Nonpareil, Yorkshire greening, Norfolk colman, which keep till the end of July.

Another source of choice under each of the above heads, may respect the soil, situation, and climate, of the garden, or orchard, in which they are to be planted, or the character, whether of dwarfs, espaliers or wall-trees, which they are to assume there. The winter and spring table-apples may require a south wall in one district, while in another they may attain equal maturity as standards or espaliers.

Where there is ample room, a selection of large sorts, as the Alexander and Baltimore apples, or of such as are the most beautifully colored, as the violet, carnation, &c. may be made to gratify the eye: where room is wanting, useful sorts and great bearers are to be preferred, as the golden and ribstone pippin, summer pearmain, codlings, grey russet, summer and winter colvilles, &c.

In general, small-sized fruit, as the Harveys and Granges, are to be preferred for standards, as less likely to break down the branches of the trees, or be shaken down by winds; middling sorts for walls and dwarfs, and the largest of all for espaliers.

In respect to a soil liable to produce canker, sorts raised from cuttings may be desirable, as the Burknott and codling tribe; and where an occupier of a garden has only a short interest therein, such as come into immediate bearing, as the Burknotts, and others from cuttings, and the Hawthorndean, Apius's apple, and other short-lived dwarf sorts on Paradise or creeping stocks, may deserve the preference. On the contrary, where a plantation is made on freehold property, or with a view to posterity, new varieties on crab or free stocks, should always be chosen, as the Grange, Ingestrie, Harvey, &c.

Some excellent sorts will grow and produce crops every where, as the Hawthorndean, codling, and Ribston pippin; the latter of which, Nicol says, will grow at John o' Groat's house, and may be planted in Cornwall; others are shy bearers in cold situations, as the Newtown pippin of America, and most of the newly-imported French sorts.

Choice of Plants and Planting. This depends in some degree on the object in view, the richness of the soil, and the shelter; young trees are more likely to succeed in exposed sites and poor soils, but the apple will bear transplanting at a greater age than any other fruit tree. It may be planted in any open weather from November till February.

1429. *Soil and Site for permanent Planting.* Any common soil, neither extremely sandy, gravelly, nor clayey, on a dry sub-soil, and with a free exposure, will suit this tree. On wet, hilly sub-soils, it will do no good, but after being planted a few years will become cankered, and get covered with moss. Where fruit-trees must be planted on such soils, they should first be rendered as dry as possible by under-draining; next, provision made for carrying off the rain-water by surface gutters; and, lastly, the ground should not be trenched above a foot deep, and the trees planted rather in hillocks of earth, above the surface, than in pits dug into it. There is no point of more importance than shallow trenching and shallow planting in cold wet soils, in which deep pits and deep pulverization only serve to aggravate their natural evils of moisture and cold. See *Sang. in Caled. Hort. Mem.* iv. 140.

"The apple tree," Knight observes, "attains its largest stature in a deep strong loam or marly clay; but it will thrive in all rich soils, which are neither very sandy nor wet at bottom. It succeeds best," he adds, "in situations which are neither high nor remarkably low. In the former its blossoms are frequently injured by cold winds, and in the latter by spring frosts, particularly when the trees are planted in the lowest part of a confined valley. A south, or south-east aspect is generally preferred, on account of the turbulence of the west, and the coldness of north winds: but orchards succeed well in all aspects; and where the violence of the west wind is broken by an intervening rise of ground, a south-west aspect will be found equal to any.

All the sorts of apple tree, Abercrombie observes, "may be planted in any good common soil, with a free exposure, whether that of a garden, orchard, or field; so that the ground be neither very low nor excessively wet, nor subject to inundation in winter. Avoid, as far as possible, very strong clayey and gravelly soils."

Mode of Bearing. "In all the varieties of the common apple, the mode of bearing is upon small terminal and lateral spurs, or short robust shoots, from half an inch to two inches long, which spring from the younger branches of two or more years' growth, appearing first at the extremity, and extending gradually down the side: the same bearing branches and fruit spurs continue many years fruitful." *Abercrombie.*

1430. *Pruning.* "As, from the mode of bearing, apple trees do not admit of shortening in the general bearers, it should only be practised occasionally; first, where any extend out of limits, or grow irregular and deformed; and secondly, a good shoot contiguous to a vacant space is shortened to a few eyes, to obtain an additional supply of young wood from the lower buds of the shoot for filling up the vacancy. But to shorten without such a motive, is not merely the cutting away of the first and the principal bearing part of the branches, but also occasions their putting forth many strong useless wood-shoots where fruit-spurs would otherwise arise; and both effects greatly tend to retard the trees in bearing; whereas the fertile branches being cultivated to their natural length, shoot moderately, and have fruit-spurs quite to the extremity." *Aber.*

Espaliers and Wall-trees require a summer and winter pruning.

The *Summer Pruning.* "Train in the young shoots of the same year, which are likely to be wanted in the figure, and retrench them where ill-placed or too numerous; for as the trees continue bearing many years on the same branches, they only require occasional supplies of young wood; therefore, begin in May or June to pinch off or cut out close all fore-right, ill-placed, and superfluous shoots; retaining only some of the promising laterals in the more vacant parts, with a leader to each branch; train in these between the mother-branches, at their full length, all summer; or, where any vacancy occurs, some strong contiguous shoot may be shortened in June to a few eyes, to furnish several laterals the same season. Keep the shoots in all parts closely trained, both to preserve the regularity of the espalier, and to admit the air and sun to the advancing fruit.

"The *Winter Pruning* may be performed from November till the beginning of April. This comprehends the regulation of the wood-branches, the bearers, and of the young shoots. First, examine the new shoots trained in the preceding summer; and if too abundant, retain only a competency of well-placed and promising laterals, to furnish vacant parts, with a leading shoot to each parent branch. Continue these mostly at full length, as far as there is room. Cut out close the superabundant and irregular young shoots; and where any of the elder branches appear unfruitful, cankery, or decayed, cut them either clean out, or prune short to some good lateral, as may seem expedient. Also prune into order any branches which are very irregular, or too extended. Carefully preserve all the eligible natural fruit-spurs; but remove all unfruitful stumps and snags, and large projecting rugged spurs; cutting close to the old wood. As each espalier is pruned, let the old and new branches be laid in at convenient distances, according to the size of the fruit, four, five, or six inches asunder, and neatly tied or nailed to the wall or trellis." *Abercrombie.*

1431. *Heading down* apple trees that are much cankered, is strongly recommended by Forsyth, who gives an example of one (*fig.* 340.), after it had been headed down four years, which bore plenty of fine fruit. The point at which it was headed down (*a*) was within eighteen inches of the soil; and under it, on the stump, were two large wounds (*b* and *c*), made by cutting out the cankery part, and which being covered with the composition were soon nearly filled up with sound wood. Very little pruning is at first given to trees so cut, but afterwards a regular succession of bearing wood is kept up by removing such as have borne for three or four years. Thus, one branch (*d*), which has done bearing, is cut off, and succeeded by another (*f*), and when that is tired also, it is cut off, and replaced by a third (*e*), and so on.

Grafting Old Apple-trees of indifferent sorts with superior varieties, is an obvious and long-tried improvement. In this case, if the tree is a standard, it is only headed down to standard height; in old subjects, most commonly the branches only are cut over within a foot or two of the trunk, and then grafted in the crown or cleft manner.

1432. *Injuries, Insects,* &c. The misletoe (*Viscum album*) is frequently, through negligence, suffered to injure trees in orchards, and different species of mosses, and lichens those of gardens. "Moss," Knight observes, "appears to constitute a symptomatic, rather than a primary, disease in fruit-trees: it is often brought on by a damp, or uncultivated soil, by the age of the variety of fruit, and by the want of air and light in closely planted unpruned orchards. In these cases it can only be destroyed by removing the cause to which it owes its existence."

Blights. Whatever deranges and destroys the organization of the blossom, and prevents the setting of the fruit, is in general termed a blight; whether produced by insects, parasitical plants, or an excess of heat or cold, drought, or moisture.

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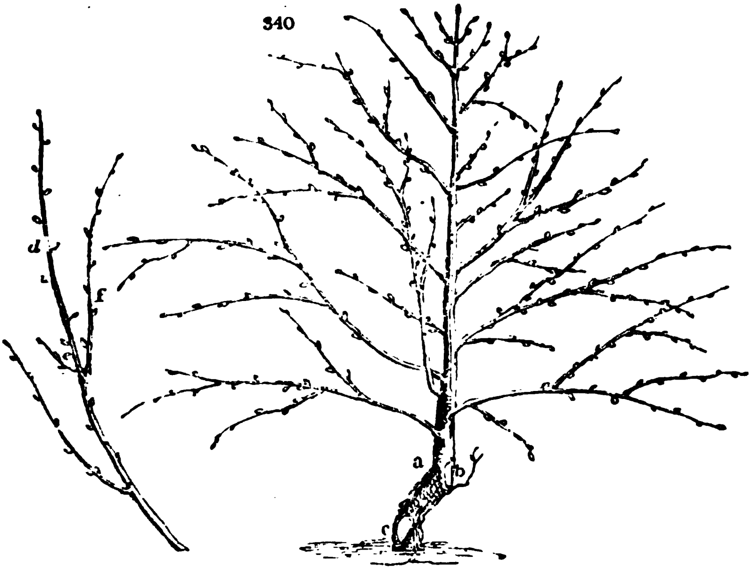

One of the most injurious *insects* with which the apple-tree has been visited for the last twenty years, is the *Aphis lanigera*, L.; the *Eriosoma mali* of Leach; woolly aphis, apple-bug, or American blight. "The eriosomata," Leach observes, "form what are called improperly galls on the stalks of trees, near their joints and knobs, which are in fact excrescences, caused by the efforts of nature, to repair the damage done to the old trees by the perforation of those insects whose bodies are covered with down." *Sam. Ent.*

W. Salisbury has given an engraving of the Eriosoma (*fig.* 341.) as he found it appear under a magnifying glass, when attacking the roots (A) and the branches (B), as well as a still more highly magnified figure of one of the bugs without wings (C) and winged (D). The latter he considers likely to be the male insect. Thoroughly cleaning with a brush and water, together with amputation when it has been some time at work, is the only means of destroying this insect; but even this will not do, unless resorted to at an early stage of its progress. The caterpillars of many species of butterfly and moth, and the larvæ of various other genera of the *hemiptera* and *lepidoptera*, &c. as *Scarabæus, Curculi*, &c. attack the apple-tree in common with other fruit-trees; and on a large scale it is difficult, if not impracticable, to avoid their injurious effects. Burning straw or other materials under the trees has been long recommended; but the principal thing to be relied on, in our opinion, is regimen; that is, judicious sub-soil and surface-soil, culture, and pruning.

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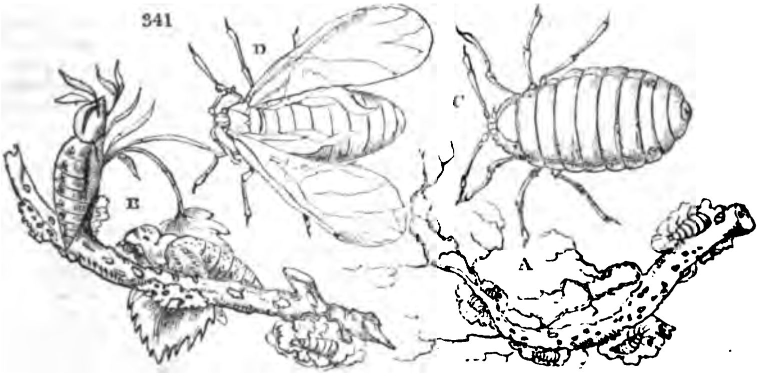

Other points of culture have been already given. See Chap. II. and III.

For Gathering and Storing the Crop, see Chap. IV. sect. 10. and Chap. V. sect. 3.

Berard, in an essay on the ripening of fruits, which gained the prize of the French Academy of Sciences in 1821, found that the loss of carbon is essential to the ripening of fruit; that this carbon combines with the oxygen of the air, and forms carbonic acid; and that when the fruit is placed in an atmosphere deprived of oxygen, this function becomes suspended, and the ripening is stopped. Hence it results, that most fruits may be preserved during a certain period, by gathering them a few days before they are ripe, and placing them in an atmosphere free from oxygen. The most simple process for effecting this consists in placing at the bottom of a bottle, a paste formed of lime, sulphate of iron, and water; then introduce the fruit so as they may rest detached from the bottom of the bottle, and from each other, and cork the bottle and cover it with cement. Peaches, plums, and apricots, have been kept in this way for a month; pears and apples for three months. (*Journal R. Jnot.* vol. xi. 396.) Duduit, of Mazeres, has found that one-third of boiled apple-pulp, baked with two-thirds of flower, having been properly fermented with yeast for twelve hours, makes a very excellent bread, full of eyes, and extremely palatable and light. *New Month. Mag. June* 1821.

Subsect. 2. The *Pear-Tree.* — *Pyrus Communis*, L. (*Eng. Bot.* 1784); *Icos. Di. Pentag.* L.; and *Rosaceæ*, J. *Poirier*, Fr.; *Birnbaum*, Ger.; and *Pero*, Ital.

1433. In its wild state, the pear is a thorny tree, with upright branches, tending to the pyramidal form, in which it differs materially from the apple-tree. The twigs or spray hang down; the leaves are eliptical, obtuse, serrate; the flowers in terminating villose, corymbs; produced from wood of the preceding year, or from buds, gradually formed on that of several years' growth, on the extremities of very short protruding shoots, called, technically, spurs. It is found in a wild state in England, and abundantly in France and Germany, as well as other parts of Europe, not excepting Russia, as far north as lat. 51. It grows in almost any soil.

The cultivated tree differs from the apple, not only in having a tendency to the pyramidal form, but also in being more apt to send out tap-roots, in being, as a seedling plant, longer (generally from fifteen to eighteen years) of coming into bearing; and when on its own root, or grafted on a wild-pear stock, of being much longer lived. In a dry soil it will exist for centuries, and still keep its health, productiveness, and vigor. "The period at which the teinton squash first sprang from the seed, T. A. Knight observes, probably, cannot now be at all ascertained; but I suspect, from its present diseased and worn-out state, that it existed at least as early as the beginning of the sixteenth century: for another kind, the barland, which was much cultivated in the early part of the seventeenth century, still retains a large share of health and vigor; and the identical trees which supplied the inhabitants of Herefordshire in the seventeenth century with liquor, are likely to do the same good office to those of the nineteenth." Our remarks on the history of the apple will apply almost without exception to the pear. The Romans, in Pliny's time, possessed thirty-six varieties (20), and the fruit is still more valued, both in Italy and France, than the apple.

Use. As a dessert-fruit the pear is much esteemed, and generally preferred to the apple. It is also used for baking, compôts, marmelade, &c. Dried in the oven, the fruit will keep upwards of a year, either with or without syrup. This mode of preparing the pear is about as common in France as the making of apple-pies is in this country. Bosc (*Nouveau Cours d'Agric. in loco*) describes two methods of drying pears for preservation; and adds, that he has tried them after three years' keeping, and found them still very good. Perry, the *poiré* of the French, is made from the fermented juice, in the manner of cider, and the best sorts are said by Withering to be little inferior to wine. The wood of the pear-tree is light, smooth, and compact, and is used by turners, and to make joiners' tools, picture-frames to be dyed black, &c. The leaves will produce a yellow dye, and may be used to give a green to blue cloths.

Criterion of a good Pear. Dessert Pears are characterised by a sugary aromatic juice, with the pulp soft and sub-liquid, or melting, as in the beurrés, or butter-pears; or of a firm and crisp consistence, or *breaking*, as in the winter-bergamots. *Kitchen Pears* should be of large size, with the flesh firm, neither breaking nor melting, and rather austere than sweet, as the wardens. *Perry Pears* may be either large or small; but the more austere the taste, the better will be the liquor. Excellent perry is made from the wild pear.

Varieties. Tusser, in 1573, in his list of fruits, mentions "peeres of all sorts." Parkinson enumerates sixty-four varieties; Mortimer, in 1708, has many sorts; and Miller has selected eighty sorts, and described them from Tournefort. In France, the varieties of the pear are much more numerous than even the varieties of the apple. The catalogue of the Luxemburg nursery at Paris contains 189 select sorts. The British nursery lists at the present time contain from two to three hundred names, among which, it may be observed, the number of good sorts are fewer in proportion than in the apple lists. In the present very imperfect state of the nomenclature of fruits, all we can do is, to make a selection from names which have some descriptive particulars attached. We shall arrange them into dessert, kitchen, and cyder pears, and each tribe shall be set down in the order of their ripening.

1434. A DESCRIPTIVE CATALOGUE OF PEARS propagated in most British Nursery Gardens, arranged as Dessert, Kitchen, and Perry Fruits.

DESSERT PEARS. — *Summer Fruit*, placed in the order of their ripening.

No.	Name.	Synonym.	How, when, and where originated, procured, or abounding.	Where figured.	Described.	Size.	Figure.	Color.	Ripe in	Lasts till	Consistence and flavor.	Bearer.	Character of the tree, and general reputation of the fruit.
1.	Citron des Carmes	Magdalen	-	Duh. n. 7.	Forsyth, n. 74.	Small	Roun.& taper.	Yellowish green	July	-	-	-	Delicate tree.
2.	Little Musk	Supreme	-	Duh. i. t. 1.	Forsyth, n. 1.	-	-	Yellow	End July	Beg. Aug.	Melting and musky	Good	Weakly tree
3.	Pear James	-	A Scotch fruit	-	Forsyth, p. 140.	Small	-	Yellow	End July	Beg. Aug.	Melting and musky	Good	Weakly tree
4.	Early Carnock	-	-	-	Forsyth, p. 140.	-	-	Yellow and br. red	End July	Beg. Aug.	-	-	Makes a beautiful standard tree
5.	Chio	Lit. basta. or musk	-	-	Forsyth, n. 2.	Very sm.	-	Yel. streaked with red	End July	Beg. Aug.	Melting and musky		
6.	Green chissel	Hastiveau, Hasting	-	Lang. P. t. 62.	Forsyth, n. 3.	Medium	-	Green	End July	Mid. Aug.	Melting and juicy		-
7.	Red muscadelle	-	-	Duh. n. 80.	Forsyth, n. 4.	Large	-	Yel. streaked with red	Beg. Aug.	Mid. Aug.	Melting and rich	-	Beautiful fruit; tree often produces two crops in a year, one in July the other in September
8.	Lemon	Lady's lemon, Lady Lamont	-	-	Forsyth, p. 140.	-	-	-	Beg. Aug.	-	Indifferent	Great	
9.	Pinkey green	-	An esteemed Scotch fruit	-	Forsyth, p. 140.	Small	Round	Green	Beg. Aug.	-	Flesh melting & sweet	Good	Hardy tree
10.	Forrow cow	Clydesdale	-	-	Forsyth, p. 140.	Large	Short stalk, flat at eye	Red and yellow	-	-	Flesh tender & musky	Good	Hardy drooping tree
11.	Pear sauch	-	A Clydesdale fruit	-	Forsyth, p. 140.	Large	Bigbellied	-	-	-	Indifferent	Great	Trees large, and fit for standards
12.	Little muscat	-	-	Poit et Tp. t. 65.	Forsyth, n. 5.	Small	Thin skin	Yellow	Beg. Aug.	Mid. Aug.	Melting & rich musky		
13.	Lady's thigh	Jargonelle, true Fr. cuisse mad.	A French fruit	Lang. P. t. 61.	Forsyth, n. 6.	Large	-	Russet green and iron	Mid. Aug.	Beg. Sept.	Breaking and musky	Indiff.	Vigorous tree; and resembles both in leaves, shoots, and fruit, the Windsor and Jargonelle
14.	Windsor	-	An English pear	Lang. P. t. 61.	Forsyth, n. 7.	Large	Smooth skin	Yellowish green	Mid. Aug.	Beg. Sept.	Breaking and sweet	Indiff.	Fruit grows mealy immediately after it is ripe
15.	Jargonelle	Cuisse madame, true Fr. jargon.	A French fruit	Lang. P. t. 61.	Forsyth, n. 8.	Large	Skin smooth	Pale green	Mid. Aug.	Mid Sept.	Melting and juicy	Good	Vigorous tree; bears best on standards
16.	Orange musk	-	-	Duh. n. 25.	Forsyth, n. 9.	-	-	Yellow	Mid. Aug.	Mid. Sept.	Dry and musky		
17.	Great blanquet	Bagpipe of Anjou	-	Pom. Aust. t. 86.	Forsyth, n. 10.	Small	Skin smooth	Pale green	End Aug.	-	Soft, juicy, rich		
18.	Little blanquet	-	-	Duh. n. 16.	Forsyth, n. 11.	Very sm.	-	Pale green	End Aug.	-	Tender and musky		
19.	Long stalked blanquet	-	-	Pom. Aust. t. 75.	Forsyth, n. 12.	-	Very smooth skin	White & a little green	End Aug.	-	Melting & rich sugary		
20.	Skinless	Early Rousselet	-	Duh. n. 33.	Forsyth, n. 13.	-	Very thin skin	Reddish	End Aug.	-	Melting and sugary		
21.	Muscat, Robert	Queen's amber	-	Duh. n. 3.	Forsyth, n. 14.	Small	-	Yellow	End Aug.	-	Rich and musky	Great	
22.	Musk drone	-	-	Duh. n. 27.	Forsyth, n. 15.	-	-	Yellow	Beg. Sept.	-	Rich and musky	-	Fruit grows mealy if it hang long on the tree
23.	Red orange	-	-	Duh. n. 26.	Forsyth, n. 16.	-	-	Greenish and purple	-	-	Melting & sugary with a little perfume		
24.	Hanging leaf	-	An esteemed Clydesdale fr.	-	Forsyth, p. 141.	-	Nearly round	Red and yellow	-	-	Delicious, sweet	-	Hardy standard tree
25.	Scotch bergamot	-	-	-	Forsyth, p. 141.	Large	-	Yellow and red	-	-	Tender and juicy	-	A good fruit
26.	Longueville	-	Considered a French fruit	-	Forsyth, p. 141.	-	-	-	-	-	-	Great	A good fruit
27.	Musk bonchrêt.	Gratioli Spinola	-	-	Forsyth, p. 141.	-	-	Red and white	-	-	Breaking & perfumed	Good	Improved by grafting on a free stock
28.	Elton	-	A seedling growing at Elton, recommended by Knight; planted in 1682.	Hort. Tr. ii 1.	Hort. Tr. ii. 1.	Medium	Ovate, flat at the extremeties	Red and brown	Beg. Sept.	Beg. Oct.	Breaking and juicy	Great	Forms an excellent standard tree
	DESSERT PEARS. — *Autumn Fruit*, placed in the order of their ripening												
29.	Cassolette	Green muscat	-	Duh. n. 44.	Forsyth, n. 17.	Small	-	Greenish with specks	Sept.	-	Rich perfumed juice	-	Delicate tree esteemed fruit
30.	Great onion	Brown admiral, king of summer	-	Duh. n. 19.	Forsyth, n. 18.	-	-	Brownish	Beg. Sept.				
31.	Musk orange	-	-	Duh. n. 25.	Forsyth, n. 19.		-	Green	Beg. Sept.	-	Melting		
32.	Avorat	August muscat Robine royal d'été	-	Duh. n. 56.	Forsyth, n. 20.	-	Skin smooth	Whitish yellow	Beg. Sept.	-	Richly sugd.&perfum.	Great	One of the best summer pears yet known
33.	Rose	Thorny rose	-	Duh. n. 57	Forsyth, n. 21.	Large	-	Yellowish green & red	Beg. Sept.	-	Breaking and musky		
34.	Poire du Pouchet	-	-	-	Forsyth, n. 22.	-	-	-	Beg. Sept.	-	Soft, tender, & sugary		
35.	Perfumed	-	-	-	-	-	-	Deep red sprinkl. w. br.	Beg. Sept.	-	Melting, dry, perfum.	-	
36.	Keather	-	A Clydesdale fruit	-	Forsyth, p. 141.	Medium	Oblong	Green	-	-	Agreeable	-	Hardy tree, fit for orchards
37.	Elshin haft	Good-man	A Scotch fruit	-	Forsyth, p. 141.	Small	Lon. flat at eye	Green and yellow	Beg. Sept.	-	Hard, dry, sweet	-	Hardy tree; great bearer
38.	Vicar	-	-	-	Forsyth, p. 142.	Medium	Oblong	Yellow, red, & striped	Beg. Sept.	-	Tend. swe. & musked		

A DESCRIPTIVE CATALOGUE OF PEARS—*continued.*

DESSERT PEARS.—*Autumn fruit*, placed in the order of their ripening—*continued.*

No.	*Name.*	*Synonym.*	*How, when, and where originated, procured, or abounding.*		*Where figured.*	*Described.*	*Size.*	*Figure.*	*Color.*	*Ripe in*	*Lasts till*	*Consistence and flavor.*	*Bearer.*	*Character of the tree, and general reputation of the fruit.*
39.	Williams's bonchrétien	-	A seedling from Berkshire	1798.	Hort. Tr. ii. 250.	Forsyth, n. 73.	3 to 4 lo. 2 to 3 br.	Pyramidal	Pale green and russet	September	October	Very juicy	Great	Succeeds the Windsor pear and jargonelle; bears well on standards
40.	Royal orang. berg.	-	-	-	-	Forsyth, p. 142.	Large	Oblong	Yellow and feint red	Mid. Sept.	-	Melting and musky		
41.	Green yair	-	A favorite Tweedside fruit		-	Forsyth, p. 142.	Medium	-	Green	-	-	Sweet, juicy, melting	Great	Hardy, upright tree; excellent fruit
42.	Salviati	-	-	-	Duh. n. 21.	Forsyth, n. 24.	Medium	-	Red, yell. and whitish	Mid. Sept.	-	Tender, sug. perfum.		
43.	Rose-water	Caillot rosat	-	-	Duh. p. 177.	Forsyth, n. 25.	-	Skin rough	Brown	End Sept.	-	Very sw. like rose-wa.		
44.	Summer rousselet	Roi d'Eté	-	-	Lang. P. t. 65.	Forsyth, n. 26.	-	-	-	End Sept.	-	Tender, agreeable		
45.	Great mouthwater	-	-	-	Duh. n. 73.	Forsyth, n. 27.	Large	-	-	End Sept.	-	Melting, juicy		
46.	Princes	-	-	-	Duh. n. 118.	Forsyth, n. 28.	-	-	-	End Sept.	-	Highly flavored	Great	Hardy, standard-tree
47.	Summer bergam.	Hampden's berg.	-	-	Lang. P. t. 65.	Forsyth, n. 29.	-	-	-	End Sept.	-	Melting and perfumed		
48.	Autumn bergam.	-	-	-	Duh. n. 48.	Forsyth, n. 30.	Small	-	-	Beg. Oct.	-	Melt. & highly perfu.	Great	Hardy, standard-tree; esteemed fruit
49.	Sum. bonchrétien	Gracioli	-	-	Lang. P. t. 65.	Forsyth, n. 31.	-	-	-	-	-	Very juicy, rich. perf.		
50.	Beurré rouge	Red butter pear	-	-	Lang. P. t. 64.	Forsyth, n. 32.	-	-	-	Beg. Oct.	-	Very melting, and full of rich sugary juice	-	Fresh gathered, this is one of the very best sort of pears that we have
51.	Doyenné	Dean's pear, Carlisle white beurré St. Mich. Diana.	-	-	Lang. P. t. 63.	Forsyth, n. 33.	-	-	-	Beg. Oct.	-	Melting, cold juice	Great	
52.	Swiss bergamot	-	-		Lang. P. t. 63.	Forsyth, n. 34.	-	-	-	Beg. Oct.	-	Melting and juicy		
53.	Verte-longue	Long green	-	-	Lang. P. t. 63.	Forsyth, n. 35.	-	-	-	End Oct.	-	Melting and juicy		
54.	Monsieur John	Whi. Mons. John, Grey Mons. John	-	-	Lang. P. t. 66.	Forsyth, n. 36.	-	-	-	End Oct.	-	Break. richly sugared	-	A most excellent fruit; few equal to it
55.	Flowered muscat	-	-	-	Pom. Aust. t. 72.	Forsyth, n. 37.	-	-	-	November	-	Very tend. and delicat.	-	An excellent fruit
56.	Vine	-	-	-	Duh. n. 110.	Forsyth, n. 38.	-	-	Dark red	November	-	Melt. juice clammy		
57.	Rousseline	-	-	-	Duh. n. 37.	Forsyth, n. 39.	-	-	Deep reddi. grey spots	End Oct.	-	Delicate, very sweet	-	Slender, drooping tree
58.	Pendar	Knave's pear	-	-	-	Forsyth, n. 40.	-	-	-	End Oct.	-	Flesh fine and tender, very much sugared		
59.	Marchioness	-	-	-	Lang. P. t. 68.	Forsyth, n. 41.	-	-	Yellow	November	-	Delicate, sugared	-	Not a good fruit, if the yellow does not change in ripening
60.	True gold. beurré	-	-	-	-	Forsyth, n. 75.	-	-	Reddish-brown	October	-	-	-	A very fine pear, but does not keep long
61.	Red doyenné	Diana, deanery p.	An old vari. br. into notice by T. A. Knight, esq.	1811.	Hort. Tr. i. 14.	Hort. Tr. i. 230.	Medium	Turbinated	Red and pale green	October	November	Melting and sugared	Great	Hardy tree, forming a vigorous, conical, head; pecul. fitted for cottage gardens
62.	Golden beurré	-	-	-	-	Forsyth, n. 72.	-	-	Scarlet and gold	October	-	Melting and high flav.	Great	A fine and beautiful pear; succeeds best on an east aspect and loamy soil
	DESSERT PEARS.—*Winter Fruit*, arranged in the order of their ripening.													
63.	Crasanne	-	-	-	Hook. P. t. 35.	Forsyth, n. 42.	-	-	-	End Dec.	-	Tender and battery	-	The very best pear of the season
64.	Lansac	Dauphiné	-	-	Lang. P. t. 67.	Forsyth, n. 43.	-	-	-	Beg. Dec.	-	Flesh yellow, tender & melt.; juice sugared & perfumed		
65.	Epine d Hiver	Winter thorn	-	-	Lang. P. t. 67.	Forsyth, n. 52.	-	-	-	End Dec.	-	Tender, buttery, sweet		
66.	St. Germain	-	-	-	Hook. P. t. 5.	Forsyth, n. 53.	-	-	-	December	March	Melting, juicy	-	Fine fruit; requires a dry soil
67.	Martin sec.	The dry Martin	-	-	Lang. P. t. 72.	Forsyth, n. 44.	-	-	-	Beg. Dec.	-	Breaking and sugared		
68.	Amadot	-	-	-	Pom. Aust. t. 166.	Forsyth, n. 45.	-	-	Russet	Mid. Dec.	-	Dry, high-flavored		
69.	Little lard	Wonder of winter	-	-	Duh. n. 67.	Forsyth, n. 46.	-	-	-	End Dec.	-	Melting, sugared	-	Esteem. one of the best pears of the season
70.	Winter achan	-	An esteemed Scotch fruit, of French origin	-	-	Forsyth, p. 142.	Small	Skin rough	Russet	Beg. Dec.	-	Breaking and sugared	-	Hardy tree, with drooping spray
71.	Brier bush	-	A Scotch fruit	-	-	Forsyth, p. 142.	Small	-	Russet	Beg. Dec.	-	Breaking, sweet	-	Ripens in most seasons
72.	Louisebonne	Good Louisa	-	-	Duh. n. 97.	Forsyth, n. 47.	-	-	-	Mid. Dec.	-	Tender, sweet		
73.	Colmar	Resemb. d'Auche	-	-	Hook. P. t. 19.	Forsyth, n. 48.	-	-	-	Beg. Janu.	-	Flesh white, very ten. greatly sugared	-	Esteemed an excellent fruit
74.	Virgouleuse	-	-	-	Lang. P. t. 67.	Forsyth, n. 50.	-	-	-	Beg. Janu.	-	Melting and rich juice	-	Esteemed by some, one of the best fruits of the season
75.	Ambrette	-	-	-	Lang. P. t. 66.	Forsyth, n. 51.	-	-	-	Beg. Janu.	-	Melting, perfumed	-	A very good pear
76.	L'Echasserie	-	-	-	Lang. P. t. 70.	Forsyth, n. 49.	-	-	-	Beg. Janu.	-	Melt. buttery, sugary	-	Bears best on standards

A DESCRIPTIVE CATALOGUE OF PEARS — *continued.*

DESSERT PEARS. — *Winter fruit*, arranged in the order of their ripening. — *continued.*

No.	Name.	Synonym.	How, when, and where originated, procured, or abounding.		Where figured.	Described.	Size.	Figure.	Color.	Ripens in	Lasts till	Consistence and flavor.	Bearer.	Character of the tree, and general reputation of the fruit.
77.	St. Austin	-	-	-	Duh. n. 99.	Forsyth, n. 54.	-	-	-	End Dec.	End July	Tender; juice sharp		
78.	Brown St. Germain	-	-	-	-	Forsyth, n. 68.	-	-	-	December	End March	High flavored	-	A good fruit on dwarfs or standards; comes in after the wall St. Germain
79.	Pear d'Auch	ResemblesCalmar	Introduced by the Duke of Northumberland in	1780.	-	Forsyth, n. 69.	-	-	-	Christmas	April	Flesh yellow	-	Without exception, the best of all the winter pears
80.	Spanish bonchrêt.	Aut. bonchrêtien	-	-	Lang. P. t. 68.	Forsyth, n. 55.	Large	-	-	January	-	Breaking, sweet	-	Delicate tree; shy bearer
81.	Wilding of Cassoy	Small wint. butter	-	-	Duh. n. 59.	Forsyth, n. 56.	Small	-	-	January	-	Melt. juice very rich	Great	
82.	Martin sire	Ronville	-	-	Lang. P. t. 70.	Forsyth, n. 57.	-	-	-	January	-	Breaking, juicy, sweet, and perfumed	-	A good fruit
83.	Winter rousselet	-	-	-	Duh. n. 31.	Forsyth, n. 58.	-	-	-	End Jan.	-	Buttery, melting, sw.		
84.	Brown beurré	-	-	-	Hook. P. 27.	Forsyth, n. 60.	-	-	Reddish, brown, &yel.	-	-	Melting & rich in juice	-	Justly esteemed, an excellent pear
85.	Holland bergamot	Amosel. Cheney's	-	-	Duh. n. 55.	Forsyth, n. 61.	-	-	-	End Jan.	April	Buttery, tender, juicy	-	A very good pear
86.	German muscat	Mus.d'Allemande	-	-	Lang. P. t. 72.	Forsyth, n. 62.	-	-	-	February	May	But. tender, high flav.	-	An excellent pear
87.	Pear of Naples	Easter St. Germ.	-	-	Duh. n. 107.	Forsyth, n. 63.	-	-	-	March	-	Half break. sweet, vin.		
88.	Bonchrêtien	-	-	-	Lang. P. t. 68.	Forsyth, n. 64.	Very lar.	-	-	March	June	Break. tend.& sugared		
89.	La pastorale	-	-	-	Duh. n. 100.	Forsyth, n. 65.	-	-	-	March	-	Tender, buttery, sweet		
90.	St. Martial	Angélique	-	-	Duh. n. 88.	Forsyth, n. 66.	-	-	-	March	-	Buttery, tender, sweet		
91.	Chaumontelle	Winter beurré	-	-	Hook. P. t. 11.	Forsyth, n. 67.	-	-	-	January	-	Melt.rich,& perfumed		
92.	Swan's-egg	-	-	-	Lang. P. t. 64.	Forsyth, n. 70.	Medium	Egg-like	Green and brown	-	-	Melting and musky	-	Healthy tree, and bears well either as standards or dwarfs
93.	Bergamotte de Pâque	Berg. Bugi. Terling, Paddington	-	-	Lang. P. t. 66.	Forsyth, n. 71.	Large	-	Green and yellow	April	June	-	-	Makes a very handsome appearance at table
94.	Round winter	-	A Clydesdale fruit	-	-	Forsyth, p. 142.	-	-	-	-	-	-	-	A very excellent winter fruit
95.	Muirfowl egg	-	An esteemed Scotch fruit	-	-	Cal. Mem. i. 94.	Medium	-	Green and brown	-	End April	-	Good	Hardy tree, bears well as standards
96.	Longueville	-	An old Scotch variety	-	-	Cal. Mem. i. 91.	Large	Long	Green	-	-	-	Good	Hardy tree, bears well as standards
97.	John Monteath	-	An esteemed Scotch fruit	-	-	Cal.Mem.ii.106.	-	-	-	-	-	-	Good	Answers well either on a stand. or a wall
	KITCHEN PEARS. — Arranged in the order of their ripening.													
98.	Swan's egg	See No. 91.												
99.	Le Besideri	-	The wilding of the forest of Heri in Bretagne	-	Duh. n. 23.	Forsyth, p. 142.	Medium	-	Yellowish	-	-	Austere		Handsome, upright tree; strong shoots
100.	Unicorn	-	-	-	-	Forsyth, p. 142.	-	-	Red and yellow	-	-	Rather austere	-	A beautiful fruit
101.	Round winter	See No. 94.												
102.	La double fleur	Double flowering	-	-	Duh. n. 58.	Forsyth, p. 142.	Large	Flat smooth	Blush and yellow	-	-	-		Excellent to preserve, taking a fine red color from the fire
103.	Bloody	-	-	-	Knoop. P. 67.	Forsyth, p. 143.								
104.	Black Worcester	Parkinson's warden, pound	-	-	Lang. P. t. 71.	Forsyth, p. 143.								
105.	Catillac	-	-	-	Lang. P. t. 71.	Forsyth, p. 143.								
106.	Span. red warden	-	-	-	-	Forsyth, p. 144.								
107.	Union	Uvedale's St. Germain, Pickering's	-	-	Lang. P. t. 71.	Forsyth, p. 144.								
108.	Franc real	Golden end of winter	-	-	Duh. n. 60.	Forsyth, n. 59.	-	-	-	-	-	-	-	Free-growing, upright tree
109.	Pow meg	-	A Carse of Gowrie fruit.	-	-	Cal.Mem.ii.110.	-	-	-	-	-	-	-	Hardy standard tree
	PERRY PEARS. — Arranged in the order of their ripening.													
110.	Barland	-	-	-	Pom. Her. t. 27.	Forsyth, p. 143.	-	-	-	-	-	Very austere	-	Hardy upright tree
111.	Holmore	-	-	-	Pom. Her. t. 20.	Forsyth, p. 144.	-	-	-	-	-	-	-	Upright tree
112.	Huffcap	-	-	-	Pom. Her. t. 24.	Forsyth, p. 144.	-	-	-	-	-	Austere	-	Large, hardy tree
113.	Oldfield	-	-	-	Pom. Her. t. 11.	Forsyth, p. 144.	-	-	-	-	-	-	-	Large tree
114.	Rough cap	-	-	-	-	Forsyth, p. 144.	-	-	-	-	-	Very austere	-	Hardy, free-growing tree
115.	Squash Teinton	-	-	-	Pom. Her. t. 13	Forsyth, p. 144.	-	-	-	-	-	Very austere	-	Hardy upright tree; great bearer

1435. *Propagation.* The pear may be propagated by layers or suckers, but not easily by cuttings. These modes, however, are productive of very indifferent plants, and are justly rejected in favor of raising from seed, and grafting or budding.

From Seed. This mode is adopted either for the purpose of obtaining new varieties, or for producing pear-stocks. In the former case, the same principles of selection or crossing are to be followed which we have stated in treating of raising seedling apple-trees, between which and the pear-tree, the chief difference is, that the latter requires a longer period, nearly double, to come into bearing.

In Raising Pears for Stocks, the seeds from perry-makers are generally made use of; but the most proper are those from the wild-pear, as likely to produce plants more hardy and durable. There is, however, less difference between free pear-stocks or those raised from the cultivated fruit, and wild pear-stocks, than there is between free apple and crab-stocks. The seeds being procured, may be sown, and afterwards treated as directed for seedling crab, or apple-tree stocks.

By Grafting and Budding. The most common stocks for grafting the pear are the common pear and wilding; but as the apple is dwarfed, and brought more early into a bearing state by grafting on the paradise or creeper, so is the pear by grafting on the quince or whitethorn. The pear will also succeed very well on the whitebeam, medlar, service, or apple; but the wilding and quince are in most general use. Pears on *free-stocks* grow luxuriantly in good soil on a dry bottom; those on *wildings* grow less rapidly, but are deemed more durable, and they will thrive on the poorest soil, if a hardy variety, and not over-pruned. "On the *quince*," Miller observes, "*breaking* pears are rendered gritty and stony; but the melting sorts are much improved: trees on these stocks may be planted in a moist soil with more success than those on wildings or thorns." On the thorn, pears come very early into bearing, continue prolific, and, in respect to soil, will thrive well on a strong clay, which is unsuitable both to those on quinces and wildings; but they are supposed to have an unfavorable influence on the fruit, in rendering it smaller and hard; and the grafts or buds require to be inserted very low, that the moisture of the earth may tend to favor the swelling or enlargement of the diameter of the stock, which does not increase proportionally to, nor ever attains the same size as the stem of the pear. The free and wilding pear-stocks are to be planted in nursery-rows, at the same distance as recommended for free and wilding apples; and the quince and thorn at the same distance as the paradise and creeper apples; in other respects, the management is the same as for the apple.

1436. *Choice of Sorts.* (See ch. ii. and iii. *on Planting the Orchard and Kitchen Garden.*) The following is a list of table-pears for use in succession, from July to July again, as furnished for the table of the Marquis of Queensbury from the Dalkeith garden. The *letters* mark the aspect of the walls against which they are trained:

(*W.*) jargonelle
(*S.*) Longueville
(*S.*) summer bergamot
(*S.*) orange bergamot
(*W.*) summer boncretien
(*W.*) autumn bergamot
(*W.*) Gansel's bergamot
(*S.* and *W.*) green sugar
(*W.*) early primitive
(*S.*) muirfowl egg
(*S.*) grey achan
(*W.*) green chissel
(*W.*) St. Germain
(*W.*) cressane
(*W.*) brown beurre
(*W.*) grey beurre
(*W.*) winter boncretien
(*W.*) swan's egg
(*W.*) chaumontelle
(*W.*) colmar.

Macdonald, in Sir John Sinclair's Gen. Rep. of Scotland. iv. 453.

Choice of Plants. Abercrombie takes trees at one year from the graft, and thence to the sixth year, or older. Forsyth says, "I would advise those who intend to plant pear-trees, instead of choosing young ones, to look out for the oldest that they can find in the nursery, and with strong stems."

Soil and Site. "A dry, deep loam," Abercrombie observes, "is accounted the best soil for the pear-tree when the stock is of its own species; on a quince-stock it wants a moist soil, without which it will not prosper. Gravel is a good sub-soil, where the incumbent mould is suitable. Cold clay is a bad sub-soil: to prevent fruit-trees from striking into it, slates may be laid just under the roots. For wall-trees, the soil should be made good to the depth of three feet; for orchard-trees, eighteen inches may do. Pear-trees, on their own stocks, will thrive on land where apples will not even live; supposing the plants to be hardy varieties, little removed from wildings, and to have room to grow freely as standards. To the more choice of the early autumn and prime winter-pears, assign south, east, or west walls.

Knight and M'Phail recommend a strong, deep, loamy soil, and the latter a high wall for training the better sorts.

Planting finally is performed any time, in mild weather, from October to March; standards are placed from twenty-five to forty feet apart every way; half-standards, from twenty to thirty; and dwarf-standards, in borders from fifteen to twenty feet from stem to stem. Wall and espalier-trees are planted from fifteen to thirty feet apart, according as they may have been planted on pear or quince-stocks.

Mode of Bearing, as in the apple-tree. "The pear-tree," M'Phail says, "does not produce blossoms on the former year's wood, as several other sorts of trees do. Its blossom-buds are formed upon spurs growing out of wood not younger than one year old, and consequently, projecting spurs all over the tree must be left for that purpose." "In some pears," Knight observes, "the fruit grows only on the inside of those branches which are exposed to the sun and air; in others it occupies every part of the tree."

1437. *Pruning and Training Standards.* "Permit these to extend on all sides freely. Several years may elapse before any cross-placed, very irregular, or crowded branches, dead or worn-out bearers, require pruning, which give in winter or spring. Keep the head moderately open in the middle." "Pruning," Knight observes, "is not often wanted in the culture of the pear-tree, which is rarely much encumbered with superfluous branches; but in some kinds, whose form of growth resembles the apple-tree, it will sometimes be found beneficial."

Wall-Trees and Espaliers will require a summer and winter-pruning.

Summer Pruning. "While the spray is young and soft, but not until the wood-shoots can be distinguished from spurs, rub off the fore-right, the disorderly, spongy, and superfluous shoots of the year, rather than let them grow woody, so as to require the knife. Retain some of the most promising, well-placed, lateral, and terminal shoots, always keeping a leader to each main branch, where the space will permit. Leave the greater number on young trees not fully supplied with branches. Train-in these at their full-length, all summer, in order to have a choice of young wood in the winter-pruning. Occasionally on old trees, or others where any considerable vacancy occurs, some principal contiguous shoot may be shortened in June to a few eyes, for a supply of several new shoots the same season.

The *Winter Pruning* may be performed any time from the beginning of November until the beginning of April. If on young trees, or others, a further increase of branches is necessary to fill up either the prescribed space, or any casual vacuity, retain some principal shoots of last summer, to be trained for that purpose. As, however, many young shoots will have arisen on the wood-branches, and bearers, of which a great part are edundant and disorderly, but which have received some regulation in the summer-pruning, we must now cut these out close to the mother-branches, while we are preserving the best in the more open parts. Examine the parent-branches, and if any are very irregular, or defective in growth, either cut them out close, or prune them to some eligible lateral to supply the place; or if any branches be over-extended, they may be pruned-in to such a lateral, or to a good fruit-bud. Cut out the least regular of the too crowded; also any casually declined bearers; with decayed, cankery, and dead wood. The retained supply of laterals and terminals should be laid as much at length as the limits allow, in order to furnish a more abundant quantity of fruit-buds. During both courses of pruning, be particularly careful to preserve all the orderly fruit-spurs emitted at the sides and ends of the bearers: if, however, any large, rugged, projecting spurs, and woody, barren stumps or snags occur, cut them clean away close to the branches, which will render the bearers more productive of fruit-buds, and regular in appearance. As each tree is pruned, nail or tie the branches and shoots to the wall or trellis. If afterwards, in consequence of either pruning out improper or decayed wood, or of former insufficient training, there are any material vacuities or irregularities in the arrangement, un-nail the misplaced and contiguous branches, and lay them in order."

1438. *T. A. Knight's Mode of Training the Pear-tree* is as follows: "A young pear-stock, which had two lateral branches upon each side, and was about six feet high, was planted against a wall early in the spring of 1810; and it was grafted in each of its lateral branches, two of which sprang out of the stem, about four feet from the ground, and the others at its summit, in the following year. The shoots these grafts produced, when about a foot long, were trained downwards, the undermost, nearly perpendicularly, and the uppermost just below the horizontal line, placing them at such distances that the leaves of one shoot did not at all shade those of another. In the next year, the same mode of training was continued, and in the year following I obtained an abundant crop of fruit.

An old St. Germain pear-tree, of the spurious kind, had been trained in the fan-form, against a north-west wall in my garden, and the central branches, as usually happens in old trees thus trained, had long reached the top of the wall, and had become wholly unproductive. The other branches afforded but very little fruit, and that never acquiring maturity, was consequently of no value; so that it was necessary to change the variety, as well as to render the tree productive. To attain these purposes, every branch which did not want at least twenty degrees of being perpendicular, was taken out at its base; and the spurs upon every other branch, which I intended to retain, were taken off closely with the saw and chissel. Into these branches, at their subdivisions, grafts were inserted at different distances from the root, and some so near the extremities of the branches, that the tree extended as widely in the autumn, after it was grafted, as it did in the preceding year. The grafts were also so disposed, that every part of the space the tree previously covered, was equally well supplied with young wood. As soon, in the succeeding summer, as the young shoots had attained sufficient length, they were trained almost perpendicularly downwards, between the larger branches and the wall to which they were nailed. The most perpendicular remaining branch, upon each side, was grafted about four feet below the top of the wall, which is twelve feet high; and the young shoots, which the grafts upon these afforded, were trained inwards, and bent down to occupy the space from which the old central branches had been taken away; and therefore very little vacant space any where remained in the end of the first autumn. A few blossoms, but not any fruit, were produced by several of the grafts in the succeeding spring; but in the following year, and subsequently, I have had abundant crops, equally dispersed over every part of the tree.

Heading-down and Pruning Old Pear-Trees. "The method of pruning pear-trees," Forsyth observes, "is very different from that practised for apple-trees in general. The constant practice has been to have great spurs, as big as a man's arm, standing out from the walls, from a foot to eighteen inches or upwards." The constant cutting of these spurs, he says, brings on the canker, and the fruit produced is small, spotted, and kernelly. Forsyth's practice with such trees was to cut them down, and renew the soil at their roots, and he refers to beurré-pear (*fig.* 342.), restored from an inch and a half of bark, which, in 1796, bore four hundred and fifty fine large pears, &c.

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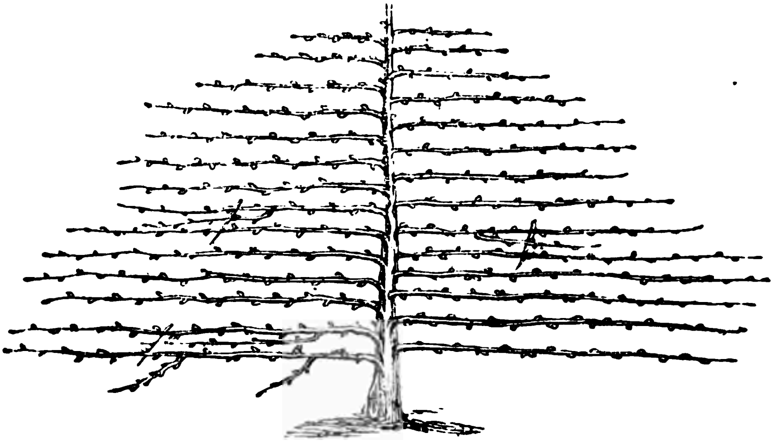

C. Harrison, and various other gardeners, adopt the mode of keeping only short spurs, by which much larger fruit is produced. According to this plan, each spur (*fig.* 343. A) bears only once, when it is cut out, and succeeded by an embrio-bud (D) at its base. This bud at the end of the first season, is no more than a leaf-bud (C); but at the end of the second summer, it has become a blossom-bud (B), and bears the third summer (A).

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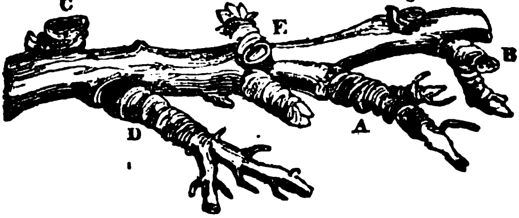

Some useful observations on the management of pear-trees, in correspondence with what we have above selected, will be found in different parts of the *Caledonian Hort. Memoirs*, vol. i.

Insects, Diseases, &c. The pear-tree is liable to the attacks of the same insects as the apple-tree; and the fruit of the summer kinds, when ripe, is liable to be eaten by birds, wasps, &c. which must be kept off by shooting, hanging bottles of water, and other usual preventives.

For other points of Culture, and Gathering and Storing, see Chap. II.; Chap. IV. sect. 9.; and Ch. V. sect. 3.

Subsect. 3. The *Quince.* — *Pyrus Cydonia*, L.; *Cydonia Vulgaris*, W. en.; *Icos. Di.-Pentag.* L.; and *Rosaceæ*, J. *Coignassier*, Fr.; *Quittenbaum*, Ger.; and *Cotogno*, Ital.

1439. This tree is of low growth, much branched, and generally crooked and distorted. The leaves are roundish or ovate, entire, above dusky-green, underneath whitish, on short petioles. The flowers are large, white, or pale-red, and appear in May and June; the fruit, a *pomme*, varying in shape in the different varieties, globular, oblong, or ovate; it has a peculiar and rather disagreeable smell and austere taste. It is a native of Austria and other parts of Europe; is mentioned by Tusser, in 1753; but has never been very generally cultivated.

Use. The fruit is not eaten raw; but stewed, or in pies or tarts, along with apples, is much esteemed. In confectionary, it forms an excellent marmalade and syrup. When apples are flat, and have lost their flavor, Forsyth observes, a quince or two, in a pie or pudding, will add a quickness to them. In medicine, the expressed juice, repeatedly taken in small quantities, is said to be cooling, astringent, and stomachic, &c. A mucilage prepared from the seeds was formerly much in use, but is now supplanted by the simple gums. In nursery gardening, the plants are much used as stocks for the pear.

Varieties. Miller enumerates:

The *oblong*, or *pear-quince*, with oblong ovate leaves, and an oblong fruit lengthened at the base.

The *apple-quince*, with ovate leaves and a rounder fruit.

The *Portugal-quince*, (*Lang. Pom.* t. 73.) with obovate leaves, and an oblong fruit, which is more juicy and less harsh than the others, and therefore the most valuable. It is rather a shy bearer, but is highly esteemed for marmalade, as the pulp has the property of assuming a fine purple tint in the course of being prepared.

The *wild*, or *eatable quince*: less austere and astringent than the others.

Propagation. Generally by layers, but also by cuttings, and approved sorts may be perpetuated by grafting. In propagating for stocks, nothing more is necessary than removing the lower shoots from the larger, so as to preserve a clean stem as high as the graft; but for fruit-bearing trees, it is necessary to train the stem to a rod, till it has attained four or five feet in height, and can support itself upright.

Soil and Site. The quince prefers a soft moist soil, and rather shady, or, at least, sheltered situation. It is seldom planted but as a standard in the orchard, and a very few trees are sufficient for any family.

The *Time of Planting, the Mode of Bearing,* and all the other particulars of culture, are the same as for the apple and pear.

Subsect. 4. The *Medlar.* — *Mespilus Germanica*, L. (*Eng. Bot.* 1523.); *Icos. Di.-Pentag.* L.; and *Rosaceæ*, J. *Neflier*, Fr.; *Mispelbaum*, Ger.; and *Nespolo*, Ital.

1440. This is a small or middle-sized branching tree; the branches woolly, and covered with an ash-colored bark, and, in a wild state, armed with stiff spines. Leaves oval-lanceolate, serrate, towards the point somewhat woolly, on very short channeled petioles. Flowers produced on small natural spurs, at the ends and sides of the branches. Bracte as long as the corolla; calyxes terminating, fleshy; petals, white; fruit, a turbinated berry, crowned with five calycine leaflets; pulp thick, mixed with callose granules, and containing five gibbous wrinkled stones. The tree flowers in June and July, and the fruit is ripe in November. It is a native of the south of Europe; but appears to be naturalized in some parts of England, where it has been sown in copses by binds.

Use. The fruit is eaten raw in a state of incipient decay; its taste and flavor are peculiar, and by some much esteemed.

Varieties. Those in common cultivation are:

1. The *Dutch* medlar (*Pom. Franc.* 2. p. 45. t. 2. and 3.) a crooked, deformed, low tree with very large leaves, entire, and downy on the under side. The flowers and fruit are very large; the latter approaching to the shape of an apple.
2. The *Nottingham* medlar, with fruit of a quicker and more poignant taste.
3. The *wild* medlar; a smaller tree with smaller leaves, flowers, and fruit than any of the former sorts, and the fruit is pear-shaped.

Propagation. By seeds, by layers, and cuttings, or by grafting on seedlings of their own species, or on any other species of *Mespilus*, or of *Cydonia*, or *Cratægus.* Miller observes, that if the stones are taken out of the fruit as soon as it is ripe, and immediately planted, they will come up next spring, and make good plants in two years. He prefers raising from seed to grafting on the *Cratægus.* Forsyth says, "Those who wish to keep the sorts true, should propagate them by grafting on their own stocks." The plant is rather difficult to strike by cuttings.

Soil. The soil in which the medlar thrives best is a loamy rich earth, rather moist than dry; but not on a wet bottom.

Final Planting. The medlar, like the quince, is usually grown as a standard or espalier; the former may be planted from twenty to thirty, and the latter from fifteen to twenty feet apart.

Mode of Bearing. On small spurs at the ends and sides of the branches.

Pruning. Forsyth recommends the same sort of treatment as for the quince. Cut out all the dead and cankery wood, and keep the tree thin of branches when it is desired to have large fruit. Care is requisite to train standards with tall stems. Espaliers will require a summer and winter pruning, as in the apple-tree.

For other details of culture, see the *Apple* and *Pear*.

SUBSECT. 5. The *True-Service.* — *Sorbus Domestica*, L. (*Pyrus Domestica*, *Eng. Bot.* 350.); *Icosan. Di.-Pentag.* L.; *Rosaceæ*, J. *Alizier*, Fr.; *Elsbeerbaum*, Ger.; and *Loto*, or *Bagolaro*, Ital. (*fig.* 344.)

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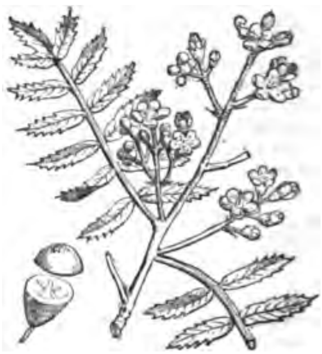

1441. This tree is of the middle size, not unlike the mountain-ash, of very slow growth, and not flowering till it arrives at a very great age. The leaves are compound, alternate, with ovate or oval leaflets. The flowers are produced on terminating panicles issuing from spurs of two or more years' growth; the petals are cream-colored; the fruit, according to Gærtner, is a pome, pear-shaped, reddish, and spotted, extremely austere, and not eatable till it is quite mellowed by frost or time, when it becomes brown and very soft. It flowers in May, and the fruit ripens in November; the tree, according to Krocker, does not come into full bearing before it is sixty years old. It is a native of the warmer parts of Europe, and has also been found wild in Cornwall, Worcestershire, and Hertfordshire, from whence the fruit is brought to London in autumn in large quantities.

Miller says, " There was one tree in the garden of John Tradescant, of South Lambeth, near forty feet high, which produced a great quantity of fruit annually, shaped like pears. Some trees of middling growth, in the garden of Henry Marsh, Esq. at Hammersmith, produced fruit of the apple-shape. From these many trees were raised in the nurseries near London, but the fruit was small compared with that of Tradescant. Great numbers of large service-trees grow wild about Aubigny in France; from the seeds of which one of the dukes of Richmond raised a great many trees at Goodwood in Sussex. From the Italian name, it appears not improbable that this is the *lotus* of Pliny, with whose description (b. xiii. c. 17.), it seems in a great measure to agree.

Use. The fruit has a peculiar acid flavor, and is eaten, when mellowed, like that of the medlar, to which it is deemed inferior. It is common in Italy, and ripens at Genoa in September, where it is esteemed good in dysentery and fluxes. The wood, which is very hard, is held in repute for making mathematical rulers, and excisemen's gauging-sticks.

Varieties. In Italy they have many varieties obtained from seeds; but those generally known here are only three: the pear-shaped, apple-shaped, and berry-shaped.

Propagation, by seeds, cuttings, or layers; or, which is preferable for plants intended to form good-sized and early-bearing trees, by grafting on seedlings of their own species. It may also be grafted on the *pyrus*, *mespilus*, or *cratægus*.

Soil. The best is a strong clayey loam.

Culture. The tree is recommended by Forsyth and Abercrombie to be grown as a standard at twenty or thirty feet distance, and to be pruned and otherwise treated like the apple and pear. Choice sorts, Abercrombie observes, are sometimes trained as dwarf standards, or espaliers.

Gathering the Crop. It is late in autumn before this operation can be performed. Wipe the fruit dry, and lay it on dry wheat-straw, spread on the open shelves of the fruit-room. In about a month it will become mellow and fit for use. See Chap. IV. sect. 10. and Chap. V. sect. 3.

SECT. II. *Stone Fruits.*

The most esteemed fruit of this class is the peach, and next the apricot; both the trees natives of Persia, but acclimated in Britain, and remarkable for the lively colors and early appearance of their blossoms. The peach is one of the most delicious of summer-fruits. Besides the peach, nectarine, and apricot; the almond, plum, and cherry, are comprehended in this section.

SUBSECT. 1. The *Peach.* — *Amygdalus Persica*, L. (*Black.* t. 101.); *Icos. Monog.* L.; and *Rosaceæ*, J.; the *Malus Persica* of the Romans. *Pêche*, Fr.; *Pfirschbaum*, Ger.; and *Persico*, Ital.

1442. This fruit-tree in its natural state is under the middle size, with spreading branches, lanceolate, smooth, and serrated leaves. The flowers are sessile, with reddish calyces, and bell-shaped, pale or dark-red corollas, often bordered with purple; the fruit a roundish drupe, generally pointed, and with a longitudinal groove; pulp, large, fleshy or succulent, white or yellowish, sometimes reddish, abounding with a grateful, sweet, acid juice; stone, hard, irregularly furrowed; kernel, bitter. The tree of quick growth, and not of long duration; blossoms in April, and ripens its fruit in August and September.

Sickler considers Persia as the original country of the peach, which, in Media, is deemed unwholesome; but, when planted in Egypt, becomes pulpy, delicious, and salubrious. The peach also, according to Columella, when first brought from Persia into the Roman empire, possessed deleterious qualities; which T. A. Knight concludes to have arisen from those peaches being only swollen almonds (the *tuberes* of Pliny), or imperfect peaches; and which are known to contain the prussic acid which operates unfavorably in many constitutions. The tree has been cultivated time immemorial in most parts of Asia; when it was introduced into Greece is uncertain: the Romans seem to have brought it direct from Persia, during the reign of the emperor Claudius. It is first mentioned by Columella, and afterwards described by Pliny. The best peaches in Europe are at present grown in Italy on standards; and next may be cited those of Montreuil, near Paris, trained on lime-whited walls. (*Mozard sur l'Education du Pêcher*, &c. 1814.) We visited these gardens in May 1819, and examined more particularly those of Jean Pierre Savard, the principal *propriétaire cultivateur*. His trees were that season covered with aphides, and the principal part of treatment in which he seemed expert was that of varying the position of the branches of the tree every year, by elevating to a greater angle the weak, depressing the strong, and cutting out the old, naked, or twigless shoots; thus presenting at all times a well-balanced tree. The stems of these trees, when first planted, and for one or two years afterwards, are hooked to the wall, to prevent their being stolen! The greatest recommendation to a French gardener, next to that of knowing how to conduct a garden *à bon marché*, is to be able to prune trees *à la Montreuil*.

In England, there are but few sorts of peaches that come to tolerable perfection in the open air, in ordinary seasons. The best adapted for this purpose are the free-stones; but all the sorts ripen well by the aid of a hot wall or glass, and may be forced so as to ripen in May or June. The tree is generally an abundant bearer; one of the noblesse kind, at Yoxfield, in Suffolk, which covers above six hundred square feet of trellis under a glass case, without flues, ripens annually from sixty to seventy dozen of peaches. *Hort. Trans.* iii. 17.

Use. It is a dessert fruit, of the first order, and makes a delicious preserve. In Maryland and Virginia a brandy is made from this fruit. "The manufacture of this liquor, and the feeding of pigs, being," as Braddick observes, (*Hort. Tr.* ii. 205.) "the principal uses to which the peach is applied in those countries. The leaves, steeped in gin or whiskey, communicate a flavor resembling that of noyeau.

Criterion of a good Peach. A good peach, Miller observes, possesses these qualities: "the flesh is firm; the skin is thin, of a deep or bright red color next the sun, and of a yellowish-green next the wall; the pulp is of a yellowish color, full of high-flavored juice; the fleshy part thick, and the stone small."

Varieties. Linnæus divides the *A. Persica* into two varieties; that with downy fruit or the peach, and that with smooth fruit or the nectarine. There are various instances on record (*Hort. Trans.* vol. i. p. 103.) of both fruits growing on the same tree, even on the same branch; and one case has occurred of a single fruit partaking of the nature of both. The French consider them as one fruit, arranging them in four divisions: the *pêches*, or free-stone peaches, the flesh of whose fruit separates readily from the skin and the stone; the *pêches lisse*, or free-stone nectarines, or free stone smooth peaches; the *pavies*, or cling-stone peaches, whose flesh is firm and adheres both to the skin and stone; and the *brugnons*, or nectarines, or cling-stone smooth peaches. Knight (*Hort. Tr* iii. 1.), Robertson (*Hort. Tr.* iii. 382.), and various botanists, consider the peach and almond as one species; we shall here follow the established nomenclature of the country, and treat them as distinct fruits.

There are many fine varieties of the peach; Tusser, in 1573, mentions peaches, white and red; Parkinson, in 1629, enumerates twenty-one; and Miller, in 1750, thirty-one varieties. In the garden of the Luxemburg, at Paris, are seventy varieties; and above double that number of names are to be found in the catalogues of our nurseries. Three distinguished and ingenious attempts have been made to class the varieties of peaches and nectarines by the leaf and flower as well as the fruit: the first is by Poiteau, in the *Bon Jardinier;* the next by Count Lelieur, in his *Pomone Française;* and the third by John Robertson, nurseryman, of Kilkenny, whose arrangement is founded on the glands of the leaves. But as these systems are not yet sufficiently perfected to render them available for this work, all we can do is to submit the following table: —

1443. A DESCRIPTIVE CATALOGUE OF PEACHES, commonly propagated in BRITISH NURSERIES, arranged as FREE STONES and CLING STONES.

FREE STONES.—Arranged in the order of their ripening. The Free Stones ripen more kindly in most Parts of Britain than Cling Stones.

No.	Name.	Synonyms and resemblances.	How, when, and where originated, procured, or abounding.	Where figured.	Where described.	Size.	Form.	Color.	Ripens	Pulp and flavor.	Bearer	Characteristics of the tree and general reputation of the fruit.
1.	White nutmeg	L'avant pêche blanche	-	Duh. n. 1. t. 2.	Forsyth, 1.	Small -	Round	White - -	End of July	Juice sugary and musky		Only esteemed for being the first sort ripe
2.	Red nutmeg	L'avant pêche de Troyes	-	Duh. n. 3. t. 3.	Forsyth, 2.	Large -	Round	Bright vermilion and yellowish-red	Begin. of Aug.	Pulp white, red at the stone; rich, musky	Great	Valued for its early maturity
3.	Avant - -	- - -	-	- - -	Forsyth, 3.	Large -	-	Red - -	Begin. of Aug.	Very fine - -	-	Fruit apt to be stringy
4.	Superb royal	- - -	-	- -	Forsyth, 37.	Large -	-	- - - -	Middle of Aug.	Very fine	-	
5.	Early purple	Pourprée native	-	Duh. n. 8. t. 12.	Forsyth, 10.	Large -	Round	Fine deep red -	Middle of Aug.	Pulp white, red at stone; juice rich and vinous	-	An excellent fruit
6.	Neal's early purple	- - -	-	Hook. P. t. 23.	Forsyth, 39.							
7.	Early Anne	- - -	-	Lang. P. t. 27.	Forsyth, 5.	Medium	Round	Fine deep red -	Middle of Aug.	Pulp white, red at stone		
8.	Great mignonne	Grosse mignonne	-	Duh. n. 14. t. 10.	Forsyth, 11.	Large -	Round	Rose-colored and greenish-yellow	Middle of Aug.	Pulp white; sugary, high-flavored	-	One of the best of peaches, and so tender as to require being grafted on a peach or apricot stock
9.	Small mignonne	Early mignonne, double de Troyes, or mignionette	-	Duh. n. 3. t. 4.	Forsyth, 11.	Medium	Round	Dark red and pale yellow	Beg. mid. Aug.	Pulp white, red at stone; vinous, sugary		
10.	Belle chevreuse	- - -	-	Duh. n. 17. t. 13.	Forsyth, 13.	Medium	Oblong	Red and yellow -	Aft. mi. of Aug.	Pulp yellow; juice rich and sugary	Good	Good fruit
11.	Smith's Newington	Early Newington, resembling le Pavie blanc	-	Duh. n. 9.	Forsyth, 15.	Medium	-	Fine red -	End of August	Pulp white and firm, very red at stone; of a pretty good flavor		
12.	Early admirable	- - -	-	Duh. n. 29.	Forsyth, 25.	Large -	Round	- - -	End of August	Pulp white, red at stone; high vinous flavor		
13.	Chancellor -	- - -	-	Duh. n. 19.	Forsyth, 20.	Medium	Oval	Fine red -	End of August	Pulp white and melting; sugary, rich	-	Tree tender, and will not succeed on common stocks; generally budded twice
14.	Montauban -	- - -	-	Lang. P. t. 28.	Forsyth, 16.	Medium	-	Purplish-red and pale red	End of August	White, melting, juicy, rich	Good	
15.	Red Magdalen	Madeline de Courson	-	Duh. n. 10. t. 7.	Forsyth, 14.	Large -	Round	Fine red - -	End of August	Firm, white, very red at the stone; sugary, exquisitely rich		
16.	White Magdalen	- -	-	Duh. n. 8. t. 6.	Forsyth, 9.	Rather lar.	Round	Slightly striped with red, and of a yellowish-white	End of August	White to stone; pretty high	-	Requires artificial heat
17.	Royal Charlotte	Queen Charlotte	-	- -	Forsyth, 38.	-	-	- - -	End of August	- - -	-	Very fine fruit
18.	Early violette	- -	Of French origin	- -	Abercrom. 289.	Large -	-	- - -	End of August			
19.	Double mountain	- -	A French fruit	- -	Abercrom. 289.	Large -	-	- - -	End of August	- - -		Fine fruit
20.	Bellegarde -	Gallande -	-	Hook. P. t. 8.	Forsyth, 21.	Very large	Round	Deep purple -	Begin. of Sept.	White, deep red at stone; rich and excellent	-	A fine fruit
21.	Bourdine -	Narbonne -	-	Hook. P. t. 16.	Forsyth, 12.	-	Round	Dark red -	Begin. of Sept.	White, deep red at stone; rich and vinous		
22.	Malta - -	Italian peach	-	Pom. Franc. p. 343.	Forsyth, 17.	-	Almost round	Fine marbled-red and deep green	Begin. of Sept.	White, deep red at stone; musky, pleasant	Good	
22.	Yellow alberge	- -	-	Duh. n. 5. t. 5.	Forsyth, 8.	Medium	Longish	Deep red and yellow	Begin. of Sept.	Yellow, deep red at stone; sugary, vinous		
23.	Rosanna - -	Much like the alberge	-	Lang. P. t. 27.	Forsyth, 23.	-	Long	Deep red and yellow	Begin. of Sept.	Yellow, deep red at stone; rich, vinous		
24.	Double swalsh	- -	-	- -	Forsyth, p. 39.	Large -	-	- - -	Begin. of Sept.	Fine, melting		
25.	Vanguard -	- -	-	- - -	Forsyth, p. 39.	Large -	-	- - -	Begin. of Sept.	Fine, melting		
26.	Late violet -	- -	-	Duh. n. 24.	Forsyth, 39.	Very large	-	Violet marbled with red	Begin. of Sept.	Pale yellow -	-	A very good fruit
27.	Violette hâtive	Early violet; Lisle	-	Duh. n. 25.	Forsyth, 22.	Very large	-	- - -	Begin. of Sept.	Very fine		
28.	Gallande, Ronald's	Early gallande	-	- - -	Forsyth, p. 38.	Large -	-	- - -	Begin. of Sept.	- - -	-	Fine fruit

A DESCRIPTIVE CATALOGUE OF PEACHES—*continued.*

FREE STONES.—Arranged in the order of their ripening—*continued.*

No.	*Name.*	*Synonyms and resemblances.*	*How, when, and where originated, procured, or abounding.*		*Where figured.*	*Where described.*	*Size.*	*Form.*	*Color.*	*Ripens*	*Pulp and flavor.*	*Bearer.*	*Characteristics of the tree, and general reputation of the fruit.*
29.	Rambouillet	Rumbullion	-	-	Lang. P. t. 33.	Forsyth, 24.	Medium	Roundish deep fur.	Fine red and bri. yellow	Begin. of Sept.	Deep red at stone; rich and vinous		
30.	Royal George	La Royale; Grosse mignonne	-	-	Hook. P. t. 41.	Forsyth, 6.	Large, often warty	Round	-	Begin. of Sept.	White, melting, rich	Great	Fruit sets with less air than most other peaches
31.	Grimwood's Royal George	Millet's mignonne	-	-	-	Forsyth, 36.	Large, often warty	Round	-	Begin. of Sept.	White, melting, rich		Tree apt to mildew
32.	Royal Kensington	Resembles the old Royal George	Sent to Kensington royal gardens in	1780.	-	Forsyth, 7.	-	-	High red and yellow	Begin. of Sept.	Rich juice	Great	One of the best peaches we have, and not liable to be blighted
33.	Incomparable	Pavie admirable	-	-	-	Forsyth, p. 38.	Very large	-	-	Middle of Sept.	-	-	Fine fruit
34.	Nivette	-	-	-	Duh. n. 37.	Forsyth, 30.	Large	Roundish	Bri. red and pale yellow	Middle of Sept.	Greenish yell. red at stone; full of rich juice		
35.	Vineuse	-	-	-	-	-	Medium	Round	Red all over	Middle of Sept.	White and fine, red at stone; rich and vinous		
36.	Noblesse	-	-	-	Hook. P. t. 2.	Forsyth, 18.	Very large	-	Pale red	Middle of Sept.	Juicy, rich	Good	
37.	Acton Scott	-	Origin. at Downton Cas. by Knight, fr. the noblesse & nutmeg peaches in	1814.	Hort. Tr. ii. t. 10.	Hort. Tr. ii. 140.	Medium	Round	Red and very white	Middle of Sept.	Rich, juicy, and sweet	Good	Tree not apt to mildew or gum
38.	Spring grove	-	Origin. by Knight at Down. fr. the large mignon. and nutmeg peaches in	1814.	-	Hort. Tr. ii. 48.	Medium	Round	Dark red and bright yel.	Middle of Sept.	Firm but melting; of excellent flavor	Good	Succeeds best on an apricot stock
39.	Late purple	La pourpre	-	-	Duh. n. 13.	Forsyth, 29.	Large	Round	Dark red and yellow	End of Sept.	White and melting, deep red at stone; sw. & high fl.		
40.	Persique	-	-	-	-	Abercrom. 290.	Large	Oblong	Fine red	-	Firm, white, red at stone; juicy and h. fl. pleasant		
41.	Teton de Venus	-	-	-	Duh. n. 33.	Forsyth, 28.	Med. with a breast-like protubera.	-	Faint red, and straw-col.	End of Sept.	White, melt. red at stone; rich and sugary	Shy	
42.	Braddick's American	-	-	-	Hort. Tr. ii. t. 13.	Hort. Tr. ii. 205.	Large	Irregular globose	Purplish and orange	End of Sept.	Melting, musky, and juicy	Good	Requires much heat and favorable seasons to attain full perfection
43.	Bloody	Sanguinole	-	-	Duh. n. 41.	Forsyth, 36.	-	-	Deep red	End of Sept.	Deep red	-	Requires artificial heat, otherwise is only fit for baking or preserving
44.	Cherry peach	Pêche-cerise	-	-	Duh. n. 21.	Forsyth, 35.	Small	Globular	Red and whitish wax co.	Begin. of Oct.	Melting and tolerable	-	A beautiful fruit, resembling in color the pomme d'apius
45.	Yellow admirable	Apricot peach	-	-	Duh. n. 30.	Forsyth, 41.	-	-	Bright yellow	-	Like the apricot in color and flavor	-	An excellent peach; large, yellow, and apricot-flavored
						CLING STONES.—Arranged in the order of their ripening.							
46.	Late admirable	-	-	-	-	Abercrom. 290.	Rather lar.	Round	Bright marbled red	Middle of Sept.	Greenish wh. veined with red at the stone; rich and vinous		
47.	Bellis	La belle de vitry, late admirable	-	-	Duh. n. 34.	Forsyth, 26.	Medium	Round	Pale red	Middle of Sept.	White, red at stone; juice vinous and rich		
48.	Golden	Orange	-	-	-	Abercrom. 290.	Ab. med.	Round	Crim. or rich purple with gold	End of Sept.	Deep yellow, crimson at stone; superior		
49.	Old Newington	-	-	-	Lang. P. 104.	Forsyth, 19.	Large	-	Fine red	End of Sept.	White, deep red at stone; excellent		
50.	Portugal	-	-	-	-	Forsyth, 27.	Large	-	Beautiful red and spotted	End of Sept.	Firm, white, red at stone; rich and sugary	-	Stone small, and deeply furrowed
51.	Catherine	-	-	-	Lang. P. t. 33.	Forsyth, 32.	Large	Round	Dark red	Begin. of Oct.	Firm, white, red at stone; rich and pleasant	Good	Excellent for forcing; or under cold glass
52.	Monstrous pavie	Pavie rouge de pomponne, royal pavie	-	-	Duh. n. 35.	Forsyth, 31.	Exceed. lar.	Round	Fine red & greenish wh.	End of Oct.	White, melting, deep red at stone; pretty juicy, vinous	-	An excellent fruit

Selection of Sorts. Abercrombie says, " Except the situation be completely favourable as to climate, aspect, and shelter, forbear to plant very early or extreme late fruit; for frost will almost inevitably cut off the former when blossoming and setting; and the latter will hardly ripen under the declining heat of autumn."

The peaches proper for a small garden, according to Forsyth, are:

The early avant, small mignonne, Anne, royal George, royal Kensington, noblesse, early Newington, Galande, early purple, chancellor, nivette, Catharine, and late Newington.

The peaches in the Dalkeith garden, and which ripen in the order in which they are placed, are as follows: — those marked *H* are planted against hot walls.

W. Early nutmeg.
W. Early Anne.
W. Red Magdalen.
W. Royal George.
W. Grimwood's Royal George.
W. Noblesse.
H. Galland.
H. Bellegard.
H. Montaubon.
H. Millet's mignon.
W. Smith's early Newington.
H. Chancellor.
W. White Magdalen.

1444. *Propagating to procure new Sorts.* The peach is raised from the stone; and this mode is pursued in America, even for procuring trees for common purposes. In Maryland and Virginia, Neill observes, " peach-trees are propagated from the stones without budding. Every peach-orchard contains of course numerous varieties. Among these, a few are always of superior quality; with the rest of the fruit pigs are fed."

The peaches (Nos. 37. and 38.) in the table, mentioned as produced by T. A. Knight, were thus originated: the parent-trees were dwarfs planted in large pots; these being brought into a state of vigorous health, the pistils of the blossom of one sort were impregnated with the pollen of another; only three peaches were suffered to remain on each tree; and from sowing the stones of these, the Acton scott, and spring grove, and other varieties, were produced: the male parent of the latter was the large French mignon; and the female, the little red nutmeg; which choice is consistent with the general principle, that the most perfect and vigorous offspring will be obtained of plants, as of animals, when the male and female parent are not closely related to each other." *Neill.*

Some excellent observations on this subject will be found in various papers by T. A. Knight, published in the *Hort. Trans.*; but especially in " Observations on the Method of producing new and early Fruits, and on some Varieties of the Peach." (Vol. i.) In the latter paper he thus concludes, " I entertain little doubt that the peach-tree might, in successive generations, be so far hardened and naturalized to the climate of England and Ireland, as to succeed well as a standard in favorable situations. The peach does not, like many other species of fruit, much exercise the patience of the gardener, who raises it from the seed; for it may always be made to bear when three years old. I will not venture to decide whether it might not possibly produce fruit even at the end of a single year. In prosecuting such experiments, I would recommend the seedling peach-trees to be retained in pots, and buds from them only to be inserted in older trees; for their rapid and luxuriant growth is extremely troublesome on the wall, and pruning is death to them." He afterwards succeeded in producing blossom-buds the first year: the means used were, leaving on the laterals near the extremities of the shoots, and exposing the leaves as much as possible to the sun, in order to promote the growth, and ripening of the wood.

Miller says, the best sorts for sowing, are those whose flesh is firm and cleaves to the stone; and from amongst those, you should choose such as ripen pretty early, and have a rich vinous juice." These stones should be planted in autumn, on a bed of light dry earth, about three inches deep and four inches asunder; and in the winter the beds should be covered to protect them from the frost, which, if permitted to enter deep into the ground, will destroy them. After remaining two years in this bed, they may be transplanted into nursery rows, three feet asunder, and one foot distant plant from plant in the rows; mulching the surface, and watering during summer in very dry weather. After being two years in this nursery, transplant them where they are to remain to produce fruit. Plant them as standards till you see their fruit; cut off bruised roots, but give their tops no other pruning than cutting out decayed or very irregular branches.

Propagation to perpetuate Varieties. The peach is generally budded on damask plum-stocks, and some of the more delicate sorts, on apricot-stocks, or old apricot-trees cut down, or on seedling peaches, almonds, or nectarines. Knight recommends growing almond-stocks for the finer kinds of nectarines and apricots, as likely to prevent the mildew, and as being allied to the peach. He says, " almond-stocks should be raised and retained in the nursery in pots, as they do not transplant well." " Perform the budding in July or August, in the side of the stock, one bud in each, inserted near the bottom, for principal wall-trees; and at the height of three, four, or five feet, for riders. The bud will shoot the following spring, and attain the length of three or four feet in the summer's growth. After the budded trees have ripened the first year's shoot, they may either be planted where they are to remain, or be trained in the nursery for two, three, or four years, till in a bearing state. Whether the plants be removed into the garden at a year old, or remain longer in the nursery, the first shoot from the budding must be headed-down, either early in June the same year, to gain a season, or in the March following, to four, five, or six eyes, to produce lateral shoots, with one upright leader, to begin the formation of the head in a fan-like expansion: the second year's shoot should also be shortened to a few eyes at the return of June or March; and those also of the third year in such degree as may seem expedient."

1445. *Soil.* A good soil for peach-trees, according to Abercrombie, "is composed of three parts, mellow unexhausted loam, and one part drift sand, moderately enriched with vegetable mould, or the cooler dungs. If the soil be lean and poor, and at the same time light, have the borders improved with decomposed dung and fertile mellow earth, (new top-spit loam, if attainable); if the ground be strong and heavy, add some light earth or dung; if very gravelly, remove the grossest part, excavating to a proper depth; and in the same proportion apply a compost as above. Let the soil be made good to the depth of thirty inches, or three feet. The nectarine wants the warmer, richer, and deeper soil, if any difference be made. Bad, cold ground, or an exhausted mould, is often the cause of the trees gumming." Forsyth says, "Peaches require a lighter soil than pears and plums, and a light mellow loam is best."

Choice of Plants. Abercrombie, Forsyth, Nicol, and most authors, agree in recommending the choice of trees, two, three, or four years trained. Forsyth says, "they should be procured in the latter end of October, or beginning of November, as soon as the leaf begins to fall."

Final Planting. The peach is almost universally planted against walls in Britain; in some few warm situations they have been tried as dwarf-standards, and Knight (*Hort. Trans.* vol. ii. p. 219.) "thinks they may be grown in some cases as low espaliers, covering with mats in spring to protect the blossom. In a very warm season there can be no doubt the fruit of the hardier sorts so grown, would be higher-colored and of superior flavor, and the trees would be less subject to the red-spider."

"Early autumn planting is best on a dry soil. Spring planting may be successfully performed in February and March; the sooner, so as the weather be favourable, the better; that the trees may take root immediately before the dry, warm season commences."

1446. *Mode of Bearing.* "All the varieties of the peach and nectarine bear the fruit upon the young wood of a year old; the blossom-buds rising immediately from the eyes of the shoots. The same shoot seldom bears after the first year, except on some casual small spurs on the two years' wood, which is not to be counted upon. Hence, the trees are to be pruned as bearing entirely on the shoots of the preceding year; and a full supply of every year's shoots must be trained-in for successional bearers the following season."

The *Summer Pruning,* "in May and June, and occasionally in the succeeding months, is to regulate the shoots of the same year, and to prevent improper growths by disbudding. Pinch off fore-right buds or shoots; and pinch off or cut out ill-placed, very weakly, spongy, and deformed shoots, and very strong luxuriant growths; retaining a plentiful supply of good lateral shoots in all parts of the tree; and leaving a leader to each branch. Let them mostly be trained-in at full length all summer, about three inches asunder, for next year's bearers; and divest them of any lateral twigs, to prevent a thicket-like intricacy, and to promote a healthy, fruitful growth in the shoots themselves. In the course of the summer regulation, if any partial vacancy occurs, or should a young tree under training want an additional supply of wood, shorten some convenient-placed strong shoot in June to a few eyes, to furnish a supply of laterals the same season."

The *Winter Pruning* "may be performed at the fall of the leaf, and thence, according to some professional writers, at any time in mild weather until spring. It should be completed in February, or early in March, before the blossom-buds are considerably advanced, which are distinguishable by being round, plump, and prominent, while the leaf and shoot-buds are oblong and narrow. There is some advantage in pruning when the blossom-buds can be certainly known. Retain, in all parts of the tree, a competent supply of such regular-grown shoots of last year as are apparently fruitful in blossom-buds. Most part of these should be shortened, not indiscriminately, but according to their strength and situation; the very strong shoots should be left longest, being topped about one-fourth, or one-third; shoots of middling vigour reduce one-third or one-half; and prune the very weak to two or three buds. Always cut at a shoot-bud, to advance for a leader: sometimes a shoot-bud lies between a twin blossom-bud: cut half an inch above the bud. As many new shoots as will lay from three to six inches asunder, may be deemed a competent supply for next year's bearers. Cut out quite close the redundant, irregular, and other improper shoots: remove or reduce some part of the former bearers of the two preceding years, cutting the most naked quite away, and others down to the most eligible younger branch or well-placed shoot. Also take out all diseased and dead wood; retaining young, where necessary, to fill a vacuity."

In cold and late situations, T. A. Knight recommends a mode of pruning adapted to obtain fruit-bearing spurs on the peach, and these spurs he finds best calculated in such situations and late seasons, to generate well-organized and vigorous blossoms. "Instead of taking off so large a portion of the young shoots, and training-in a few only, to a considerable length, as is usually done, and as I should myself do to a great extent, in the vicinity of London, and in every favourable situation, I preserve a large number of the young shoots, which are emitted in a proper direction in early spring by the yearling wood, shortening each where necessary, by pinching off the minute succulent points, generally to the length of one or two inches. Spurs which lie close to the wall are thus made, upon which numerous blossom-buds form very early in the ensuing summer; and upon such, after the last most unfavorable season, and in a situation so high and cold that the peach-tree, in the most favorable seasons, had usually produced only a few feeble blossoms; I observed as strong and vigorous blossoms in the present spring, as I have usually seen in the best seasons and situations; and I am quite confident that if the peach-trees, in the gardens round the metropolis had been pruned in the manner above described, in the last season, an abundant and vigorous blossom would have appeared in the present spring. I do not, however, mean to recommend to the gardener to trust wholly, in any situation, for his crop of fruit to the spurs produced by the above-mentioned mode of pruning and training the peach tree. In every warm and favorable situation, I would advise him to train the larger part of his young wood, according to the ordinary method, and in cold and late situations only, to adopt, to a great extent, the mode of management above suggested. A mixture of both modes, in every situation, will be generally found to multiply the chances of success; and, therefore, neither ought to be exclusively adopted, or wholly rejected in any situation. The spurs must not be shortened in the winter or spring, till it can be ascertained what parts of them are provided with leaf-buds."

In a very elevated and cold situation, C. Harrison (*Hort. Trans.* vol. ii. p. 14.) prunes and nails his peach and nectarine trees in December and January, taking away two-thirds of the young shoots; and in two-hand dressings in May and July, he leaves the lowest and weakest shoots for a succession in the year following, pinching off the leading and other shoots. J. S. Wortley, Esq. (Harrison's employer,) says, "he can hardly do his gardener justice in describing his practice; for he never saw trees so beautifully trained, and upon such good principles. The chief rule which he follows, is never to allow the shoots that are left for bearing fruit, to run to any length from the strong wood; for which reason, when the trees are pruned in autumn, the bearing branches for the next year are shortened, taking care not to leave more fruiting-buds than he thinks will come to perfection."

Training. The peach is almost universally trained in the fan manner, either straight lined, or wavy (*fig.* 345.), though some allege that it bears better in rich soils when two leading branches are encouraged, and the bearing shoots trained outwards from those, so as to form a sort of horizontal training.

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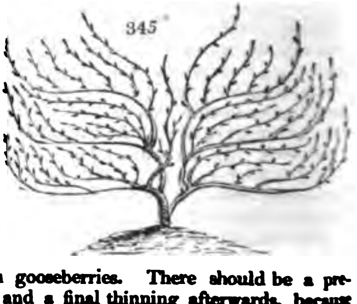

Thinning the Fruit. "In favorable seasons, the blossoms often set more fruit than they can support, or than have room to attain full growth; and if all were to remain, it would hurt the trees in their future bearing: therefore they should be timely thinned, when of the size of large peas or half-grown gooseberries. There should be a preparatory thinning before the time of stoning, and a final thinning afterwards, because most plants, especially such as have overborne themselves, drop many fruit at that crisis. Finish the thinning with great regularity, leaving those retained at proper distances, three, four, or five, on strong shoots, two or three on middling, and one or two on the weaker shoots; and never leaving more than one peach at the same eye. The fruit on weakly trees, thin more in proportion." *Abercrombie.*

Renovating old, decaying Trees. Head down, and renew the soil from an old upland pasture, and if the bottom of the border is moist, or if the roots have gone more than two feet, or two and a half feet downwards, pave the bottom, or otherwise render it dry and impervious to roots at the depth of twenty inches, or two feet from the surface. This plan will be found almost universally successful in restoring sufficient vigor, to resist insects and diseases, and produce abundance of fruit.

Protecting Blossom. This may require to be done by some of the various modes already enumerated (1020 to 1030). Forsyth recommends old netting as the best covering. C. Harrison protects his trees from the frost, in the month of January, by branches of broom: these are previously steeped in soap-suds, mixed with one-third of urine, for forty-eight hours, in order to clear them from insects, and when dry, disposed thinly over the whole tree, letting them remain on only until the trees begin to break into leaf." At the time of the blooming and setting of the fruit he applies cold water in the following manner: viz. If upon visiting the trees, before the sun is up, in the morning, after a frosty night, he finds that there is any appearance of frost in the bloom or young fruit, he waters the bloom or young fruit thoroughly with cold water, from the garden engine; and he affirms, that even if the blossoms or young fruit are discolored, this operation recovers them, provided it be done before the sun comes upon them. He farther says, that he has sometimes had occasion to water particular parts of the trees more than once in the same morning, before he could get entirely rid of the effects of the frost. Dr. Noehden remarks (*Hort. Trans.* ii.) "that this operation of watering before sunrise, in counteracting the frost, seems to produce its effect in a manner analogous to the application of cold water to a frozen joint or limb, which is injured by the sudden application of warmth. Harrison discovered this method by the following accident: "In planting some cabbage-plants, among the rows of some kidney-beans, very early in the morning, after a frosty night, in spring, before the sun was high enough to come upon the frosted beans, he spilt some of the water upon them which he used in planting the cabbage-plants; and, to his surprise, he found that the beans began immediately to recover."

J. Carr, Esq. of St. Anne's, near Leeds, protects his blossom by retardation; and the means used are, detaching the branches of the trees from the walls in autumn, and not refixing them till late in the spring, when the blossoms are about to expand. In addition to unfastening the trees, a wedge is put in behind the main stem to throw it forward, in order that it may receive as little protection from the wall as possible. (*Cal. Mem.* iii. 112.)

Ripening Peaches on leafless Branches. Whenever the part of the bearing branch, which extends beyond the fruit, is without foliage, the fruit itself rarely acquires maturity, and never its proper flavor and excellence. This Knight conjectured to be owing to the want of the returning sap which would have been furnished by the leaves; and he proved it experimentally, by innarching a small branch immediately above the fruit. The fruit, in consequence, acquired the highest degree of maturity and perfection. *Hort. Trans.* ii. 25.

1447. *Insects, Diseases,* &c. The leaves of the peach-tree are very liable to the attacks of the acarus, its greatest enemy, and also to be devoured by the *Chermes* (*fig.* 346. *a.*); *Aphis* (*fig.* 346. *b.*); and even a much smaller insect, the *Thrips* (*fig.* 347.); which, in its natural size (*a.*), is hardly perceptible with the naked eye. These are to be kept under by the usual means of watering over the leaves, and fumigation with tobacco-smoke. The honey-dew, mildew, gum, and canker, are chiefly to be kept under by regimen: dusting with sulpur has been found to destroy the mildew, but the only certain way of removing it is by a renewal of the soil, which will commonly be found old mould long in use and too rich; and by abundance of air. J. Kirk (*Caled. Hort. Mem.* iv. 159.) has tried renewing the soil for fifty years, and always found it an effectual remedy.

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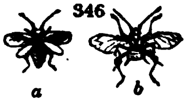

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The young wood of the peach-tree is liable to be covered with black spots or blotches, which Kinment proved to be produced by over-rich soil. "Some time in the beginning of winter, 1811, I collected together a rich compost heap, (No. 1.), consisting of one-third light loam, one-sixth strong clay, one-twelfth lime, one-sixth hot-bed dung, one-sixth vegetable mould, and one-twelfth pigeon-dung. At the same time, I collected another heap, (No. 2.), much less rich, consisting of one-half light loam, one-fourth strong clay, one-eighth earth from scourings of ditches, one-sixteenth lime, and one-sixteenth hot-bed dung. These heaps I turned over occasionally, in order that they might be well-meliorated by the frosts. About the middle of March, 1812, I planted the trees, and applied to the roots of a few of them the rich compost of No. 1.; but the greatest number of them was planted with the compost No. 2. About the latter end of June, I examined the young trees all over: the shoots they had made were nearly all of the same size; but I was no way disappointed when I found those I had planted with the rich mould, sadly infested with black spots; while those planted with No. 2. remained whole and sound. There being only the few which were planted with No. 1. infested with the black spots. With my knife I cut the blemishes entirely out; and about the latter end of September I found the wounds completely whole. Early in the spring, 1813, I cleared off the rich mould entirely from their roots, and supplied the vacancy with No. 2.; and at the end of last season

I had the happiness to see them succeed to the utmost of my wishes, free of black spots." (*Caled. Hort. Mem.* ii. 79, 80.)

The fruit, when ripe, is very liable to the attacks of the wasp (*Vespa vulgaris*), the large fly, (*Musca vomitoria*), and especially the earwig, (*Forficula auricularia*), &c.; the two first may be excluded by nets, or enticed by honied bottles, and the latter caught by the beetle-trap, reeds, or bean-stalks, laid in behind the leaves, and examined every morning.

Gathering. Use the peach-gatherer, and gather one day or two before the fruit is to be used, and before it be dead-ripe, laying it on clean paper in a dry airy part of the fruit-room. See chap. iv. sect. 3. and chap. v. sect. 10.

Forcing, and the Use of Hot-walls. The peach-tree forces well under glass, (See chap. vii. sect. 3.) and its ripening may be accelerated in the open air, when planted against a hot-wall, by the application of gentle fires in cold moist weather, in August and September. This will ripen the fruit and wood, but no attempt should ever be made to accelerate the blossoms early in spring, as without the protection of glass they are almost certain of being cut off.

Subsect. 2. The *Nectarine.* — *Amygdalus Persica, var. Nectarina,* L. *Pêche lisse,* Fr.

1448. The nectarine is distinguished from the peach by its smooth and rather firmer and more plump fruit. In other respects the general description of the peach equally applies to the nectarine, both, as before observed, being by the continental gardeners considered as one fruit. Forsyth says, " The fruit is called nectarine from nectar, the *poetical* drink of the gods." Some botanists, considering it as a distinct species, distinguish it by the trivial name of *nuci-persica,* from the similitude of the green fruit in smoothness, color, size, and form to the walnut, (*nux,*) covered with its outer green shell.

The *Varieties* are enumerated in the *following table.* — *Free-stones* as they ripen.

Elruge; first cultivated at Hoxton, by Gurle, in 1680; (*Hook. P. L. & For.* 3.) medium size; dark red and pale yellow color; ripens about the middle of August; and is soft and melting.

Temple's; (*Lang. P. t.* 30. and *For.* 8.); medium size; pale red and yellowish color; ripens in the middle of September; flavor rich and juicy.

Fairchild's early; (*For.* 1.); small size; round figure; beautiful red color; ripens in the middle of August; flavor good.

Peterborough, Late Green, Vermash; (*For.* 10.)

Scarlet; (*For.* 4.); small size; fine scarlet and pale red color; ripens in the end of August.

Violet, Violet Hâtive; (*Hook. P. t.* 15. *For.* 11.); medium size; purple and pale color; vinous flavor.

Murry; (*For.* 7.); medium size; dingy red and pale green; ripens in the middle of September.

White, Flanders; (*Hook. P t.* 30. *For.* p. 58.); ripens in the beginning of September.

Cling-stones arranged in the order of their ripening.

Late Newington; (*Lang. P. t.* 29. *For.* 2.); red and yellow color; ripens in the middle of September; excellent rich juice.

Brugnon, Italian; (*Lang. P. t.* 29. *For.* 5.); deep red and pale yellow color; ripens the beginning of September; rich flavor.

Red Roman, Brugnon Musqué; (*Duh. n.* 26. *For.* 6.); large size; dark red and yellow color; ripens in September; replete with rich juice.

Golden; (*Lang. P. t.* 29. *For.* 9.); medium size; soft red and yellow color; ripens in the beginning of October; poignant rich flavor.

Early Pavie; (*For.* 57.).

Late Genoa; (*For.* 57.)

Early Newington; (*For.* 57.); above medium size; ripens the end of August; deep red color; pulp super-excellent; and, according to Miller, one of the best flavored of nectarines, or of any known fruit in the world.

Roger's seedling; (*For.* 57.)

Selection of Sorts. Forsyth recommends for a small garden :

Fairchild's early | Elruge | Scarlet | Newington | Red Roman | and Temple's.

Those in the Dalkeith garden are as follows. Such as are marked (H) being planted against a hot wall.

(H) Red Roman.
(H) Dutilly's.
(H) Elruge.
(H) Brugnon.
(H) Temple.
(H) Murry.
Fairchild's.
(H) Scarlet.
(H) Clermont.

Insects. " On account of the smoothness of the skin of the nectarine," Forsyth says, " it suffers much more from the wood-louse (*Oniscus assellus*), ear-wigs, &c. than the peach; it will, therefore, be necessary to hang up a greater number of bundles of bean-stalks about these than about any other fruit-trees. Wasps are also very destructive to nectarines, and the trees are very liable to be infested with the red spider."

Culture, &c. This is in all respects the same as the peach.

Subsect. 3. The *Apricot.* — *Prunus Armeniaca,* L.; *Armeniaca Vulgaris,* Pers. D. (Lam. Ill. t. 431.); *Icos. Di-Pentag.* L.; and *Rosaceæ,* J.; *Malus Armeniaca,* of the Ancients. *Abricot,* Fr.; *Abricosenbaum,* Ger.; and *Albicocco,* Ital.

1449. This is a low tree, of rather crooked growth, with broad roundish pointed leaves, glandular, serrated, and the petiole commonly tinged with red. Linnæus remarks, that the vernant leaves are convoluted, that is, not folding flat together, like those of the cherry, but rolling upwards, more or less. The leaves of many apricot-trees have a disposition to this at all times. The flowers are sessile, of a white color, tinged with dusky-red; fruit round, yellow within and without, firmer than plums and most peaches, inclosing a smooth compressed stone, like that of the plum. The flowers appear in April, on the shoots of the preceding year, and on spurs of two or more years' growth, and the fruit ripens in September. From its trivial name, it is generally supposed to have originated in Armenia, but Regnier and Sickler assign it a parallel between the Niger and the Atlas; and Pallas states it to be a native of the whole of the Caucasus, the mountains there, to the top, being covered with it. Thunberg describes it as a very large spreading, branchy tree in Japan. Grossier says, that it covers the barren mountains to the west of Pekin, that the Chinese have a great many varieties of the tree, double-blossomed, which they plant on little mounts for ornament, and dwarfs in pots for their apartments. It appears from *Turner's Herbal*, that the apricot was cultivated here in 1562; and in *Hakluyt's Remembrances*, 1582, it is affirmed, that the apricot was procured out of Italy by Wolfe, a French priest, gardener to Henry VIII.

The fruit seems to have been known in Italy in the time of Dioscorides, under the name of *Præcocia*, probably as Regnier supposes, from the Arabic, *Berkoch;* whence the Tuscan, *Bacoche* or *Albjcocco*; and the English, *Apricock:* or, as Professor Martyn observes, a tree, when first introduced, might have been called a *præcox*, or early fruit; and gardeners taking the article *a* for the first syllable of the word, might easily have corrupted it to apricocks. The orthography seems to have been finally changed to apricot about the end of the last century; as Justice, in 1764, writes apricock; and Kyle, of Moredun, in 1782, apricot.

Use. The fruit is used in a raw state at the desert, and is esteemed next to the peach; it is also made into marmalades, jellies, and preserved. Grossier says, that lozenges are made by the Chinese, from the clarified juice, which, dissolved in water, yield a cool refreshing beverage: oil may be extracted from the nut, and the young shoots yield a fine golden cinnamon-color to wool.

Varieties. Parkinson, in 1629, enumerates six; Rea, in 1720, seven; the Luxemburg catalogue, in 1800, fifteen; and the British catologues enumerate about the same number.

Masculine: Early Red Masculine; an old variety, mentioned by Parkinson in 1629; *(Duh.* n. t. 1. & *For.* 1.*)*; small size; roundish form; greenish red color; ripens in the end of July; the pulp tender, with a tart taste; the tree a good bearer, and the fruit esteemed for its earliness and tart taste.

Orange: mentioned by Rea in 1702; *(For.* 2.*)*; large size; deep yellow color; ripens in the end of August; the pulp dry and insipid; fitter for tarts than for the table; excellent for preserving.

Algier; mentioned by Rea in 1702; *(For.* 3.*)*; flatted oval form; straw-color; ripens in the middle of August; the pulp juicy and high-flavored; and, according to Miller, earlier than the orange.

Roman: mentioned by Rea in 1702; *(Lang. P. t.* 15. and *For.* 4.*)* large size; round form; deep yellow color; ripens in the middle of August; the pulp not very juicy.

Turkey: mentioned by Rea in 1702; *(Lang. P. t.* 15. and *For.* 5.*)*; large size; globular form; very deep yellow color; ripens in the end of August; the pulp firm and dry.

Breda; brought from Africa to Breda, and thence to England in 1702; *(For.* 6.*)* large size; round form; deep yellow color; ripens in the end of August; the pulp soft and juicy; the tree a great bearer; an excellent fruit, especially if grown on standards, to which this sort is particularly adapted.

Brussels: mentioned by Rea as brought from Brussels in 1702; *(Pom. Aust. t.* 57. and *For.* 7.*)*; medium size; inclining to an oval form; red, with dark spots and greenish yellow color; ripens in the end of August; the pulp not liable to be mealy, or doughy; brisk flavor; the tree a great bearer; and held in great esteem on account of its bearing so well in standards, or large dwarfs.

Moor Park: Anson's, Temple's, Dunmore's Breda, and Peach Apricot; brought from the Netherlands by Sir Thos. More, say in 1700; *(Hook. P. t.* 9. and *For.* 8.*)*; ripens in the end of August; fine fruit; according to Nicol, preferable to all other Apricots.

Peach Apricot; Apricot of Nancy; brought from Paris by the Duke of Northumberland, in 1767; *Duh. n.* 10. and *For.* 9.*)*; very large size; ripens in the end of August; the fruit is the finest and largest of all the apricots, and differs from the Moor Park chiefly in the leaves.

Black Peach: introduced by Sir Joseph Banks in 1800; *(Pom. Franc.* i. 36. and *For.* 10.*)* black-skinned; ripens in the beginning of August; and of good flavor.

Alberge; *(Pom. Franc.* i. 39. and *For.* p. 5.*)*; the only variety whose seeds produce the same fruit as the parent.

Angoumois (Duh. n. 4. *t.* 3. and *For.* p. 5*)*.

Blotched-leaved; *(Pom. Franc.* i. 34. and *For.* p. 5.*)*

Breda, Grover's; *(For.* p. 5.*)*

Great; *(For.* p. 5.*)*

Holland; *(Duh.* 5. *t.* 4. and *For.* p. 5.*)*

Orange, Royal.

Persian.

Portugal; *(Duh.* 6. *t.* 5. and *For.* p. 5.*)*

Provence; *(Duh.* 6. *t.* 4.*)*

Transparent.

Violet.

Choice of Sorts. Those grown in the Dalkeith garden are:

Moorpark | Breda, early | Masculine, early | Brussels, early | and Orange, early.

1450. *Propagation.* New varieties are procured from the seed as in the peach, and approved sorts are perpetuated by budding, generally on muscle or plum stocks. The Brussels and Breda, when intended for standards, are budded on the St. Julian plum, which produces a strong, clean stem; but for the rest, any stock will do, provided it be free and thriving. Knight (*Hort. Trans.* vol. ii. p. 19.) recommends budding the Moorpark on an apricot stock, which he has found prevents the trees of this sort from becoming diseased and debilitated, which they generally do on plum stocks. Budding apricots is generally performed early in the season, from the middle of June to the end of July. For dwarfs, the bud is inserted six or eight inches from the ground; and the sorts are sometimes twice budded, or one variety budded on another, which is said to keep the trees in a more dwarf state. For riders or standards, they are budded on plum-stocks four or five feet high. Miller prefers half-standards, budded about three or four feet from the ground; the trees so produced, being less liable to suffer from high winds.

Choice of the Plants. Abercrombie prefers trees of two or three years' growth from the bud, and fit for immediate bearing. Forsyth makes choice of those plants which have the strongest and cleanest stems; and if he can such as have been headed-down, of two or three years' growth, as they will bear and fill the walls much sooner than those which have not been so treated. He says, "make choice of trees with one stem; or, if they have two, one of them should be cut off; for by planting those with two stems, the middle of the tree is left naked, and, of course, one-third of the wall remains uncovered."

Season of Planting. Abercrombie says, the best season is from the fall of the leaf until February or March. Forsyth says, the best time is in August, when the leaf begins to fall.

Final Planting. The Breda and Brussels are occasionally planted as standards or espaliers in warm situations; and in these states, in fine seasons, produce more highly-flavored fruit than on walls. The other varieties are generally planted on walls, which, Miller and Forsyth say, should have an east or west aspect; for if they are planted full south, the great heat causes them to be mealy before they are eatable. The borders should not be less than six or eight feet wide, and two or two and a half feet deep. The soil a light rich loam, perfectly dry below. Forsyth says, "the borders may be three feet deep."

"Standard apricots," Abercrombie observes, "do not come into bearing under a considerable number of years, sometimes ten or twelve; but then the fruit, in a congenial situation, is abundant and of the finest flavor. So, when the prevailing fault of a particular sort is mealiness, and yet it cannot be expected to ripen on even a dwarf standard, the medium course of training the plant to a trellis almost touching a south wall, will improve the flavor.

1451. *Mode of Bearing.* The varieties of the apricot, in general, bear chiefly upon the young shoots of last year, and casually upon small spurs rising on the two or three-years' old fruit branches. The moor-park bears chiefly on last year's shoots, and on close spurs formed on the two-year old wood. The bearing shoots emit the blossom-buds immediately from the eyes along the sides; and the buds have a round and swelling appearance.

Pruning Wall-Trees. The general culture of the wall-apricots comprehends a summer and winter course of regulation by pruning and training.

Summer Pruning. Begin the summer pruning in May or early in June, and continue it occasionally in July, August, &c. This pruning is principally to regulate the young shoots of the same year. In the first place, take off close all the fore-right shoots, and others that are ill-placed or irregular, or too luxuriant in growth; taking care to retain a competent supply of choice well-placed moderately-growing side-shoots, with a good leader to each mother-branch. Continue these mostly at their full-length all summer, regularly trained-in close to the wall, to procure a sufficiency to choose from in the general winter pruning, for new bearers next year. If the summer regulation commence early, while the shoots are quite young, and, as it were, herbaceous, one, two, three, or four inches long, those improper to retain may be detached with the finger and thumb; but when of firmer growth, they must be removed with the knife. If any very strong shoot rise in any casually vacant part, it may be topped in June, which will cause it to produce several laterals the same year of more moderate growth, eligible for training-in to supply the vacancy.

Thinning the Fruit. Sometimes the fruit are much too numerous, often growing in clusters; in which case, thin them in May and the beginning of June, in their young green state; leaving the most promising fruit singly, at three or four inches' distance, or from about two to six on the respective shoots, according to their strength. The apricots so thinned off, and the first principal green fruit, are esteemed very fine for tarts.

Winter Pruning. This may be performed either at the fall of the leaf, or in mild intervals from that time until the beginning of March. When it is deferred until the buds begin to swell, the promising shoots can be the better distinguished. It comprehends a general regulation both of the last year's shoots and the older branches. A general supply of the most regular-placed young shoots must be every where retained, for successional bearers the ensuing year. Cut out some of the most naked part of the two last years' bearers, and naked old branches not furnished with competent supplies of young wood, or with fruit-spurs, either to their origin, or to some well-directed lateral, as most expedient, to make room for training a general supply of the new bearers retained; and cut away all decayed wood and old stumps. Generally observe, in this pruning, to retain one leading shoot at the end of each branch; either a naturally-placed terminal, or one formed by cutting, where a vacuity is to be furnished, into a proper leader. Let the shoots retained for bearers be moderately shortened: strong shoots reduce in the least proportion, cutting off one-fourth or less of their length; from weak shoots take away a third, and sometimes half. This shortening will conduce to the production of a competency of lateral shoots the ensuing summer, from the lower and middle-placed eyes; whereas, without it, the new shoots would proceed mostly from the top, and leave the under part of the mother-branches naked, and the lower and middle parts of the three unfurnished with proper supplies of bearing wood. Never prune below all the blossom-buds, except to provide wood, in which case cut nearer to the origin of the branch. As, in these trees, small fruit-spurs, an inch or two long, often appear on some of the two or three years' branches furnished with blossom-buds; these spurs should generally be retained for bearing; but when any project fore-right far from the wall, cut them in accordingly; for spurs projecting above three inches, though they may set their fruit, seldom ripen it, unless the season and situation are both favorable. The thick clusters of spurs which are apt to form on aged trees, ought also to be thinned. As each tree is pruned, nail it, laying in the branches and shoots from three to six inches' distance, straight and close to the wall.

Pruning Espaliers. As directed for wall-trees.

Pruning Standards. Half-standards will require only occasional pruning to regulate any branches which are too numerous, too extended, or cross-placed; and to remove any casually-unfruitful parts and dead wood. At the same time, the regular branches, forming the head of the tree, should not be generally shortened, but permitted to advance in free growth." *Abercrombie.*

Training the Apricot-Tree. This is generally done in the fan manner, which, not only for the apricot but for wall-trees generally, Forsyth disapproves of (in our opinion without reason), as occasioning "the sap to rise too freely to the top, leaving the lower part almost naked, so that scarcely one quarter of the wall is covered with bearing wood" He recommends a mode between the fan and horizontal manner (*fig.* 348.), as more likely to keep the wall covered than the other.

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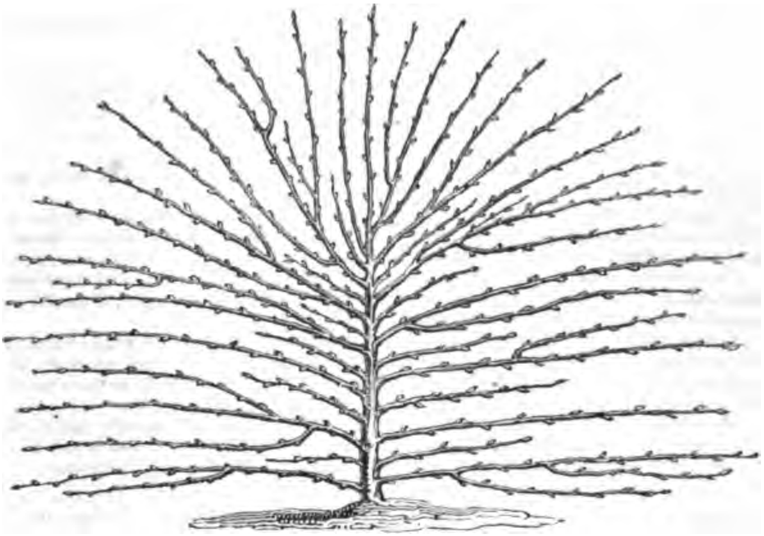

Renovating Old-decaying Trees. Forsyth had the greatest success in this department of fruit-tree culture, by cutting down to within a foot or eighteen inches or more occasionally of the ground, and then renewing the soil of the border.

Gathering. The fruit is apt to become mealy, if left on the tree till over ripe; it should be gathered with the peach-gatherer while moderately firm.

Insects, Diseases, &c. As the fruit ripens early, it is very liable to be attacked by wasps and large flies, which should be kept off by a net, stretched a foot or more apart from the wall or trellis. The other insects, and the diseases of this tree, are the same as in the peach-tree; but it is not nearly so obnoxious to their attacks, probably owing to the comparatively hard nature of its bark and wood, and coriaceous leaves.

The apricot does not *force* well; but a few are sometimes tried in pots, and placed in the peach-house. See chap. vii. sect. 3.

Subsect. 4. The *Almond.* — *Amygdalus*, L.; *Icos. Monog.* L.; and *Rosaceæ*, J. (*Plenck.* ic. t. 385.) *Amandier*, Fr.; *Mandelbaum*, Ger.; and *Mandorlo*, Ital.

1452. The *Common* or *Sweet Almond* is the *A. Communis*, L.; and the *Bitter Almond* is the *A. Amara*, L. (*Blackw.* t. 195.) It will grow to the height of twenty feet, with spreading branhes. The leaves resemble those of the peach, but the lower serratures are glandular, which has given rise to the conjecture that glandular-leaved peaches have sprung more immediately from the almond than such as are without glands, as is generally the case with nectarines. The flowers vary in their color from the fine blush of the apple blossom to a snowy whiteness. The chief obvious distinction is in the fruit, which is flatter, with a coriaceous covering, instead of the rich pulp of the peach and nectarine, opening spontaneously when the kernel is ripe. It is a native of Barbary, China, and most eastern countries. The *tuberes* of Pliny, Knight considers as swollen almonds, and the same with the *amandier pêcher*, or almond peach, described by Du Hamel: having raised a similar variety from dusting the stigma of the almond with the pollen of the peach, which produced a tolerably good fruit. (*Hort. Trans.* iii. 4.) It is mentioned by Turner in 1548, and, though scarcely worth cultivating in England as a fruit-tree for profit, yet it is a very satisfactory thing to produce almonds of one's own growing at the dessert. The tree forms an important article in the general culture of many parts of France, Italy, and Spain. In a forward spring the blossoms often appear in February, but in this case frost generally destroys them, and they bear little or no fruit; whereas, when the trees do not flower till March, they seldom fail to produce fruit in abundance.

Use. The kernel of the stone is the only part used, which is tender, and of a fine flavor. The sweet almond and other varieties are brought to the dessert in a green or imperfectly ripe, and also in a ripe or dried state. They are also much used in cookery, confectionary, perfumery, and medicine. "Sweet almonds used in food," Professor Martyn observes, "are difficult of digestion; and afford very little nourishment, unless extremely well comminuted. As medicine, they blunt acrimonious humours; and sometimes give instant relief in the heartburn."

Varieties and Species in Cultivation. Miller enumerates three species, Duhamel seven; the number of sorts at present grown in the nurseries, are as follows:

Tender shelled; Sultane; (*Duh.* n. 2. and *For.* 1.); small size.
Sweet; Common Sweet; (*Duh.* n. 5. and *For.* 2.); large size; bitter-almonds sometimes found on the same tree.
Bitter, Common Bitter; (*Pom. Franc.* i. 67. and *For.* 3.); large size; sweet almonds sometimes found on the same tree.
Sweet Jordan, Amyg. dulcis of Miller; (*Pom. Franc.* i. 67. and *For.* 4.); tender shell, and large sweet kernel; leaves broad, short, and crenate.
Head-shelled; (*For.* 5.)
Dwarf; (*Duh.* n. 8. and *For.* 6.)
Peach Almond; Amandier Pêcher; (*Duh.* n. t. 4. and *Hort. Trans.* 3. t. 1.) produces some fruits; pulpy and of tolerable good flavor; and others mere almonds; some partake of both natures.
Pistachio; Amande Pistache; (*Miller*, 4.) very small size.

Selection of Sorts. The tender-shelled is in the greatest esteem; and next, the sweet and Jordan.

Propagation. The almond is propagated, like the peach, by seed, for varieties or stocks; and by budding on its own or on plum-stocks, for continuing varieties. Plum-stocks are preferred for strong moist soils, and peach or almond-stocks for dry situations.

Final Planting. It is generally planted as standards in shrubberies, and these will sometimes in good seasons ripen their fruit; but when fruit is the object, it should be trained against a west or east wall, like the peach.

Mode of Bearing and Pruning. The almond-tree bears chiefly on the young wood of the previous year, like the apricot and peach; and in part upon small spurs on the two-year old, three-year old, and older branches: it is therefore pruned like these trees.

Gathering and Preserving the Crop. A part may be gathered when nearly ripe daily for some weeks before gathering the whole crop. This operation generally falls to be performed in September, when a part may be laid in the fruit-room, and a part thoroughly dried and bedded in sand in the fruit-cellar, for keeping through the winter.

Subsect. 5. The *Plum.* — *Prunus domestica*, L. (*Eng. Bot.* 1783.); *Icos. Di-Pentag.* L.; and *Rosaceæ*, J. *Prune*, Fr.; *Pflaumenbaum*, Ger.; and *Prugno*, Ital.

1453. This tree rises fifteen feet in height, branching into a moderately-spreading head; the leaves are ovate, serrated, and on short petioles. Petals white, drupe an oblong spheroid, shell long, ovate, and compressed. The natural color of the plum is generally considered to be black; but the varieties in cultivation are of yellow, red, blue, and green colors, and of different forms and flavors. It is a native, or naturalized in Britain, being frequently found in hedges; but its original country is supposed to be Asia, in Europe: and, according to Pliny, it was brought from Syria into Greece; and thence into Italy.

Use. The best varieties are esteemed a delicious dessert fruit; and the others are used in pies, tarts, conserves, and sweetmeats. A wholesome wine is also occasionally made from them, with or without other fruits and ingredients. Plums, Professor Martyn observes, when sufficiently ripe, and taken in moderate quantity, are not unwholesome; but in an immature state, they are more liable to produce colicky pains, diarrhœa, or cholera, than any other fruit of this class. Considered medicinally, they are emollient, cooling, and laxative, especially the French prunes, which are peculiarly useful in costive habits. The wood of the plum is used in turnery, cabinet work, and in making musical instruments.

Varieties. Tusser enumerates ten; Parkinson, sixty; Miller only thirty sorts. In the Luxemburg catalogue are sixty-eight: nearly a hundred names are to be found in the catalogues of our nurserymen, of which those in the following table are deemed the best.

A DESCRIPTIVE CATALOGUE OF PLUMS, commonly propagated in BRITISH NURSERIES, arranged as DESSERT and KITCHEN FRUIT.

DESSERT PLUMS.—Arranged in the order of their ripening.

No.	Name.	Synonymes, and resemblances.	How, when, and where originated, procured, or abounding.	Where figured.	Described.	Size.	Shape.	Color.	Ripens	Flesh and flavor.	Bearer.	Characteristics of the tree, and general reputation of the fruit.
1.	Jaunehative	White primordian		Duh. n. 1. t. 61.	Forsyth, 1.	Small	Round	Yellow	End of July	Mealy	Great	Chiefly esteemed for its precocity
2.	Early damask	Morocco		Lang. P. t. 20.	Forsyth, 2.	Medium		Red and blue	Beg. of Aug.	Good		
3.	Great damask	Tours		Duh. n. 4.	Forsyth, 4.	Large	Oval	Bluish	August	Rich		
4.	Violet	Blue perdrigon		Duh. n. 21.	Forsyth, 7.			Bluish red and yellow	August	Adheres to stone; rich		
5.	Little black damask			Duh. n. 9.	Forsyth, 3.			Black	End of Aug.	Rich	Great	
6.	Orleans	Red damask		Lang. P. t. 20.	Forsyth, 5.	Large	Oval	Red	End of Aug.	Rich juice	Great	A well-known esteemed wall-fruit
7.	White perdrigon	Brignole		Duh. n. 20.	Forsyth, 8.			Pale yellow with red	Beg. of Sept.	Rich perfumed		An excellent fruit, raw or in sweetmeats
8.	Myrobalan	P. cerasifera	Native of N. America	Duh. n. 46.	Forsyth, 19.	Very small	Round	Red	Beg. of Sept.	Sweet		Tree thorny, and blossoms early
9.	Rochecorbon	Red diaper		Duh. n. 37.	Forsyth, 22.	Large		Red	Beg. of Sept.	Very high		
10.	Wilmot's Orleans		From seed by Wilmot 1808.	Hort. Tr. iii. t. 14.	Hort. T. iii. 362.	Large	Round	Dark purple	Mid. of Sept.	Rich juice	Good	A superior early plum
11.	Fotheringham	Sheen		Lang. P. t. 20.	Forsyth, 6.			Dark red		Rich		Hardly any plum excels this
12.	Little Queen Claudia			Pom. Fr. t. 131.	Forsyth, 12.	Small		Whitish yellow and red	September	Rich		
13.	Green gage	Reine Claude		Hook. Pom. t. 38.	Forsyth, 14.	Small	Round	Yellowish-green	September	Exquisite taste; eats like a sweet-meat	Shy	Esteemed the best dessert plum, and improved by planting against a wall
14.	Isleworth green gage	Reine Claude	A seedling by Wilmot in 1810.		Hort. T. iii. 362.	Large		Yellow				
15.	La royale			Hook. Pom. t. 47.	Forsyth, 11.		Oval	Red w. whitish meal	End of Sept.		Shy	Excellent plum, equal to the green-gage
16.	Drap d'or	Cloth of gold		Duh. n. 30.	Forsyth, 15.	Small	Oblong	Yellow	End of Sept.	Very high	Great	A good fruit
17.	Cheston			Lang. P. t. 23.	Forsyth, 16.		Oval	Dark blue	End of Sept.	Rich	Great	
18.	Saint Catherine			Hook. P. t. 24.	Forsyth, 23.				End of Sept.	Rich sweet	Good	One of the best for confectionary and eating
19.	Great Queen Claudia	Dauphine gage		Duh. n. 25.	Forsyth, 13.	Small	Round	Yellowish-green	Beg. of Oct.	Rich musky		An excellent fruit, being the green-gage
20.	Apricot			Duh. n. 28.	Forsyth, 17.	Large		Pale yellow and white	Beg. of Oct.	Sweet		
21.	Maitre Claude			Lang. P. t. 23.	Forsyth, 18.	Large	Round	Whitish	Beg. of Oct.			Accounted one of the best white plums
22.	Violet	Blue impératrice		Hook. P. t. 4.	Forsyth, 24.				Mid of Oct.	Agreeable		One of the latest plums
23.	Coe's golden drop	St. Edmund's Bury		Hook. P. t. 14.	Forsyth, p. 18.	Small	Round	Yellow	Mid of Oct.	Excellent	Good	Keeps till the middle of December
24.	Damascene	Bl. Span., or prunes		Lang. P. t. 23.	Forsyth, p. 18.							
25.	Damask, violet			Duh. n. 5.	Forsyth, p. 18.							
26.	Diaper, blue	Violet, diaper		Duh. n. 36.	Forsyth, p. 18.							
27.	Nectarine	Caledonian		Hook. P. t. 39.	Forsyth, p. 18.	Very large						Hardy free-growing tree
28.	Précoce de Tours			Hook. P. t. 34.	Forsyth, p. 20.					Coarse skin harsh	Great	

KITCHEN PLUMS.—Arranged in the order of their ripening.

No.	Name.	Synonymes, and resemblances.	How, when, and where originated, procured, or abounding.	Where figured.	Described.	Size.	Shape.	Color.	Ripens	Flesh and flavor.	Bearer.	Characteristics of the tree, and general reputation of the fruit.
29.	Mirabelle			Duh. n. 29.	Forsyth, 20.	Small		Amber	Beg. of Sept.	Juicy	Great	Excellent for sweetmeats
30.	Large white damask			Duh. n. 7.	Forsyth, 21.	Medium	Oval	Pale yellow	Beg. of Sept.	Firm and well-tasted	Good	A useful kitchen fruit
31.	Prunella				Abercrombie	Small	Lg. pointed	White				Excellent for drying
32.	Bullace	P. insititia			Abercrombie	Small	Round	Green, black and white			Great	A thorny tree; the fruit used by the country people, and bears well in hedges
33.	Red imperial	Red mag. bonum		Duh. n. 32.	Forsyth, 9.	Large	Oblong	Red	End of Sept.			An excellent baking fruit
34.	Damson		A Shropshire fruit		Forsyth, 27.	Large	Round	Black	End of Sept.	Rich flavor	Great	Tree raised from suckers or stones; fruit good for baking or preserving, and in gathering upwards of a month
35.	Muscle				Forsyth, p. 19.							
36.	Prune Suisse			Duh. n. 19.	Forsyth, p. 19.							
37.	Wentworth				Abercrombie							
38.	White imperial	White mag. bonum		Pom. Fr. t. 127.	Forsyth, 10.	Large	Oval	Yellowish	Beg. of Oct.			Excellent for baking
39.	Monsieur's	Wentworth		Duh. n. 41.	Forsyth, 25.	Large	Oblong	Yellowish	Beg. of Oct.	Too sharp to be eaten raw	Great	Excellent for baking
40.	Wine sour		A Yorkshire fruit		Forsyth, 26.				October		Great	An excellent fruit for preserving; grows on any soil; best on lime-stone or gravel

Selection of Sorts. The following are recommended by Forsyth for a small garden.

Jaunehative.
Early damask.
Orleans.
Royal.
Green gage (different sorts.)
Drap d'or.
Saint catherine and impératrice.
Magnum bonum for baking.
Winesour for preserving.

The table-fruit in the Dalkeith garden are, as under, placed in the order of their ripening, all of them being planted against walls.

Voilet de hautive.
Early hautive.
New Orleans.
Early Morocco.
Green gage.
Blue gage.
Blue perdigron.
Apricot plum.
Fotheringham.
White magnum bonum.
Imperial.

1455. *Propagation.* Most of the varieties are propagated by grafting or budding on the muscle, St. Julian, bonum magnum, or any free-growing plums, raised from seed, or from suckers; but seedlings are preferable stocks for a permanent plantation. The common baking plums, as the damson, bullace, wentworth, &c. are generally propagated by suckers, without being either budded or grafted. Plum-grafting is performed in July or March; budding in July or August. Miller prefers budding, because plums are very apt to gum wherever large wounds are made on them.

New varieties are procured by propagating from seeds on the general principles already stated. T. A. Knight (*Hort. Trans.* iii. 214.), in an attempt to combine the bulk of the yellow magnum bonum with the richness and flavour of the green-gage, produced a fruit which partook of both parents, but which has not yet been given to the public; but a good variety of the Orleans plum (No. 10. in the table), has been raised from seed by J. Wilmot. *Hort. Trans.* iii. 392.

Soil. Plums, according to Miller, should have a middling soil, neither too wet and heavy, nor over light and dry, in either of which extremes they seldom do well.

Abercrombie recommends any mellow, fertile garden or orchard ground; and where a soil is to be made, "one-half fresh loam, one-fourth sharp sand, one-sixth road stuff, and one-twelfth vegetable remains, or decomposed dung or animal matter."

Site. The plum is cultivated like other indigenous fruit trees: the hardier sorts, as standards; and the finer varieties against walls. It is sometimes forced; but the blossom, like that of the cherry, is difficult to set, and on the whole, it is a fruit not well-adapted for forcing. The finer varieties are almost always planted against walls, which, Miller says, should have an east or south-east aspect, which is more kindly to these fruits than a full south aspect, on which they are subject to shrivel and be very dry; and many sorts will be extremely mealy, if exposed too much to the heat of the sun; but most sorts will ripen extremely well on espaliers, if rightly managed. Some, he adds, plant plums for standards, in which method some of the ordinary sorts will bear very well; but then the fruit will not be near so fair as those produced on espaliers, and will be more in danger of being bruised or blown down by strong winds. Abercrombie says, "have some choice sorts against south walls for earlier and superior fruit; others on east and west walls, and espaliers, to ripen in succession, with full and half-standards in the orchard."

Choice of Plants. Miller recommends trees of not more than one year's growth from the bud; for if they are older, they are very subject to canker; or if they take well to the ground, commonly produce only two or three luxuriant branches. Abercrombie and Nicol take plants from one to five years old. Forsyth chooses "clean straight plants with single stems, and of two or three years' growth."

Final Planting. Miller says, it is common to see plum-trees planted at the distance of fourteen or sixteen feet, so that the walls are in a few years covered with branches; and then all the shoots are cut and mangled with the knife so as to appear like a stumped hedge, and produce little fruit; therefore the only way to have plum-trees in good order, is to give them room, and extend their branches at full length. Abercrombie directs full and half-standards to be planted at forty, thirty, twenty-five, and twenty feet distance; dwarfs generally twenty feet apart, and wall-trees or espaliers fifteen, twenty, or twenty-five feet from stem to stem. Forsyth says, plums and cherries thrive best by themselves; and he prefers a wall for each, placing plums on walls ten feet high, eight yards apart; and at seven yards distance on twelve feet walls.

1456. *Mode of Bearing.* "All the sorts produce their fruit on small natural spurs, rising at the ends and along the sides of the bearing shoots of one, two, or three years' growth. In most sorts, new fruit-branches are two years old before the spurs bear. The same branches and spurs continue fruitful in proportion to the time which they take to come into bearing."

After the formation of the head is begun, it takes from two to six years before the different sorts come into bearing. Miller trains horizontally, and is against shortening the branches of plum-trees, since the more these trees are pruned, the more luxuriant they grow, until the strength of them is exhausted, and then they gum and spoil; therefore, the safest method to manage these trees is to lay in their shoots horizontally, as they are produced at equal distances, in proportion to the length of their leaves.

pinching off the points of young shoots where lateral branches are desired, and displacing for right and irregular shoots, or such as shade the fruit. With thus carefully going over these trees in the growing-season, there will be but little work to do to them in the winter.

Abercrombie agrees with Miller in not shortening fruitful branches. Standards, he says, must be allowed to "expand in free growth, occasionally pruning long ramblers, and cross-placed or other irregular branches. Thin crowded parts, cut away worn-out bearers, also decayed and cankery wood.

Forsyth says, "Never cut the stems of young plum-trees when first planted, but leave them till the buds begin to break; then you may head them down to five or more eyes, always observing to leave an odd one for the leading shoot: remember to cut sloping towards the wall, and as near to an eye as possible; thus managed, the shoots will soon fill the wall with fine wood. If you find that some of the shoots are too luxuriant, you may pinch the tops off with your finger and thumb, about the beginning of June, in the first year after planting; by doing which you will obtain plenty of wood to fill the bottom of the wall. A great deal depends on the first and second year's management of your trees."

Renovating Decaying Trees. Proceed as directed for the peach; but observe that the plum-tree, when cut down, is very apt to run to wood, therefore the new soil must neither be very rich, nor laid on in a very deep stratum.

Protecting Blossom. This is sometimes done with the tenderer sorts, in the same way as for peaches and apricots.

"*Taking the Crop.* The different sorts of the plum ripen in succession for about three months in summer and autumn. Some early sorts begin to ripen in July; the main varieties reach full maturity in August and September; late sorts continue ripening till the end of October or beginning of November. Each kind should be brought to table presently after being gathered, as they will not keep long in a natural state.

Insects, Diseases, &c. See Peach. The gum and canker are the most common diseases, and, as in almost every other case, the acarus is the most noxious insect. As a remedy for the former, Abercrombie directs to head-down. The insects are destroyed by the common means. The gages, or *reine Claudes*, when nearly ripe, are very apt to be eaten by wasps.

SUBSECT. 6. The *Cherry.* — *Prunus Cerasus*, L. (*Eng. Bot.* 706.); *Icos. Di-Pentag.* L.; and *Rosaceæ*, J. *Cerisier*, Fr.; *Kirschenbaum*, Ger.; and *Ciriegio*, Ital.

1457. The cherry is a middle-sized tree, with ash-colored, shining, roundish branches, ovate, serrated leaves, and white flowers, produced in nodding umbels, and succeeded by a red drupe, with an acid pulp. The leaf and flowering buds are distinct, the former terminating, the latter produced from the sides of the two or more years' branches. The cultivated cherry was brought to Italy by the Roman general Lucullus, in 73 A. C., from a town in Pontus in Asia, called Cerasus, whence its specific name, and was introduced to Britain 120 years afterwards. Many suppose that the cherries introduced by the Romans into Britain were lost, and that they were reintroduced in the time of Henry VIII. by Richard Haines, the fruiterer to that monarch. But though we have no proof that cherries were in England at the time of the Norman conquest, or for some centuries after it; yet Warton has proved, by a quotation of Lidgate, a poet, who wrote about or before 1415, that the hawkers in London were wont to expose cherries for sale in the same manner as is now done early in the season. The tree is now very generally cultivated both as a wall and standard fruit, and has been forced for upwards of two centuries (128).

Use. It is a refreshing summer fruit, highly grateful at the dessert, and affording pies, tarts, and other useful and elegant preparations in cookery and confectionary. Steeping cherries in brandy qualifies and improves its strength and flavor; a fine wine is made from the juice, and a spirit distilled from the fermented pulp. The gum which exudes from the tree is equal to gum arabic; and Hasselquist relates that more than one hundred men, during a siege, were kept alive for nearly two months, without any other sustenance than a little of this gum taken sometimes into the mouth, and suffered gradually to dissolve. Cherry-wood is hard and tough, and is used by the turner, flute-maker, and cabinet-maker.

Varieties. The Romans had eight kinds; red, black, tender-fleshed, hard-fleshed, small bitter-flavored, and a dwarf-sort. Tusser, in 1573, mentions cherries red and black. Parkinson mentions thirty-four sorts, Ray twenty-four, and Miller has eighteen sorts, to which he says others are continually adding, differing little from those he has described. The catalogue of the Luxemburg garden contains forty-two sorts, and those of our nurseries exceed that number of names. As usual, we have inserted only those sorts of which we could obtain some authenticated descriptive particulars.

The French divide their cherries into *griottes* or tender-fleshed, *bigarreaux* or hard-fleshed, and *guignes*, *geans* or small fruits.

1458. A DESCRIPTIVE CATALOGUE OF CHERRIES, commonly propagated in British Nurseries, arranged in the order of their ripening.

No.	Name.	Synonym.	How, where, and when originated, or abounding.		Where figured.	Where described.	Size.	Figure.	Color.	Ripe in	Flesh and flavor.	Bearer.	Characteristics of the tree, and general reputation of the fruit.
1.	Small may	Early may duke			Lang. P. xvii. 2.	Forsyth, 1.	Small	Round	Red	Beg. of June	Soft and sub-acid	Great	One or two trees sufficient for a large gar. being only esteemed for its precocity
2.	May duke				Hook. P. t. 28.	Forsyth, 2.	Medium	Round	Red	Beg. of June	Soft and agreeab. acid	Good	Excellent cherry; bears well against a wall, or as a dwarf-standard
3.	Early black	Resembles the Waterloo	Orig. by Knight from the graffion and may duke,	1816.		Hort. T. iii. 212.	Medium	Round and pointed	Black	Beg. of June	Soft, not very juicy, sweet		Valuable as being more early than even the May duke
4.	Late duke				Duh. xx. t. 15.	Forsyth, 3.			Blackish red	Mid. of June	Firm, red, and ve. sw.		Very good fruit
5.	Archduke				Duh. xviii. 13.	Forsyth, 4.				Beg. of July			Excellent fruit
6.	Ronald's large black heart		From Circassia, in	1794.	Hook. P. 31.	Forsyth, 16.	Large			Beg. of July		Great	Valuab. for forcing; well worth cultivating
7.	Fraser's black Tartarian		From Russia, by M. Fraser, nurseryman, Sloane-sq.	1796.		Forsyth, 17.	Large		Black	Beg. of July	Brisk	Excellent	A fine fruit
8.	Fraser's white Tartarian					Forsyth, 18.			White & transparent		Brisk	Excellent	
9.	Black eagle		Originated by Knight from the graffion and may-duke	1814.	Hort. Tr. ii. 9.	Hort. Tr. ii. 187.		Bet. hea. & ro.	Dark red	Mid. of July	Firm, sweet, high	Good	Tree very luxuriant and hardy
10.	Kentish	Gros gobet, Montmorency			Duh. x. 8.	Forsyth, 5.			Bright red	July	Agreeably acid	Great	A good fruit
11.	Bigarreau, several sorts				Hook P. 46.	Forsyth, p. 66.				July			
12.	Holman's duke				Lang. P. xvii. 1.	Forsyth, p. 66.				July			
13.	Elton		Originated by Knight from the graffion and white heart	1814.	Hook P. 7.	Forsyth, p. 66.	Large	Heart			Soft, swe. juicy, delic.	Good	Tree very luxuriant and hardy
14.	Hertfordshire	A sort of heart				Forsyth, 6.				End of July	Firmer than most hea.		Valuable as a succession-fruit
15.	Bleeding-heart	Gascoign's			Lang. P. xvii. 4.	Forsyth, 7.	Very lar.	Long	Dark red	End of July	Pleasant		
16.	Carnation				Lang. P. xvi. 3.	Forsyth, 11.	Large	Round	Red and white	End of July	Soft, not very sweet		A showy fruit
17.	Waterloo		Originated by Knight from the ambrée or graffion and may duke, in	1818.	Hort. Tr. ii. 81.	Hort. T. iii. 301.	Large	Conical	Deep red	End of July	Firm, sweet, high	Good	An excellent fruit
18.	Harrison's heart		Introduced from the East Indies by Govern. Harrison in George I.'s time	1709.		Forsyth, 8.				July & Aug.			A fine fruit; trees 100 years old in Kensington-gardens, bear good crops
19.	Black-heart				Lang. P. t. 18.	Forsyth, 9.							
20.	Graffion	Resembling Harrison's heart; ambrée of Duh.				Forsyth, 15.				July & Aug.	Firm, and stone flat		A fine well-known fruit
21.	Corone	Coroun, caroon, resem. the black heart			Lang. P. xvi. 1.	Forsyth, 13.				Beg. of Aug.		Good	An excellent fruit
22.	Lukeward					Forsyth, 14.				Beg. of Aug.	Pleasant	Good	A fine fruit
23.	Black gean	Black wild cherry				Abercrombie	Small	Round	Black	Mid. of Aug.	Firm, peculiar flavor	Good	Tree fit for timb.; from its seeds are raised the black coroun, and small white cherry
24.	Small black wild	Gean or cherry	Common in woods			Abercrombie	Small	Round	Black	Mid. of Aug.	Firm, bitterish	Great	Tree lofty & lar.; fruit exc. for wine & bra.
25.	Small red wild	Gean or cherry	Found in woods			Abercrombie	Small	Round	Red	Mid. of Aug.	Firm, bitterish	Great	Tree lofty and large; fruit excellent for making wine or qualifying brandy
26.	White Swiss					Abercrombie	Medium		White	Mid. of Aug.			
27.	Lundie gean		First cultivated at Lord Duncan's, near Dundee	1788.		Forsyth, 19.	Medium		Black	August	High		
28.	Transparent gean					Forsyth, 20.	Small		Red and transparent	August	Delicious		
29.	Cluster				Lang. P. xviii. 2.	Forsyth, p. 66.							
30.	Yellow Spanish					Forsyth, 12.	Medium	Oval	Amber	Aug. & Sept.	Sweet and pleasant		
31.	Florence	Resembles the Bigarreau	Introduced from Florence by J. A. Hublon, esq.	1780.	Hort. Tr. ii. 14.	Hort. Tr. ii. 229.		Heart	Pale red	September	Firm, white, sweet, and rich	Good	A highly esteemed fruit at Florence
32.	Amber heart				Duh. xiv. 11.	Forsyth, p. 66.		Heart					
33.	Flemish heart				Lang. P. xviii. 3.	Forsyth, p. 66.		Heart					
34.	Red heart				Lang. P. xviii. 4.	Forsyth, p. 67.		Heart					
35.	White heart					Forsyth, p. 67.		Heart					
36.	Morello	Milan			Lang. P. t. 16.	Forsyth, 10.	Small	Round	Light red	Sept. & Oct.	Soft and acid	Great	A very fine fruit, when kept till October; excellent for preserving and brandy

Selection of Sorts. Forsyth recommends for a small garden :

The may-duke.
The morello.
The arch-duke.
The black-heart.
The Harrison's-heart.
The graffion.
The Turkey-heart.
The Kensington duke-cherry.

Those in the Dalkeith garden are :

The early may-duke, two sorts.
The Harrison's-heart.
The black-heart.
The white-heart.
The amber-heart.
The morello ; all against walls.

Miller says, the best sorts for an orchard are the common red or Kentish, the duke, and the lukeward ; all of which are plentiful bearers.

1459. *Propagation.* Varieties of the cherry are continued by grafting or budding on stocks of the black or wild red cherries, which are strong shooters and of a longer duration than any of the garden kinds. The hearts, which are all ill-bearers, are sometimes grafted on bird-cherry stocks, which are said to have the same effect on the cherry, that the paradise stock has on the apple, that of dwarfing the tree and rendering it more prolific. Some graft on the morello for the same purpose. The stones of the cultivated cherry are commonly, but improperly, substituted for those of the wild sort, as being more easily procured. New varieties are procured by propagating from seed, and some valuable fruits will be found, in the table, so raised by T. A. Knight.

" The cherry," this gentleman observes, (*Hort. Trans.* ii. 138.) " sports more extensively in variety, when propagated from seeds, than any other fruit which I have hitherto subjected to experiment : and this species of fruit is therefore probably capable of acquiring a higher state of perfection than it has ever yet attained. New varieties are also much wanted ; for the trees of the best old kinds are every where in a state of decay in the cherry orchards ; and I am quite confident, that neither healthy nor productive trees will ever be obtained from grafts or buds of the old and expended varieties of this or any other species of fruit tree."

Cherry-stones, whether for stocks or new varieties, are sown in light sandy earth in autumn ; or are preserved in sand till spring, and then sowed. They will come up the same season, and should not be removed till the second autumn after sowing. They may then be planted out in rows three feet apart, and the plants one foot asunder in the row. The succeeding summer they will be fit to bud, if intended for dwarfs ; but if for standards, they will require to stand one or more seasons generally till four years old. They should be budded or grafted near six feet from the ground ; the usual way is to bud in summer, and graft those which do not succeed the following spring.

Soil. The cherry delights in a dry sandy soil and elevated situation ; but some sorts, as the mayduke, will thrive in all soils and aspects, and all the varieties may be planted in any common mellow garden or orchard ground. In Kent, the tree prospers in a deep loam incumbent on rock. Miller says, the soil which cherries thrive best in, is a fresh hazel loam ; if it be a dry gravel, they will not live many years, and will be perpetually blighted in the spring.

Site. To obtain fruit early, some sorts, as the mayduke, are planted against walls ; but all the varieties will do well as dwarfs or espaliers in general situations, and most of them as standards. The mayduke, Nicol observes, does well as a standard ; but against a south wall the fruit becomes considerably larger, and contrary to what happens in other fruits, it seems to acquire a higher flavor. The morella is much improved in flavor when planted against a wall of good aspect.

Abercrombie says, " Allot to the finest of the early kinds south walls for fruit in May and June ; train others against west and east walls, for supplies in succession ; and some on north walls for the latest ripeners, particularly the morello, which, so situated, will continue in perfection till September and October : but it is also proper to plant some trees of this sort on south walls, to have the fruit ripen earlier, with improved flavor."

Final Planting. " Plant full standards from twenty to thirty feet apart ; small standards, fifteen, eighteen, or twenty feet. The proper season for planting is from the middle or end of October, or any time in November or December, if open weather, till February or March." Miller says, never plant standard or rider cherry-trees over other fruits ; for there is no sort of fruit that will prosper well under the drip of cherries. He allows forty feet square for standards in orchards for the same reason.

1460. *Mode of Bearing.* " Cherry-trees in general produce the fruit upon small spurs or studs, from half an inch to two inches in length, which proceed from the sides and ends of the two-year, three-year, and older branches ; and as new spurs continue shooting from the extreme parts, it is a maxim in pruning both standards and wall-trees, not to shorten the bearing branches where there is room for their regular extension. The morello is in some degree an exception.

Pruning Cherry-trees in general. — *Standards.* Give only occasional pruning, to reform or remove any casual irregularity from cross-placed or very crowded branches ; and take away all cankery and decayed wood.

Wall-Trees. " A summer pruning, to commence in May or June, is necessary to regulate the shoots of the same year. Disbud the superfluous and foreright shoots; or if they have been suffered to spring, pinch or cut them off, with such as are disorderly. Retain a competent supply of some of the best well-placed side and terminal shoots, to remain for selection at the winter pruning. Nail or lay-in the reserve close to the wall, at their full length, and so train them all summer.

"The winter pruning may be performed at the fall of the leaf, or at any time in moderate weather till February or March. It comprises a regulation both of the old and young wood. Carefully preserve the sound productive branches and bearers in their full expansion; and reduce or remove such only as are irregular in growth, too crowded, unfruitful, decayed, or cankery. Any branches extending out of bounds, prune-in to some good lateral shoot or fruit-bud. According to the time the bearers have already lasted, look to some promising shoots, for successors to those which may first wear out. To fill immediate vacancies, retain select shoots of last year, and the year before, with uniformly a leader to the advancing branch where there is room, and with lateral shoots in any open or unproductive space nearer the origin of the branch, to be trained as bearers between the main branches. Some cut superfluous fruit-shoots clean away; others leave a sprinkling of short stubs, cut very short if foreright. The new laterals and terminals are to be trained in at full-length, as far as room will permit. They will come into bearing the first and second year. In pruning cherry-trees in general, be careful to preserve the small clustering fruit-spurs, except where in wall-trees any old spurs project considerably, and assume a rugged disorderly appearance; cut such clean out smoothly.

Pruning the Morello. "The morello cherry bears principally on the shoots of last year, the fruit proceeding immediately from the eyes of the shoots; and bears but casually, and in a small degree on close spurs formed on the two year old wood, and scarcely ever on wood of the third year. Therefore, both in the summer and winter pruning, leave a supply of last year's shoots, on all the branches, from the origin to the extremity of the tree, for next year's bearers; cutting out past bearers to make room. It is plain that the morello ought to have no stubs left with a view to spurs, and all foreright shoots ought to be disbudded while young. To leave a convenient space for young wood, train the present bearers six inches apart; lay in between each of these one young shoot for bearing next year, which will make the promiscuous distance three inches."

Underwood (*Caled. Mem.* i. 427.) has often observed, when the branches of cherry-trees are laid in too near to one another, or are crossed by branches of the same kind, or by plum-tree branches, as is sometimes the case, that although there be abundance of blossom, yet there is no crop, even in good seasons. On examining the blossom, produced on such crowded shoots, he found, that in fifty flowers, there were not above two styles, of course no fruit could be expected. By not laying in the branches so close, and by removing all superfluous summer shoots, more light and air was admitted, and he had, in consequence, plentiful crops.

Renovating Old or Decayed Trees. Proceed as in renovating the plum.

Protection from Birds. "As cherries, in a ripening state, are frequently attacked by birds, it is advisable to have choice wall-trees or espaliers defended with large nets in due time. Old fishing-nets may also be spread over the branches of dwarf-standards. To protect other standard trees, let scarecrows and clap-boards be put up *in terrorem.*"

Gathering the Fruit. Use the hand, taking hold of the fruit-stalk in gathering from the wall, and the cherry-gatherer, in gathering, from distant branches of high standards.

Insects, Diseases, &c. Wall cherry-trees are often infested with the red-spider, but standards are generally not much injured by insects. Naismith says, "our cherry-trees, both in the open air, and on the natural walls, particularly the tops of the young shoots, are much attacked with a small black insect, provincially called the black beetle. The remedy I have found most effectual for their destruction, is, a mixture of pitch, with one-sixteenth part of powdered orpiment, one-sixteenth part of sulphur, dissolved over a slow fire in an earthen pipkin, until they be well incorporated; when cold, divide it into small pieces, about the size of a hen's egg, and burn it under the trees with damp straw, directing the smoke as much as possible where the insects are most numerous. In an hour afterwards (if the state of the fruit will admit) give the trees a good washing with the garden engine, which generally clears off the half-dead beetles, and prevents the spreading of the red-spider." *Caled. Mem.* ii. 90.

Sect. III. *Berries.*

The gooseberry is the most useful fruit of this class, and is grown in far greater perfection in Britain than in any other country; next to the gooseberry is the currant, valuable as affording wine; besides these are included the mulberry, raspberry, strawberry, barberry, and elderberry.

Subsect. 1. The *Black, or Garden Mulberry.*—*Morus nigra*, L. (*Blackw.* t. 196.); *Monæc. Pent.* L.; and *Urticeæ*, J. *Mûrier*, Fr.; *Maulbeerbaum*, Ger.; and *Moro*, Ital.

1461. This is a middle-sized tree, with a whitish bark and broad subquinquelobate, bluntish and rugged leaves. It has generally male flowers or catkins, on the same tree with the fruit, which is a turbinate berry. Young trees from seed, Professor Martyn and Knight observe, often shew nothing but male flowers for several years, and yet afterwards produce also female flowers, and become fruitful. The fruit of seedling-trees, it is said, is the largest and best flavored.

The black mulberry is a native of Persia, and it is supposed was brought to Europe by the Romans, as Pliny mentions two varieties. It will not live in the open air in several parts of Sweden, and is treated as a wall-tree in the north of Germany. It is mentioned by Tusser, in 1573, and was cultivated by Gerarde, in 1596. In some of the old kitchen gardens near London, there are trees of a very great age, which are very healthy and fruitful. Bradley says, that most of these were planted in the time of James the First, who attempted unsuccessfully to set up a silk manufacture in England; but the species on the leaves of which silk-worms are fed, is the white mulberry (*morus alba*), whose fruit is not of any value. Forsyth mentions "four large mulberry-trees as still standing on the site of an old kitchen-garden, now part of the pleasure-ground at Sion House, which the late Duke of Northumberland used to say were about three hundred years old. The mulberry is remarkable for putting out its leaves late, so that when they appear, which is generally in May, with the leaves of the common ash-tree, the gardener may take it for granted that all danger from frost is over.

Use. The fruit is brought to the dessert, and recommends itself by its highly aromatic flavor, and abundant sub-acid juice. It is very wholesome, cooling, and rather laxative. Like the strawberry, it does not undergo the acetous fermentation, and therefore may be safely eaten by gouty and rheumatic persons. An agreeable wine is made from the juice; a syrup is obtained from the unripe berries, which is used as a gargle in cases of sore throat; and the bark of the tree is a vermifuge.

Varieties. Only one variety of the black is mentioned by Miller, with palmate leaves and smaller fruit.

1462. *Propagation.* By seed, layers, cuttings, or grafting. The first is the least advisable mode, unless for stocks to inarch upon, because though some affirm the fruit of seedlings to be the largest, yet the plants are very long of coming into bearing.

By Layers. "These will generally take root sufficiently the first year to bear separating from the parent tree, and should then be planted in a nursery, and trained up with single stems. In four years they will be fit to plant out where they are to remain. They should be planted at a proper distance to admit the sun and air, as the fruit, when the trees are too close is very apt to turn mouldy; they should also be sheltered from the east, north, and west winds." Knight lays parts of the bearing branches of old trees, in pots raised to these branches upon poles. Wood of any age will do, and the plants afford fruit the second and third year.

By Cuttings. In raising mulberries from cuttings, choose the former year's shoots, having one joint of the two years' old wood. Plant them in autumn, if fine weather, or in the month of March, in rows nine inches apart, and at the distance of two inches in the rows, leaving only two or three buds above ground: mulch the ground with leaves or dung well rotted, to keep it moist, and the plants will require little watering. If they succeed well, they may, next season, be transplanted into a nursery, and treated as directed for layers. These young trees, while they remain in the nursery, should be transplanted every three or four years. Miller says, mulberry cuttings will also strike well if planted on a hot-bed in spring.

Knight failed in raising cuttings on a hot-bed in spring, but was very successful by the following process. He cut vigorous shoots from the trees in November, and formed them into cuttings of about five inches long, each consisting of about two parts of two years' old wood, and one part of yearling wood. They were intended to be put in pots, and the bottom of each cutting was cut so much aslope, that its surface might be nearly parallel with that of the bottom of the pot in which it was to be placed. "The cuttings were then placed in the common ground, under a south wall, and so deeply immersed in it, that one bud only remained visible above its surface; and in this situation they remained till April. At this period the buds were much swollen, and the upper ends of the cuttings appeared similar to those of branches which had been shortened in the preceding autumn, and become incapable of transmitting any portion of the ascending fluid. The bark at the lower ends had also begun to emit those processes, which usually precede the production of roots. The cuttings were now removed to the pots, to which they had been previously fitted, and placed in a moderate hot-bed, a single bud only of each cutting remaining visible above the mould, and that being partially covered; and in this situation they vegetated with so much vigor, and emitted roots so abundantly, that I do not think one cutting in a hundred would fail with proper attention. The mould I employed was the alluvial and somewhat sandy loam of a meadow, which was sparingly supplied with water; and the plants, till they had become sufficiently rooted, were shaded during bright weather."

By Suckers. Mulberry-trees, as well as most others so propagated, are longer of coming into bearing, than those raised in any other way but by seed. The plants of this tree, raised from bearing branches, have entire heart-shaped leaves, but those obtained from suckers or seeds present deeply divided or half-winged leaves.

By Grafting. Knight having planted some young mulberry trees in pots, raised them to the bearing branches of old trees, and grafted them by approach. The young grafts bore fruit the third year, and continued annually productive. This tree succeeds very ill by the common mode of independent grafting. *Hort. Tr.* i. 60.

Soil. The tree, Miller observes, delights in a rich light earth, and where there is depth of soil, as in most of the old kitchen gardens about London. In a very stiff soil, or on shallow ground, whether of clay, chalk, or gravel; the trunk and branches are commonly covered with moss, and the little fruit produced is small, ill-tasted, and ripens late. Abercrombie says, the mulberry thrives well in a deep sandy loam, and will succeed in any fertile mellow ground, having a free situation in the full sun.

Site. The mulberry is generally grown as a standard or half standard, sometimes as espaliers, dwarfs, or wall trees. A single young plant does not afford much fruit; but one full grown and healthy, will afford more than is sufficient for the supply of a large family. Miller recommends planting in a situation defended from the strong south and north-west winds, in order to preserve the fruit from being blown off; but at the same time to keep them at such a distance from trees or buildings, as not to keep off the sun, for where the fruit has not the benefit of his rays to dissipate the morning dews early, it will turn mouldy and rot upon the trees.

Forsyth recommends planting mulberries in grass orchards and pleasure-grounds, because as the finest of the fruit, when ripe, frequently drops, it can be picked up without receiving any injury. Another reason for planting these trees on lawns or in orchards is, that, when full grown, they are too large for a kitchen-garden. Abercrombie adds, " so nice is the criterion of perfect ripeness, that berries falling without damage are superior to those gathered. Besides, a grass surface harmonizes best with trees of magnitude, and increases the beauty of a rural scene."

Williams experienced, that the fruit might be much improved in size and flavor by training the trees against a south or west wall. " The standard mulberry," he says, " receives great injury by being planted on grass plats with the view of preserving the fruit when it falls spontaneously. No tree perhaps receives more benefit from the spade and the dunghill than the mulberry; it ought, therefore, to be frequently dug about the roots, and occasionally assisted with manure. The ground under the tree should be kept free from weeds throughout the summer, particularly when the fruit is ripening, as the reflected light and heat from the bare surface of the soil is thus increased; more especially if the end branches are kept pruned, so as not to bower over too near to, and shade, the ground. The fruit is also very fine if the tree is trained as an espalier, within the reflection of a south wall or other building. If a wooden trellis were constructed with the same inclination as the roof of a forcing-house, fronting the south, and raised about six feet from the ground, leaving the soil with the same inclination as the trellis, a tree trained on it would receive the solar influence to great advantage, and would probably ripen its fruit much better than a standard." *Hort. Trans.* ii. 92.

Knight concurs with Williams as to the advantages of planting the tree against a south wall in cold situations, adding, that " it affords an exception to all, or almost all, other fruits, to which the wall gives increased bulk and beauty, at the expence of richness and flavor." *Hort. Trans.* iii. 66.

Final Planting. The nurseries, and especially those at Paris, afford large standard trees of five or six years' growth, which come into bearing the year after removal. Those are in general to be made choice of in preference to raising the tree from cuttings, or inarching. In orchards they may be planted thirty or thirty-five feet from other trees, and twenty feet apart on walls or espaliers; dwarfs may be planted fifteen feet apart, and in each case temporary fruit trees may be introduced between.

1463. *Mode of Bearing.* " The mulberry produces its fruit chiefly on little shoots of the same year, which arise on last year's wood, and on spurs from the two-year-old wood; in both stages, mostly at the end of the shoots and branches."

Pruning. Miller and Forsyth agree in saying there is no occasion to prune standards farther than to thin out irregular crossing branches, and never to shorten the young wood, on which the fruit is produced.

Pruning Wall-Trees and Espaliers. "Cut so as to bring in a partial succession of new wood every year, and a complete succession once in two years: taking the old barren wood out, as may be necessary. In the winter pruning, lay in the reserved branches and shoots at six or seven inches' distance."

Williams observes, that the trained mulberry requires some nicety in pruning, otherwise it will not bear fruit. "The following method has succeeded in my garden for several years past. All the annual shoots, except the foreright, are neatly trained to the wall, and these last must be left to grow till towards midsummer, and then be shortened about one-third of their growth to admit light to the leaves beneath. By the end of August the foreright shoots will have advanced again, so as to obstruct the light, and they must then be shortened nearer to the wall than before. In the month of March, or beginning of April, the ends of the terminal shoots should be pruned away down to the first strong bud that does not stand foreright, and the front shoots which were pruned in August, must also be shortened down to two or three eyes.

"If trained after this method the tree will afford fruit the third year; when the management of the foreright shoots must be somewhat different. These should now be shortened at the end of the month of June or beginning of July, so as to leave one leaf only beyond the fruit, the terminal shoots being nailed to the wall as before, and left without any summer pruning; the forerights will not advance any further, as their nutriment will go into the fruit, which, when quite ripe, becomes perfectly black, very large, and highly saccharine."

On this mode, Knight remarks, (*Hort. Tr.* iii. 63.) that the mode recommended may suit the extremely fertile climate and soil of Pitnuston. "But in cold situations (and it is chiefly in such that the mulberry-tree will be found to deserve a place upon a south wall,) little fruit will be produced, and that will ripen but ill, unless the bearing wood be brought closely into contact with the wall; and the great width of the leaves, and vigorous habit of the tree, present some difficulties to the cultivator, when this mode of training and pruning is adopted. It will be found necessary to diminish the luxuriant growth of the tree, and at the same time to increase its disposition to bear fruit. Such effects may, however, be readily produced by several different means; by destroying a small portion of the bark, in a line extending round the trunk or large branches, or ringing, by tight and long-continued ligatures, or by training the bearing branches almost perpendicularly downwards. I have adopted the last mentioned method, because it greatly increases the disposition in the tree to bear fruit, without injuring its general health, and because it occasions a proper degree of vigor to be every where almost equally distributed."

Season for Pruning. "As the blossom buds of the mulberry-tree cannot be readily distinguished from others, in the winter, the best period for pruning is, when the blossoms first become visible in the spring. Pinch off every barren shoot, which is not wanted, to cover the wall, and stop every bearing shoot, under similar circumstances, at the third or fourth leaf. Williams has correctly stated, that the bud immediately below the point, at which a bearing or other branch is pinched off, usually affords fruit in the following year." *Knight in Hort. Trans.* iii. 63.

The mulberry succeeds better than any other tree when trained downwards (*fig.* 349.), either horizontally and drooping (*a*), or in the stellate manner (*b*).

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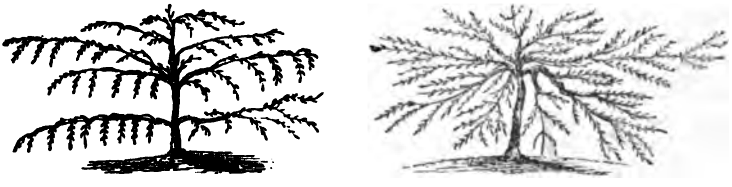

Renovating Old Mulberry-Trees. Miller, Forsyth, and T. A. Knight, agree that this may be done with trees of almost any age, by removing part of the branches; or by completely heading down, and renewing the soil by fresh mould enriched by dung.

Taking the Crop. "The most forward berries attain maturity about the end of August; and there is a succession of ripening fruit on the same tree for about a month or six weeks; the ripening berries gradually change from a reddish to a black color, and should be gathered accordingly for immediate use; this delicate fruit will not keep good off the tree above a day or two." W. Coke and T. A. Knight have had mulberries from wall and espalier trees in gathering from July to the end of October. *Hort. Trans.* iii. 394.

Forcing the Mulberry. Knight observes, that "the mulberry is a much finer fruit when ripened under glass, in the north of Herefordshire, than in the open air; and in the still colder parts of England it is probably the only means by which it can be ripened at all. The culture of this fruit, by me, under glass, has been confined to plants growing in pots; but I am not acquainted with any species of fruit-tree which, under such circumstances, produces more abundantly, or which requires less care. Its blossoms set equally well in different degrees of heat, and the same continued temperature which will ripen the earlier varieties of the grape in the end of July, will afford perfectly-ripe mulberries early in June; and a tree of the latter species, when fully loaded with fruit, presents at least as agreeable an object to the eye as many plants which are cultivated as ornaments only. It is not subject, under common care, to any disease or injury, except the attacks of the red spider; and as the foliage and growing fruit of the mulberry-tree are not at all injured by being wetted every evening with clear water, the red spider can never prove a very formidable enemy." *Hort. Trans.* ii.

Subsect. 2. The *Barberry* is the *Berberis vulgaris*, L. (*Eng. Bot.* 49.); *Hexan. Dig.* L.; and *Berberides*, J. *Epine Vinette*, Fr.; *Berberitzen*, Ger.; and *Berbero*, Ital.

1464. This is a branchy prickly shrub, rising to the height of eight or ten feet, with ash-colored bark, yellow inside. The flowers appear in pendulous racemes towards the ends of the branches; the corolla, yellow; the berries at first green, but of a fine red when ripe. The flowers appear in May with a cowslip odour; and the fruit, which is of an acid flavor, ripens in September. It is a native of the eastern countries, and also of most parts of Europe, in woods, coppices, and hedges in England, especially in a chalky soil. It is generally supposed that the *Puccinia*, a fungus which closes up the epidermis of the leaves of corn crops, and appears on their surface like rust, is generated by the *Æcidium berberides*, an insect which inhabits the barberry. *Sir J. Banks on Blight, &c.*

Use. It is used for preserving, candying, and pickling, as well as for garnishing dishes; they are also ornamental shrubs both when in flower and in fruit.

Varieties. Those most esteemed for their fruit are the following, viz.

Red barberry without stones, which has an agreeable flavor when full ripe. It is only found without stones when the plant has attained considerable age, and is on a poor soil.

White barberry. (*Poit et Turp. Fr.* t. 51.)

Black sweet; which is the tenderest of them, and should be planted in a warm situation.

Common red with stones. Duham. i. p. 152. *et tab.* This is planted more for ornament than use, on account of its beautiful red berries.

Purple-fruited. Poit. et Turp. Fr. t. 50.

Propagation. "All the varieties are propagated commonly by suckers, also by cuttings and layers of the young branches, and occasionally by grafting; the common red sort is also raised by seed; each of which methods of propagation may be performed in the spring; that by suckers and layers may be effected also in autumn."

Soil and final Planting. The barberry prefers a light dry soil. One or two plants may be planted in a complete orchard, and trained as standards; but where the shrubbery is the site, it may be allowed to grow as a bush or shrub. "According to the nature of the ground, plant either at any time from autumn to spring, or only in the spring; the plants may be already furnished with a head pretty well advanced, if thought proper; allow them square distances of from fifteen to thirty feet."

Mode of Bearing and Pruning. "The barberry produces its fruit at the sides of the branches in small loose bunches: it bears both on young and old wood, chiefly toward the extremities." "The branches should not be shortened, except the design be to force out new wood; permit the head to extend freely; and give only occasional pruning, to keep it in a pretty round form, open in the middle; cutting out weak, luxuriant, crossing, superfluous, and decayed branches; reduce also long ramblers, and trim up low stragglers, also lateral shoots on the stem, and eradicate all root-suckers."

Taking the Crop. "As a proportion of the berries ripen in the course of September, they will afford occasional gatherings for present use; and as they will be wholly ripe in October, all that are wanted for domestic supply should be then pulled; always pick them in bunches." *Abercrombie.*

Subsect. 3. The *Elder-Berry-Tree.* — *Sambucus nigra*, L. (*Eng. Bot.* 476.); *Pent. Trig.* L.; and *Caprifoliæ*, J. *Sureau*, Fr.; *Hollunderbaum*, Ger.; and *Sambuco*, Ital.

1465. This is a bushy tree of twelve or sixteen feet in height, much branched, and covered with a smooth grey bark, becoming rough on old stems. The leaves are unequally pinnate. The flowers appear in terminating cymes, and are succeeded by globular blackish-purple berries, mawkishly sweet. It flowers in May, and the berries ripen in July. The whole plant has a narcotic smell, and it is not prudent, we are told, to sleep under its shade. It is a native of Britain, and many other parts of Europe, and of Africa, Japan, &c. It is common in damp woods and hedges, and is sometimes introduced in cottage gardens and plantations for the fruit, and in forest plantations, exposed to the sea-air as a nurse plant.

Use. The fruit is in demand in many places, but especially in London and the principal English towns, for making elder wine of the expressed juice; a powerful, warming, and enlivening article for the cottager. The tree, professor Martyn observes, is a whole magazine of physic to rustic practitioners, nor is it quite neglected by more regular ones. An excellent healing ointment is made of the green inner bark, which is also purgative in moderate, and diuretic in small doses. A decoction of the flowers promotes expectoration and perspiration, and they give a peculiar flavor to vinegar. The flowers are reported to be fatal to turkeys, and the berries to poultry in general. No animal will eat the leaves of this tree; notwithstanding it has its own *phalæna* and *aphis.* The wood is used by the turner and mathematical instrument maker; and is made into skewers for butchers, tops, angling rods, and needles for weaving nets.

Varieties. Miller mentions several, but those cultivated for their fruit are chiefly the white and black. The scarlet and green berried may also be used like the black, and are very ornamental trees in the shrubbery.

Site and Soil. "As the tree will grow any where, either in open or shady situations, it may be planted in any out-ground or waste spot, in single standards or in rows, to assist in forming boundary fences. Trees planted in the hedge order, if suffered to grow up untrimmed, will produce abundance of berries for use."

Propagation and Rearing. "The elder is raised by cuttings of the young shoots in the spring, and by seed in the autumn. Select for cuttings some strong young shoots of last summer, cut into lengths of one foot, and thence to three feet or more: these may be planted either where it is intended the plants should remain, or in a nursery for a year's growth. Insert them from six to fifteen inches into the ground, according to their length; they will soon strike root; and will shoot strongly at top the same year. Train those designed for standards with a single stem from three to five feet high; and those for hedges, with branches out from the bottom. To raise this tree from seed: sow in autumn, October, or November, or later in mild weather, or soon in the spring, either for a hedge, in drills, where the plants are to remain; or in a bed or border for planting out when of one or two year's growth."

Final Planting. "Standards may be planted from ten to twenty feet apart. They should be allowed to shoot out above to form a branchy head, nearly in their natural order; in which they will soon become plentiful bearers. For hedge-planting, insert cuttings or year-old plants into the sides or tops of banks or ditches, or other suitable boundary lines, a foot asunder. Permit them to branch out from the bottom; and where they are designed for full fruiting, merely cut in the sides a little regular below, leaving them to run up above in branchy growth, for producing large crops of berries."

Taking the Crop. "The berries ripen in perfection for the purpose of making wine, about the middle and end of September, and in October, and should then be gathered in bunches." *Abercrombie.*

Subsect. 4. The *Gooseberry.* — *Ribes Grossularia,* and *R. Uva-crispa,* L. (*Eng. Bot.* 1292, and 2057.); *Pent. Monog.* L.; and *Cacti,* J. *Groseille à maquereau,* Fr.; *Stachelbeerstrauch,* Ger.; and *Uva-spino,* Ital.

1466. In Piedmont, where the gooseberry is found wild, and where the Italian botanists state the berries to be eatable, but astringent, and neglected, it is called *griselle.* Some derive our name gooseberry from gorzeberry, or the resemblance of the bush to gorze; others, as professor Martyn, from its being used as a sauce with young or green geese. Gerarde says, it is called feaberry (feverberry) in Cheshire; and it has the same name in Lancashire and Yorkshire. In Norfolk this term is abbreviated to feabes, or, as they pronounce it, fapes. Carberry is another British name for this fruit.

The gooseberry is a low, branching, prickly shrub, with trilobate sub-pubescent leaves; one-flowered, nodding peduncles, and pendulous berries, hairy or smooth. It is a native of several parts of Europe, and abounds in the *vallais* in copsewoods, where it produces a small, green, hairy, high-flavored fruit. In England it is naturalized in various places on old walls, ruins, and in the woods and hedges about Darlington. It is cultivated in greater perfection in Lancashire than in any other part of Britain; and next to Lancashire, the climate and treatment of the Lothians seem to suit this fruit. In Spain and Italy the fruit is scarcely known. In France it is neglected and little esteemed. In some parts of Germany and Holland the moderate temperature and humidity of climate seems to suit the fruit; but in no country is its size and beauty to be compared with that produced in Lancashire, or from the Lancashire varieties cultivated with care in the more temperate and humid districts of Britain. Neill observes, that when foreigners witness our Lancashire gooseberries, they are ready to consider them as forming quite a different kind of fruit.

Happily this wholesome and useful fruit is to be found in almost every cottage-garden in Britain; and it ought to be considered a part of every gardener's duty to encourage the introduction of its most useful varieties in these humble inclosures. In Lancashire, and some parts of the adjoining counties, almost every cottager who has a garden, cultivates the gooseberry, with a view to prizes given at what are called Gooseberry-prize Meetings, of which there is annually published an account, with the names and weight of the successful sorts, in what is called the *Manchester Gooseberry Book.* The prizes vary from £1 to £5 or £10. The second, third, to the sixth and tenth degree of merit, receiving often proportionate prizes. There are meetings held in spring to "make up," as the term is, the sorts, the persons, and the conditions of exhibition; and in August to weigh and taste the fruit, and determine the prizes. In the gooseberry book for 1819, is an account of 136 meetings; the largest berry produced among the whole was, the *top-sawyer* seedling, a red fruit, weighing 26 dwts. 17 grs. Forty-six red, thirty-three yellow, forty-seven green and forty-one white sorts were exhibited, and fourteen new-named seedlings, which had been distinguished at former meetings, stated as "going out," or about to be sold to propagators.

Use. The fruit was formerly in little esteem; but it has received so much improvement, that it is now considered very valuable for tarts, pies, sauces, and creams, before being ripe, and when at maturity it forms a rich dessert-fruit for three months; and is preserved in sugar for the same purpose, and in water for the kitchen. Unripe gooseberries can be preserved in bottles of water against winter: the bottles are filled with berries close corked, and well sealed; they are then placed in a cool cellar till wanted. By plunging the bottles, after being corked, into boiling water for a few minutes, (heating them gradually to prevent cracking,) the berries are said to keep better." *Neill.*

Varieties. The gooseberry is mentioned by Turner in 1573. Parkinson enumerates eight varieties: the small, great, and long common, three reds, one blue, and one green. Ray mentions only the pearl-gooseberry; but Rea has the blue, several sorts of yellow, the white Holland, and the green. Miller only says, there are several varieties obtained from seed, most of them named from the persons who raised them; but as there are frequently new ones obtained, it is needless to enumerate them. The present lists of London nurserymen contain from 80 to 100 names; but those of some of the Lancashire growers above 300. Forsyth, in 1800, mentions ten sorts as common; and adds a list of forty-three new sorts grown at Manchester. The following may be considered established varieties, and such as merit cultivation:

Red.
Old Ironmonger
Early black
Damson, or dark red
Large rough red
Red walnut
Warrington
Smooth red
Hairy red
Red champagne
Nutmeg
Captain
Wilmot's early red.

Green.
Green Gascoigne
Green walnut
White Smith
Green globe
Green-gage.

Yellow.
Great amber
Globe amber
Great mogul
Hairy globe
Golden drop
Honeycomb
Sulphur
Conqueror
Yellow champaigne
Golden-knap
Royal sovereign
Tawny.

White.
Large crystal
White-veined
Royal George
White Dutch
White walnut.

Selection of Sorts. "It must be admitted," Neill observes, "that although the large gooseberries make a fine appearance on the table, they are often deficient in flavor when compared with some of smaller size. Many of them have very thick, strong skins, and are not eatable unless thoroughly ripened. Some of the large sort, however, are of very good quality, such as the red champaigne and the green walnut. Among these also Wilmot's early red deserves further notice. It was raised by Wilmot at Isleworth, in 1804, and has been cultivated by him very extensively on account of its valuable properties; being early ripe, of excellent flavor, and extremely productive. It usually ripens from the middle to the end of June. For culinary use in the month of May it is larger and better than most others, the skin not being tough, but the whole berry melting to a fine consistence." Forsyth very judiciously recommends cultivating the early and late sorts, in order to prolong the season of this fruit. In Lancashire, the Warrington or Manchester red, which is an improved variety of the old Ironmonger, is esteemed the best dessert fruit; and the shoots growing upright, the shrub occupies less horizontal space than most varieties. The walnut red they consider the best sort for preserving.

The best mode to obtain a complete collection is to send to a Lancashire nurseryman, stating whether the object desired be an assortment of large showy sorts, — a numerous variety, or a selection of the most useful sorts. J. Whalley, of Liverpool, seems to us a very fit tradesman to be applied to.

1467. *Propagation.* The gooseberry may be propagated by all the modes applicable to trees or shrubs; even by pieces of the roots; but the mode by cuttings is usually adopted for continuing varieties, and that by seeds for procuring them.

By Seeds. As far as we know, the scientific mode of impregnating one variety with another has not been applied to this fruit. In general, the seed of some choice variety thoroughly ripe is taken and sown in autumn or early in spring, in beds or pots of rich light mellow earth: when the plants are a year old they are planted out in nursery-rows, to be cultivated and trained there a year or two; in general, they will bear the third year. By preparing for the best of these seedlings a very rich soil, and by watering, shading, and thinning the fruit, the largest sorts have been obtained. Not content with watering at root and over the top, the Lancashire connoisseur, when he is growing for exhibition, places a small saucer of water immediately under each gooseberry, only three or four of which he leaves on a tree. This is technically called *suckling*. He also pinches off a great part of the young wood, so as to throw all the strength he can into the fruit.

By Cuttings. Miller says, the best season for planting gooseberry-cuttings is in autumn, just before their leaves begin to fall. The cuttings should be taken from bearing shoots, rather than those *gourmands* which issue from the main stem. Cut them to such a length as the strength and ripeness of the wood will bear, and cut off all the buds excepting three, or at most four, at top, and train the plants with a single stem of nine inches, or a foot high, from the top of which the branches should radiate upwards at an angle of 40°, or better if 45° degrees.

Haynes advises taking off cuttings in July, when the fruit is on the tree, in order to make sure of the sorts. He says, by immediate planting, watering, and shading, as good plants are produced as from ripe wood-cuttings. *Tr. on the Gooseberry*, &c. p. 92.

Soil and Site. Any good garden soil, on a dry bottom and well-manured, will suit the gooseberry. That which is soft and moist produces the largest fruit. The situation should not be under the drip of trees over-much shaded or confined, otherwise the fruit will be small, ill-flavored, and the plants apt to mildew. Forsyth says, gooseberries should be dunged every year, or at least have a good coat of dung once in two years. Haynes recommends a mixture of peat and loam well-manured, and a shaded situation. The last he proposes to effect by planting among his quarters of gooseberries, rows of Jerusalem artichokes in the direction of east and west.

Final Planting. "The season for planting gooseberries is any time during open weather from October till March. When trees are procured from the public nurseries choose such as are of some advanced size, about three years' growth, with pretty full, heads, for immediate plentiful bearers. Let the general supply be in standard bushes, and planted principally in the kitchen-garden, in single rows, along the boundary-edges of the main quarters, or outward borders, from six to eight feet apart; or some may be planted in cross rows, to subdivide extensive quarters. When the object is to raise large quantities of fruit, plantations are made in continued parallel rows, eight or ten feet asunder, by six feet in the row. It would be eligible to plant a few choice sorts against south and other sunny walls or paling, for earlier and larger fruit; and on north walls, to ripen late in succession." *Abercrombie.*

Forsyth says, "The market-gardeners about London plant them in rows, from eight and ten feet apart from row to row, and six feet from plant to plant in the rows. In small gardens I would recommend planting them in a quarter by themselves, at the distance of six feet between the rows, and four feet from plant to plant; or you may plant them round the edges of the quarters, about three feet from the path; you will then have the ground clear for cropping, and a man, by setting one foot on the border, can gather the gooseberries without injuring the crop."

Neill says, "In some places gooseberry-trees, on the sides of the borders, are trained to a single tall stem, which is tied to a stake: this, though six or eight feet high, occasions scarcely any shade on the border, and it does not occupy much room, nor exclude air; while, at the same time, the stem becomes close hung with berries, and makes a pleasant appearance in that state." *Ed. Enc.* art. *Hort.* § 161.

Maher observes (*Hort. Trans.* ii. 146.), that as "the crop of ripe fruit is often injured, by having the largest and earliest berries prematurely gathered, whilst green, for tarts, a sufficient number of trees of such varieties as are the earliest, should be planted in a separate quarter of the garden, and devoted exclusively to the use of the kitchen, for tarts and sauce."

1468. *Mode of Bearing.* "The gooseberry produces its fruit not only on the shoots of last summer, and on shoots two or three years old, but also on spurs or snags arising from the elder branches along the sides: but the former afford the largest fruit. The shoots retained for bearers should therefore be left at full length, or nearly so." *Abercrombie.*

Pruning. "The bushes will require a regulating-pruning twice in the year.

Summer Pruning. "Where any bushes are crowded with cross and water-shoots, of the same year, shading the fruit from the sun, and preventing the access of air, thin the heart of the plant and other tufted parts moderately, pinching off or cutting out close what spray is removed; but do not touch the summer shoots in general. Maher says, it will greatly contribute to the perfection of the fruit, if the very small berries are taken away with a pair of scissars about the middle or end of May; and these small berries will be found quite as good for sauce, or gooseberry cream, as the larger."

Winter Pruning. "You may proceed to the winter pruning any time from November until the end of February, or until the buds are so swelled that farther delay would endanger their being rubbed off in the operation. Cut out the cross-shoots and water-shoots of the preceding summer, and the superfluous among crowded branches. Prune long ramblers and low stragglers to some well-placed lateral or eye; or if an under-straggler spring very low, cut it away. Of last year's shoots retain a sufficiency of the best well-placed laterals and terminals, in vacant parts, to form successional bearers, and to supply the places of unfruitful and decayed old wood, which, as you proceed, should be removed. Mostly retain a leading shoot at the end of a principal branch, leaving it either naturally terminal, or, where the branch would thus be too extended, pruning to some competent lateral within bounds. The superfluous young laterals on the good main branches, instead of being taken off clean, may be cut into little stubs of one or two eyes; which will send out fruit-buds and spurs. Of the supply reserved for new bearers, a small number will probably require shortening, where too extended, or curvated incommodiously; leave these from eight to twelve inches in length, according to strength and situation; those of moderate extent and regular growth will require very little shortening, and many none at all.

"Observe, too close cutting, or general shortening, occasions a great superfluity of wood in summer: for the multiplied laterals thus forced from the eyes of the shortened branches increase to a thicket, so as to retard the growth and prevent the full ripening of the fruit; on which account it is an important part of pruning to keep the middle of the head open and clear, and to let the occasional shortening of the shoots be sparing and moderate. Between the bearing branches keep a regulated distance of at least six inches at the extremities, which will render them fertile bearers of good fruit. Some persons, not pruning the gooseberry-tree on right principles, are apt to leave the shoots excessively close and tufted, while they shorten the whole promiscuously: others sometimes clip them with garden-shears to close round heads; in consequence of being pruned in these methods, the bushes shoot crowdedly, full of young wood in summer, from which the fruit is always very small, and does not ripen freely with full flavor."

Forsyth says, "Many of the Lancashire sorts are apt to grow horizontally, and the branches frequently trail on the ground, which renders them liable to be broken by high winds, especially when they are loaded with fruit. In that case I would recommend two or three hoops to be put round them, to which the branches may be tied, to support them, and prevent their being broken by the wind."

S. Jeeves has tried training gooseberries on an arched trellis, in the manner of a *berceau*, or arbor-walk. For this purpose, he plants in rows, five feet and a half apart, and the plants three feet distance in the row. He chooses the strongest growing kinds, and trains four branches, at nine inches' distance from each plant, till they meet at top. The advantages of this plan are, beauty of appearance, fruit not splashed by rain, easily gathered, and the ground more readily cultivated. *Hort. Trans.* vol. iv. p. 194.

1469. *Insects, Diseases, &c.* The caterpillars of saw-flies, *Tenthredinidæ*, Leach, (*fig.* 350.); of butterflies, *Papiliæ*, L. (*fig.* 321.); and of moths, *Phalænæ*, L. (*fig.* 322.), are well-known and serious enemies to gooseberries. The larvæ of the *Tenthredinidæ*, have from sixteen to twenty-eight feet; a round head; when touched, they roll themselves together. They feed on the leaves of the gooseberry, apple, and most fruit-trees, as well as roses, and other shrubs and plants. When full grown, they make sometimes in the earth, and sometimes between the leaves of the plant on which they feed, a network case, which, when complete, is strong and gummy, and in that change to a *pupa* incomplete, which for the most part remains during the winter in the earth. The perfect fly emerges early in the ensuing spring; its serrated sting is used by the female in the manner of a saw, to make incisions in the twigs or stems of plants, where it deposits its eggs. The Caledonian Horticultural Society having "requested information respecting the best method of preventing or destroying the caterpillar on gooseberries," received various communications on the subject, and the following are extracts from such as they deemed fit for publication.

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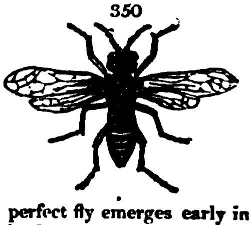

J. Gibb describes the large black, the green, and the white caterpillar, with his methods of destroying them.

"During the winter months, the *large black* kind may be observed lying in clusters on the under parts, and in the crevices of the bushes; and even at this season, (Feb.) I find them in that state. In the course of eight or ten days, however, if the weather be favorable, they will creep up in the day-time, feed on the buds, and return to their nest during the night. Whenever leaves appear upon the bushes they feed upon them till they arrive at maturity, which is generally in the month of June; after which they creep down upon the under sides of the branches, where they lodge till the crust or shell is formed over them. In July they become moths, and lay their eggs on the under sides of the leaves, and of the bark. The produce of these eggs, coming into life during the month of September, feed on the leaves so long as they are green, and afterwards gather together in clusters on the under side of the branches, and in crevices of the bark, where they remain all the winter, as already said. Winter is the most proper time for attacking this sort with success, as their destruction is most effectually accomplished by the simple operation of pouring a quantity of boiling-hot water upon them from a watering-pan, while no injury is thereby done to the bushes.

"The *green* sort, are at present (Feb.) in the shelly state, lying about an inch under ground. In April they come out small flies, and immediately lay their eggs on the veins and under-sides of the leaves. These eggs produce young caterpillars in May, which feed on the leaves till June or July, when they cast a blackish kind of skin, and afterwards crawl down from the bushes into the earth, where a crust or shell grows over them, and in that state they continue till the following April. The only method which I have hitherto found effectual for destroying these is, 1st, to dig the ground around the bushes very deep during the winter season, by which means the greater part of them are destroyed, or buried too deep ever to penetrate to the surface: 2dly, in April, when the flies make their appearance, to pick off all the leaves on which any eggs are observable; this is a tedious operation, but may be done by children. If any of the enemy should escape both these operations, they will be discernible as soon as they come to life, by their eating holes through the leaves, and may then easily be destroyed, without the least injury to the bushes or fruit.

"The *white* kind, otherwise called *borers*, are not so numerous as the other kinds, though very destructive; they bore the berry, and cause it to drop off; they preserve themselves during the winter season, in the chrysalis state, about an inch under ground, and become flies nearly at the same time with the last-mentioned kind; they lay their eggs on the blossoms, and these eggs produce young caterpillars in May, which feed on the berries till they are full grown, and then creep down into the earth, where they remain for the winter in the shelly state." *Caled. Mem.* vol. i.

Macmurray, in autumn, pours a little *cow-urine* around the stem of each bush, as much as suffices merely to moisten the ground. The bushes which were treated in this manner remained free of caterpillars for two years; while those that were neglected, or intentionally passed over, in the same compartment, were totally destroyed by the depredations of the insects. A layer of sea-weed laid on in autumn, and dug in in spring, had the same effect for one year. *Caled. Mem.* vol. i. 95.

R. Elliot says, "Take six pounds of black-currant leaves, and as many of elder-leaves, and boil them in twelve gallons of soft water; then take fourteen pounds of hot lime, and put it in twelve gallons of water; mix them altogether; then wash the infested bushes with the hand-engine; after that is done, take a little hot lime and lay at the root of each bush or tree that has been washed, which completes the operation.

"By these means you will completely destroy the caterpillars, without hurting the foliage of the bush or tree in the least. A dull day is to be preferred to any other for washing. When the foliage is all off the bushes and trees, wash them over with the hand-engine, to clean them of decayed leaves; for this purpose, any sort of water will do; then stir up the surface of the earth all round the roots of the bushes and trees, and lay a little hot-lime about them to destroy the eggs. This I have never found to fail of success since my first trial, six years ago. The above-mentioned proportion of leaves, lime, and water, will serve for two acres of ground or more, covered with trees and bushes in the ordinary manner, and will cost very little money indeed. The same proportion is to be observed in making a wash for the rest of the trees or bushes."

J. Machray procured some tobacco and soft or black soap, and boiled a quarter of a pound of tobacco with the one pound of soft soap in about eighteen Scots pints of water, and kept stirring the liquid while boiling with a whisk, in order to dissolve the soap; this liquor, when milkwarm, or so cool as not to hurt the foliage, he applied to the bushes with a hand-squirt in the evening, and in the morning found all the ground under the bushes covered over with dead caterpillars. This practice he continued for six years, always when he saw any symptoms of the approach of caterpillars.

J. Tweedie, in the course of any of the winter months, pares all the earth from under the bushes to the depth of about three inches, into a flat ridge betwixt the rows; and on the first dry day following, either treads, beats, or rolls these ridges, and trenches the whole down one and a half or two spade deep, observing to tread the foul earth into the bottom of the trench.

Forsyth's method is as follows: "Take some sifted quick-lime and lay it under the bushes; but do not at first let any of it touch the branches or leaves; then shake each bush suddenly and smartly, and the caterpillars will fall into the lime; if the bush be not shaken suddenly, the caterpillars, on being a little disturbed, will take so firm a hold as not easily to be shaken off. After this is done, sift some of the lime over the bushes; this will drive down those which may have lodged on the branches. The caterpillars ought to be swept up next day, and the bushes well washed with clear lime-water mixed with urine; this will destroy any caterpillars that may still remain, and also the aphides, if there are any on the bushes."

Our opinion is, that no reliance is to be placed in hot-lime, or any wash whatever for destroying either the insects or their eggs. Hot water, applied in Gibb's manner, appears more likely to do so, and digging down, as performed by Tweedie, may be of real service; but the only effectual plan seems to be that of previously hand-picking; which, however tedious it may seem, will in the end be found a more economical mode than any of the above; not even excepting Elliot's, which, though the materials "cost very little money indeed," yet their application will be found very laborious.

Taking the Crop. "From gooseberries being useful for different purposes, both in a green and in a mature state, and from the compass of time afforded by early and late sorts, they are in season and great request four or five months in summer, from April till September. The early sorts, on south walls, come in for gathering in small green berries, for tarts, &c. in April or early in May, and attain maturity in June. From common standard-bushes an abundant supply is yielded in May and June of gooseberries in a green state; and in proportion as part is reserved to ripen, a succession, in full size and maturity, is obtained in June, July, and August. Some late kinds, either planted in shady situations, or shielded with mats from the sun in their ripening state, continue good on the tree till September."

Prolonging the Crop. In addition to planting late sorts in shady situations, the bushes, whether standards or trained, may be matted over when the fruit is ripe, and in this way some of the reds, as the Warrington, and the thick-skinned yellow sorts, as the Mogul, will keep on the trees till Christmas.

Forcing. The gooseberry may be forced in pots or boxes placed in pits, or in the peach-house or vinery. Hay plants in pots in November, removes to the peach-house in January, and has ripe fruit in the end of April, which he sends to table growing on the plants. *Hort. Trans.* iv. 415.

Subsect. 5. The *Black Currant.* — *Ribes Nigrum*, L. (*Eng. Bot.* 1291); *Pentand. Monog.* L.; and *Cacti*, J. *Groseille à fruit noir*, or *Poivrier*, Fr.

1470. This is an humble shrub, with smooth shoots, strong-smelling trilobate leaves and hairy racemes, with a solitary one-flowered peduncle at the base of the raceme. The flowers appear in April, of a greenish white, and the fruit ripens in June and July, and changes from a green to a black color. It is a native of most parts of Europe, especially the more northern parts. It abounds in the woods in the north of Russia; and in the subalpine regions of Siberia, where the branches and berries are very large and sapid. In Britain, it is found in wet hedges, on the banks of rivers, in alder swamps, and sometimes in woods.

Use. The fruit, which has a peculiar flavor, and disliked by some, is seldom brought to the dessert; but it is eaten in puddings and tarts, and made into jellies, and wines. The Russians put the berries into brandy, and the Irish into whiskey, in the same way as the English put cherries; the Russians also ferment the juice with honey, and so form a strong and palatable wine. Many cottagers, who cannot afford to mix green tea with common bohea, substitute one or two dried leaves of black currant, the flavor produced by which, few are so acute as to distinguish from that of a mixture of green and black tea. There are no *varieties* of the black currant.

Propagation. By cuttings. See *Gooseberry.*

Soil and Site. A moist, soft soil, and shady situation, such as is afforded by borders of north exposure is preferable. Miller says, "The fruit is always best when the plants are placed in an open situation, and light loamy soil."

Final Planting. As only a few plants are in general required for private gardens, these may be placed at the distances recommended for gooseberries, in the margin of a shady border, or against a wall of a north exposure. Neill says, it produces most fruit as a standard, but the largest berries when trained to a wall.

Mode of Bearing. The black currant bears chiefly on the shoots of the preceding year, and also from snags or spurs, which, however, are less abundant, and of smaller size in the black currant than in the gooseberry or red currant.

Pruning. Attend to the general directions given for pruning gooseberries, observing to depend less on spurs than on the preceding year's wood, cutting out the old as it becomes naked and barren, to make room for the new.

Insects and Diseases. The black currant is seldom attacked by insects; though, like the elder-tree, it has its own variegated caterpillars, which sometimes reduce it to a state of complete nudity.

Gathering the Fruit. See *Red Currant.*

Forcing. The black currant may be forced in pots like the gooseberry. In Russia this is often done for the sake of the fragrance of the leaves.

Subsect. 6. The *Red Currant.* — *Ribes Rubrum*, L. (*Eng. Bot.* 1289.); *Pent. Mon.* L.; and *Cacti*, J. *Groseille ordinaire à grappes* or *d'outre mer*, Fr.; *Johannisbeere*, Ger.; and *Uvetta*, Ital.

1471. This is a low shrub, with smooth branches, doubly serrate, pubescent leaves, yellowish-green flowers on pendulous racemes, which appear in May, and the fruit ripens in June and July. The berries of this shrub, in its wild state, are red; cultivation has produced white and pale-red berried varieties. It is a native of the northern parts of Europe, and found in hedges and woods in England. Professor Martyn observes, that " The currant does not seem to have been known to the ancient Greeks and Romans, as the southern nations of Europe have not even an appropriate name to it at this day. The old French name *groseilles d'outre mer;* and the Dutch, *beskins overzee,* proclaim their having been strangers imported. Our English name of currant is evidently from the similitude of the fruit, to that of the *uva Corinthiaca,* the small grape of Zante, or the common grocers' corinths, or currants. The red currant has been long cultivated in Britain, and very much improved in the size of the bunch and berry.

Use. The fruit is acceptable at the dessert, being of an agreeable acid taste. It is much used for jellies, jams, and wines. Forsyth says, it is the most useful of all the small fruit, either for the table and kitchen, or for preserving, making wine, &c.; and continues longer in succession than any other. According to Withering, the juice forms an agreeable acid to punch; and Professor Martyn, says it was a common beverage in Paris in 1763. Its medicinal qualities are similar to those of other sub-acid fruits, allaying thirst, lessening an increased secretion of the bile, and correcting a putrid and scorbutic state of the fluids.

Varieties. These are:

Common red or wild currant.
Large red.
Long-clustered red.
Champagne large red.
Champagne pale red.
White Dutch.
Large new white Dutch, (*Hook. P. L.* t. 36.)
White crystal.
Large pale-red Dutch.
Gooseberry-leaved.

1472. *Propagation and Nursery Culture.* The same as in the gooseberry. With a view to obtaining improved varieties from *seed,* that indefatigable horticulturist, Knight, procured cuttings, in the year 1810, of the finest varieties of the red and the white currant; which he planted in pots of very rich mould, and placed under a south wall, to which the trees were subsequently trained. At the end of three years, within which period the pots had been as often changed, the trees were first suffered to produce blossoms. These were, with the exception of a very small number, removed from the white currant trees, as soon as their buds unfolded; and those which remained were deprived of their stamens, whilst immature, and subsequently fertilized by the pollen of the red variety. The seeds thus obtained, were sowed in pots, as soon as the fruit had become perfectly mature, and were subjected, early in the following spring, to the artificial heat of a forcing-house; by which means, and by proper subsequent attention, the plants grew more than a foot in height in the first season. At two years old, in the year 1816, several of the plants, and, in 1817, the greater part of them produced fruit of great variety of character and merits; but out of about two hundred varieties, only three red and two white appeared to possess greater merits than their parents. *Hort. Trans.* iii. 88.

Soil and Site. All the sorts are very hardy, will grow freely, and bear plentifully almost any where, alike in open and shady situations, by which the fruit may be obtained early, in June and July, and prolonged for several months in succession till October. As to soil, the currant generally does well in any common garden-ground, well tilled and recruited; it bears the greater crop in a strong loam, or improved clay, somewhat moist; the earlier in a sandy light mould, which is not poor. Previous to planting, the ground should be dug two feet deep.

Final Planting. " The season for planting on a dry soil is any time in open weather, from the fall of the leaf till February or March. Plants expected to bear the following summer are best moved in October, unless the ground be wet in winter. Allot a competent supply of standard-bushes, to be planted chiefly in the kitchen-garden, in a single row round the main quarters, or in the outward borders, or some in cross-rows, to divide extensive quarters. Plant them from five to ten feet distance in the row. To raise large supplies, full plantations are formed in parallel rows, with intervals between the rows of eight or ten feet, and between the trees in each row of six feet.

" Where convenient, have also some choice sorts trained against walls or palings, of different aspects, to obtain early and late fruit in perfection; some against a south exposure, for early production; others on east, west, and north walls, for intermediate succession and late fruit. Plant them at six, eight, or ten feet distance; letting them occasionally fill up the vacant spaces between other wall-trees. The branches should be allowed to advance from near the bottom, and be trained in a nearly horizontal direction from three to six inches asunder. Before nailing them, cut out superabundant and irregular growths, retaining a competency of regular shoots for orderly training, among which, if any are of very considerable length, prune them to moderate extent.

" Some may likewise be trained as espaliers, in a detached row in the borders or divisions of the quarters. The trees so trained may either be left to grow without support, or be tied occasionally to stakes, and the branches thus will not overspread the ground. Being kept moderately thin and regular, they will bear fine large fruit, and make an agreeable appearance.

1473. *Mode of Bearing.* "Currant-trees, in general, bear the fruit both on the young wood of one, two, and three years' growth; and on the older branches, from small spurs and snags along the sides, which continue several years fruitful; but the fruit produced on the last year's shoot is always finest, especially when the old mother-bearers have borne more than four years.

Pruning. "The chief part of the future culture is seasonable pruning. After the plants are furnished with full heads, they produce many superfluous and disorderly shoots every summer, crowding the general bearers, so as to require retrenchment and regulation, both in the young growths of the year and older wood. The season for the capital pruning is winter; but a preparatory part is performed in summer, to thin the superfluous shoots of the year where too crowded, excluding the sun and air from the fruit. First, as to standards:

Summer Pruning. "In May or June cut out close the most irregular shoots rising in the centre of the tree, with all the cross and water-shoots, to admit more freely the essential influence of the air and sun, and promote the growth of the fruit and improve its flavor. Also twist off all root-suckers as they appear.

Winter Pruning. "This extends both to the old and young wood; the time for it is when the plant is at rest. Of the shoots of the preceding summer, cut out the cross-placed and the otherwise irregular, with those which are not wanted for vacancies; but superfluous good lateral shoots are to be cut down to short stubs or artificial spurs, about half an inch long, so as to leave an eye or two, in order that they may send out fruit-shoots and spurs. With regard to the old bearers, take away those which are naked, or getting unfruitful, or of which the fruit is declining in size; reduce any of excessive length, pruning-in to some well-placed lateral young shoot, to preserve the head within some regular compass; cut out also any decayed or cankery parts; retain a competency of the finest best-placed new shoots above and below vacant parts, to come in for successional-bearers, or to supply the places of defective old wood; and preserve a leading shoot to the principal branches, where within orderly limits; shortening such terminal shoots as are of greatest length, to ten, twelve, or fifteen inches, according to their strength and situation on the branches; and leaving those of small extent mostly entire. Take care of the small natural fruit-spurs, and occasionally select short lateral shoots of one, two, or three inches, for bearing fruit; or similar small shoots may be cut to short snags of an inch or two long, also for fruiting. Thin out spurs on the old branches where very thick. As the old fruit-branches decline bearing, or decay, cut them away, taking care to provide young ones in succession; and thus keep the trees always furnished with full-bearing branches, and advancing young bearers, in a regular open expansion, six, eight, or ten inches asunder at the extremities; circumscribing the general head within the height of three or four feet, or five at most."

"Currants of the finest quality," Neill observes, "are raised by Macdonald, at Dalkeith-House. A good deal depends on the way in which he manages the bushes, especially during the ripening of the fruit. He prunes the bushes at the usual season of mid-winter, shortening the last year's shoots down to an inch or an inch and a half. Next summer the plants shew plenty of fruit, and at the same time throw out strong shoots. As soon as the berries begin to color, he cuts off the summer-shoots to within five or six inches before the fruit. This is commonly done with the garden shears, with which a man may go over half an acre of bushes in a day. Sun and air thus get free access, and more of the vigor of the plant is directed to the fruit: the berries are found not only to be of higher flavor, but larger than usual." It appears, (*Caled. Hort. Mem.* ii.) that Macdonald had used the knife for his summer-pruning till within two years. We confess we regret to hear of the introduction of the shears into the kitchen-garden, and especially into that of so opulent a proprietor, who ought to set an example of order, progress, and perfection, and not of reviving random work, for the sake of economy. It would certainly be better to employ women and children.

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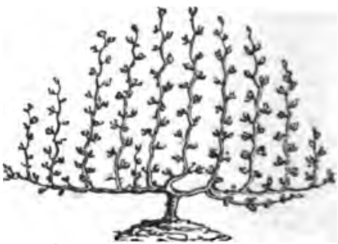

To Wall-Trees, Espaliers, and Fan-Standards without support, the same course of summer and winter pruning is applicable, with the obvious variations required by their figure. In training wall-trees, two branches are led in a horizontal direction along the bottom of the wall or trellis, perhaps half a foot from the surface of the earth, and the growth from these of all upright-shoots, which will admit of being arranged at the distance of five or six inches from each other, is encouraged. Fan-standards are sometimes trained in a manner nearly similar (*fig.* 351.) and sometimes with the branches radiating from the crown of the stem (*fig.* 274. *b*).

Insects, &c. The red currant is occasionally attacked by the caterpillar, and very frequently by the *Aphis ribes*, L., which changes the color of the leaves to red, pits and puckers them, and causes the fruit to be shrivelled and flavorless.

Forsyth says, " As currants are very liable to be devoured by ear-wigs, which take shelter under their leaves and branches, bundles of bean-stalks should be hung up some time before the bushes are covered with mats or nets. If proper attention be not paid to this, the fruit will generally suffer very much from these insects. After the bushes are covered, take the mats off once in three or four days, and kill the ear-wigs that have got into the bean-stalks, which it will be necessary still to keep hung up. As there is a sweetness in the inside of bean-stalks which attracts the ear-wigs, they very readily take shelter in them from rain."

Taking the Crop and Preserving. " The ripening fruit comes in for small gathering in June, advances to maturity in July, and continues in perfection till the end of August: or if trees in a full exposure are timely defended from birds and the full sun, with garden mats, or protected with nets where they grow against north walls, the fruit may be continued good till September or October." Gather in a dry state, as in rainy weather they lose their flavor. *Abercrombie.*

Forcing. To obtain early currants by forcing, let some good-bearing trees, in pots, be placed, as early as January or February, in any common forcing department: they will produce ripe fruit in April and May.

Subsect. 7. The *Raspberry*. — *Rubus Idæus*, L. (*Eng. Bot.* 2442.); *Icos. Polyg.* L.; and *Rosaceæ*, J. *Framboisier*, Fr.; *Himbeerestrauch*, Ger.; and *Rovo ideo*, Ital.

1474. The stems of this plant are suffruticose, upright, rise about two feet high, and are biennial in duration; but the root is perennial, the leaves are quinate-pinnate. The flowers come in panicles from the extremity of the present year's shoots; they are white, appear in May and June, and the fruit, which in the wild plant is red, ripens about a fortnight afterwards. It is a native of Britain, and not uncommon in woods in low moist situations.

Use. The fruit is grateful to most palates, as nature presents it, but sugar improves the flavor; accordingly, it is much esteemed when made into sweetmeats, and for jams, tarts, and sauces. It is fragrant, sub-acid, and cooling; allays heat and thirst, and promotes the natural excretions in common with other summer fruits. It is much used in distilling, to make the cordial spirituous liquor, to which it gives name. Raspberry-syrup is next to the strawberry in dissolving the tartar of the teeth; as like that fruit it does not undergo the acetous fermentation in the stomach, it is recommended to gouty and rheumatic patients.

The *Varieties* are:

Early small white.
Large white.
Large red.
Most large red Antwerp.
Large yellow Antwerp.
Cane or smooth-stalked.
Twice-bearing white.
Twice-bearing red.
Smooth cane, twice-bearing.
Woodward's raspberry. *Hook.* P. L. t. 37.

Estimate of Sorts. " With respect to the varieties of fruit: the first in the above list is a small fruit, but esteemed for its early bearing. The second and third, the common large white and red sorts, are cultivated in fuller crops, as plentiful bearers of larger berries. The two Antwerp sorts are still superior in yielding fine large fruit, and deserve a wall or espalier. The cane-raspberry is a good sort for the main crop. The twice-bearers are esteemed for their singular property of producing two crops of fruit the same year, of which the first commonly ripens in July, and the second in September or October; and in fine dry seasons the plants will afford some production from the second crop till November.

Propagation. " The varieties can be perpetuated by young sucker-shoots rising plenteously from the root in spring and summer: when these have completed one season's growth, they are proper to detach with roots for planting, either in the autumn of the same year or the next spring, in February or March, but not later than the middle of April. These new plants will bear some fruit the first year, and furnish a succession of strong bottom-shoots for full-bearing the second season. New varieties are easily raised from seed; and they come into bearing the second year.

Soil and Site. " All the varieties will succeed in any common mould trenched about two feet deep, and sufficiently manured; but the soil in which the raspberry-bush most prospers and bears the finest fruit, is a light rich loam. Allot the main crop a free exposure to the sun, that the berries may ripen in perfection. Be careful to favor the twice-bearers with a dry soil, and a sheltered sunny situation, to give the second crop every aid in coming to maturity. When raspberries are cultivated on a large scale, it is best to keep them in plantations by themselves. Set these in rows from four to six feet asunder, as the bushes are of the smaller or larger kinds, by three or four feet in each row. Scattered bushes may either occupy a single row lengthwise along the back part of a border, or stand in detached stools, at ten or fifteen feet distance. Select sorts are frequently trained against walls, stakes, or espaliers, from the most sunny to the most shady aspect, for early and late fruit of improved growth and flavor."

Neill says, "the raspberry-bush grows freely in any good garden soil; but it is the better for being slightly moist. Although the place be enclosed by trees, and even slightly shaded, the plant succeeds. In an inclosed and well-sheltered quarter, with rather a damp soil, containing a proportion of peat-moss, we have seen very great crops of large and well-flavored berries produced; for example, at Melville House, the seat of the Earl of Leven, in Fifeshire." Haynes also recommends well-manured bog-earth, and a situation naturally or artificially shaded.

New Plantation. "Raspberry-bushes are in their prime about the third and fourth year; and, if well managed, continue in perfection five or six years; after which, they are apt to decline in growth, and the fruit to become small, so that a successive plantation should be provided in time. Select new plants from vigorous stools in full perfection as to bearing.

Summer Culture. "Keep them clear from weeds during the summer by hoeing between the rows; at the same time, loosen the earth about the plants.

"Under this management the plants, if tolerably strong, will both yield a moderate crop the first summer, and supply young stems for bearing in greater plenty and perfection the following season; and so, from year to year, the summer culture should be repeated. As the plants get established, let all straggling suckers between the rows, or from the extreme roots of single stools, be cleared out by hoeing, or twisted off, to admit the air and sun freely to the fruit.

The fruit of the raspberry may be obtained of a very large size, other circumstances being of the most favorable kind, by destroying all the suckers; but in this way, the plant being destroyed, a double plantation is wanted, one to grow only suckers, and the other, fruit. In this way J. C. Kecht, at Berlin, produces plants ten and twelve feet high, with fruit larger than any we have seen in this country. *Versuch den Weinbau*, &c. p. 46.

Pruning and Winter-dressing. "It is requisite every winter or spring to cut out the dead stems, and to thin and regulate the successional young shoots. This annual pruning may be performed any time, during open weather, from November till the beginning of April. When kitchen garden crops are cultivated between the rows, it is most convenient to do this as soon as the old bearers begin to decay. As to pruning indiscriminately in the open weather of winter, it sometimes happens that severe frosts immediately follow, and partially kill the plants; therefore it is safer to shorten the tender young stems early in spring; but let it not be deferred till the buds are making new shoots, as that would weaken the root. Cut out all the old dead stems clean to the bottom; and having selected from the strongest young shoots on each main stool, three, four, or five, to be preserved for a succession of bearers, cut away the superabundant close to the ground. Let each of the shoots retained be pruned at top, below the weak bending part; cutting them in the smaller plants, to about three or four feet in length, and in the large sorts, to the length of five or six feet. If any of the stems diverge irregularly, or straggle much asunder, they may be tied together at top, and thus the strong ones will support each other; or the taller varieties may have the support of stakes. Prune plants against a wall or trellis as above; and train the shoots to rise a little diagonally. After pruning, having cleared away the cuttings, dig the ground between and about the plants. To turn in a little rich compost every year will conduce to plentiful and fine returns; lay it at the extremities of the roots, and deeper as the plantation gets older. Eradicate all straggling suckers.

Taking the Crop. "The fruit of the different varieties comes in from the end of June or July till October or later. As it ripens, it should be timely gathered for immediate use; because, when fully ripe, it will not keep above two or three days before it moulds, or becomes maggotty, and unfit to be used." *Abercrombie.*

SUBSECT. 8. The *Strawberry.* — *Fragaria*, L.; *Icos. Polyg.* L.; and *Rosaceæ*, J. *Fraisier*, Fr.; *Erdbeerpflanze*, Ger.; and *Pianta di fragola*, Ital.

1475. This is a small creeping plant, with a perennial root, and in general, ternate leaves. There are numerous sorts by some botanists distinguished as species, by others considered as varieties. Knight (*Hort. Trans.* vol. iii. 207.) considers the *grandiflora*, or pine; the *Chiloensis*, or Chili; and the *Virginiana*, or common scarlet: the first supposed to be a native of Surinam, the second of Chili, and the third of Virginia; to be varieties only of one species; as all may be made to breed together indiscriminately. The fruit has received its name from the ancient practice of laying straw between the rows, which keeps the ground moist and the fruit clean. They are natives of temperate or cold climates, as of Europe and America. The fruit, though termed a berry, is, in correct botanical language, a fleshy receptacle, studded with seeds.

Use. The fruit is fragrant (whence *fragaria*), delicious, and universally esteemed. It consists almost entirely of matter soluble in the stomach, and neither there nor when laid in heaps and left to rot, does it undergo the acetous fermentation. Hence it is very nourishing, and may be safely eaten by gouty and rheumatic persons.

" In addition to its grateful flavor, the sub-acid juice has a cooling quality, particularly acceptable in summer. Eaten either alone, or with sugar and cream, there are few constitutions with which strawberries, even when taken in large quantities, are found to disagree. Further, they have properties which render them, in most conditions of the animal frame, positively salutary; and physicians concur in placing them in their small catalogue of pleasant remedies. They dissolve the tartarious incrustations of the teeth. They promote perspiration. Persons afflicted with the gout have found relief from using them very largely; so have patients in cases of the stone; and Hoffman states, that he has known consumptive people cured by them. The bark of the root is astringent." *Abercrombie.*

The *Species* and *Varieties* are:

The *wood strawberry*, F. *vesca*; (*Eng. Bot.* 1524.) with oval serrated leaves; the fruit round and small, red, white, and green. A native of Britain.

The *scarlet*, F. *virginiana*, (*Duh. arb.* 1. t. 5.) with leaves like the preceding; the fruit roundish and scarlet-colored. A native of Virginia.

The *Roseberry*, F. *virg. var.* (*Hort. Trans.* ii. pl. 27.) an Aberdeen seedling, introduced in 1810. The plants have few roundish leaves; larger fruit than the scarlet, and are very prolific. Continues bearing till August.

The *Downton*, F. *virg. var.* (*Hort. Trans.* ii. pl. 15.) The fruit is large, irregular, and cockscomb-like; leaves large; plant hardy and prolific.

The *Carolina*, F. *caroliensis*, red, from North America.

The *musky or hautboy*, F. *elatior*, (*Eng. Bot.* 2177.) with oval rough javelin-edged leaves; the fruit large, of a pale red color. A native of Britain.

The *Chili*, F. *Chiloensis*, (*Duh. arb.* 1. t. 3.) with large, oval, thick, hairy leaves and large flowers; the fruit large and very firm. A native of South America.

Keen's imperial, or new Chili, F. *Chil. var.* (*Hort. Trans.* ii. pl. 7.) a large showy fruit.

The *Pine*, F. *grandiflora*, (*Miller, icon.* 2. t. 288.) the leaves small and delicate; there are two sorts, the red and the white, or greenish-tinted, of this most rich-flavored fruit. South America.

The *alpine, or prolific*, F. *collina*; which commonly lasts from June till November, and in a mild season, till near Christmas; two sorts of the fruit, the red and the white. Alps of Europe.

The *one-leaved*, F. *monophylla*, (*Bot. Mag.* 63.) the pulp of the fruit pink-colored. South America.

Modes of Propagation. " The plants multiply spontaneously every summer, as well by suckers from the parent stem as by the numerous runners; all of which, rooting and forming a plant at every joint, require only removal to a bed where there is room for them to flourish. Each of these separately planted, bears a few fruit the following season, and will bear in full perfection the second summer. A plantation of the alpine yields fruit the same year that it is made. The woods and the alpine come regular from seed, and bring a finer fruit than from off-sets. The other species are uniformly propagated by off-sets, except the intention be to try for new varieties."

Knight, in making experiments, with a view of ascertaining whether most of the sorts would not breed together indiscriminately, raised above four hundred varieties, " some very bad, but the greater part tolerably good, and a few very excellent." The fruit of above a dozen sorts was sent to the Horticultural Society in August, 1818, and found of various degrees of excellence. The seeds, if sown immediately after being gathered, will produce plants which will come into bearing the following year.

Soil and Site. Neill says, " Strawberries are generally placed in a quarter of the garden by themselves, and it should be one which is freely exposed to sun and air. They are sometimes, however, planted in single rows, as edgings to borders, and in this way they often produce great crops. In either case care must be taken to replant them every fourth or fifth year at the farthest. The alpine and wood species may be placed in situations rather cool and shady; perhaps as an edging in the shrubbery. In such places they produce their fruit perfectly well, and late in the season, which is desirable."

1476. *General Culture.* The following original and excellent instructions for cultivating the strawberry, are given by M. Keen, of Isleworth; a most successful grower of this fruit. He says, " I will commence with a general detail of my practice: this may be considered as applicable to all the varieties of the strawberry; and afterwards, in noticing each kind, that I cultivate, I will specify such peculiarities of treatment as are exclusively applicable to each.

" In preparing the soil for strawberries, if it be new, and, as is frequently the case, very stiff, it should be trenched; but if the bottom spit of soil, as sometimes happens, be of an inferior quality, I then recommend only a simple digging, placing dung at the bottom, underneath the mould so dug; on the contrary, should the land have been kept in a high state of cultivation, or be good to the full depth, it will be advisable for the bottom spit to be brought up to the top, placing the dung between the two spits. The best way to obtain new plants is, by planting out runners in a nursery, for the express purpose, in the previous season: for it is a very bad plan to supply a new plantation from old plants. With respect to the time of planting, I have always found the month of March better than any other. Sometimes, when my crops have failed, I have had runners planted in the autumn, for the following year, but these have always disappointed my expectations. I plant them in beds, containing three or four rows, and the plants, in each row, at a certain distance from each other, leaving an alley between each bed, the distance of the rows and of the plants in the rows, as well as the width of the alleys, depending on the kind of strawberry planted. The width of the alleys, as it will afterwards be stated, may appear considerable; but, I am satisfied, that allowing this space for the workmen to stand on, when they water the plants, or gather the fruit, is beneficial, because I have observed in other persons' grounds, where less space is allotted for this purpose, that great damage is done to the plants and fruit by the trampling of the people.

" After the beds are planted, I always keep them as clear of weeds as possible, and on no account allow any crop to be planted between the rows. Upon the growing of the runners, I have them cut when necessary: this is usually three times in each season. In the autumn, I always have the rows dug between; for I find it refreshes the plants materially; and I recommend to those persons to whom it may be convenient, to scatter in the spring, very lightly, some loose straw or long dung, between the rows. It serves to keep the ground moist, enriches the strawberry, and forms a clean bed for the trusses of fruit to lie upon; and thus, by a little extra trouble and cost, a more abundant crop may be obtained. A short time before the fruit ripens, I always cut off the runners, to strengthen the root; and after the fruit is gathered, I have what fresh runners have been made, taken off with a reaping-hook, together with the outside leaves around the main plant, after which I rake the beds, then hoe them, and rake them again. In the autumn, unless the plants appear very strong, I have some dung dug in between the rows, but if they are very luxuriant, the dung is not required, for in some rich soils it would cause the plants to turn nearly all to leaf. I also have to remark, that the dung used for manure should not be too far spent; fresh dung from the stable-door is preferable to spit dung, which many persons are so fond of. The duration of the beds must be determined by the produce of the plants, which varies much according to the different sorts; it also varies with the same sort in different soils, so that the precise time of the renewal of the beds must be regulated by the observation of the gardener, in each particular case.

" I commence my observations on the different sorts with the pine-strawberry. The best soil for it is a light loam, though no other kind of strawberry will bear a strong loam better than this. It is likewise to be noticed, that this is of all others the most difficult strawberry from which to procure a good crop. Particular care must be taken that they are planted in open ground: for in small gardens they grow very strong, but seldom bear fruit, in consequence of being so much shaded by standard trees; and I have observed the shade of the walnut-tree to be much more injurious to these than to others: for under it they seldom bear at all, but run entirely to leaf. In planting the beds of pines, I keep the rows two feet apart, and put the plants eighteen inches from each other in the row, leaving alleys of three feet wide between each bed: these large distances I find necessary, for the trusses of fruit in my garden ground are frequently a foot long. The duration of this strawberry, with me, is three years: the first year it bears the best, the second year the crop is very good, and the third year it is less.

" The *Imperial Strawberry*, which was raised by myself, from seed, may be treated in a similar way, with respect to planting, distance, &c. as the pine; but I have to remark, that it requires rather a lighter and richer soil, and is not so liable to run to leaf, when planted under trees.

" The *Scarlet Strawberry* must be treated also like the pine. With respect to distance for planting the beds of scarlets, I put each row twenty-one inches apart, and each plant eighteen inches distant in the row, and make the alleys two feet six inches wide. The duration of this strawberry, with me, seldom exceeds three years.

" The *Hautboy* I have always found to thrive best in a light soil: and it must be well supplied with dung, for excess of manure does not drive it into leaf like the pine-strawberry. In planting the beds, each row must be two feet apart, and from plant to plant, in the rows, must be eighteen inches, leaving the alleys between the beds three feet wide. There are many different sorts of hautboys: one has the male and female organs, in the same blossom, and bears very freely: but that which I most approve, is the one which contains the male organs in one blossom, and the female in another: this bears fruit of the finest color, and of far superior flavor. In selecting these plants, care must be taken that there are not too many of the male plants among them: for as these bear no fruit, they are apt to make more runners than the females. I consider one male to ten females the proper proportion for an abundant crop. I learned the necessity of mixing the male plants with the others, by experience, in 1809; I had, before that period, selected female plants only for my beds, and was entirely disappointed in my hopes of a crop. In that year, suspecting my error, I obtained some male blossoms, which I placed in a bottle on the bed of female hautboys. In a few days, I perceived the fruit near the bottle to swell; on this observation, I procured more male blossoms, and in like manner placed them in bottles, in different parts of the beds, removing the bottles to fresh places, every morning, and by this means obtained a moderate crop where I had gathered no fruit the preceding year. The duration of the hautboy, with me, seldom exceeds three years.

"The *Wood Strawberry* is best raised from seed, which I obtain from fruit just gathered, sowing it immediately in a bed of rich earth. When the plants are of a proper size, I transplant them into other beds, where I let them continue till the March following. They are then planted in rather a moist soil, in beds, as the others, each row being two feet apart, and the plants in each row eighteen inches distant, the alley between each bed being three feet wide: in this way I produce abundant crops of very fine fruit. I have propagated this strawberry from runners, but never with such good success as from seeds, particularly if the runners were taken from old roots. The duration of this strawberry, with me, seldom exceeds two years.

"The *Alpine Strawberry* must always be raised from seed, which should be sown in a bed of rich earth, in the spring. When the plants are of a proper size, which will be in July or August, I plant them in rows at the back of hedges, or walls, in a rich, or in a very moist soil: the rows should be two feet apart, and the distance, from plant to plant, in the rows, twelve inches. My alpines, this year, thus managed, are bearing most abundantly, so much so, that in gathering them there is not room for the women to set their feet, without destroying many. The alpines differ from all other strawberries in quickness of bearing; for no other sort, sown in the spring of the year, will produce fruit, under two years, whereas this yields a crop at the end of one year. Its duration, with me, seldom exceeds two years, and frequently it lasts only one year." *Hort. Trans.* ii.

Taking the Crop. The fruit ripens from June to August and September; but the main crop is usually over in July. Gather when the weather is dry, and the same day that the fruit is to be sent to table, otherwise it will soon lose its flavor. Pinch off the calyx and a quarter of an inch of the peduncle, along with the berry.

For *Forcing* the *Strawberry*, see Chap. VII. sect. 8.

Sect. IV. *Nuts.*

Among these the most useful in this country is the walnut, both for the dessert and pickling; the filberd is also a very useful fruit; chestnuts are wholesome and nutritive, and form, in Spain and Italy, an important article of human food.

Subsect. 1. The *Walnut.* — *Juglans regia*, L. (*Lam. ill.* 781.); *Monœc. Polyan.* L.; *Terebintaceæ*, J. *Noyer*, Fr.; *Walnuss baum*, Ger.; *Noci*, Ital.

1477. This is a large and lofty tree, with spreading boughs, and pinnate leaves, having a very strong aromatic odor. The male flowers come in subterminating aments; the females scattered two or three together in close sessile-buds on the young wood near the extremities of the branches. The fruit is an ovate, coriaceous, smooth drupe, inclosing an irregularly grooved nut, which contains a four-lobed oily eatable kernel, with an irregular knobbed surface, and covered with a yellow skin. The flowers are produced in the end of April and beginning of May, and the fruit ripens in September and October. It is a native of Persia and the south side of Caucasus; but it is supposed to have been introduced here from France, and called *gaul-nut*, before 1562.

Use. The kernel, when ripe, is in esteem at the dessert; and the fruit whole, in a green state, before the stone hardens, is much used for pickling. An oil which supplies the place of that of almonds, is expressed from the kernel in France. In Spain they strew the gratings of old and hard nuts, first peeled, into their tarts and other meats. The leaves strewed on the ground and left there annoy worms; or macerated in warm water, afford a liquor which, from its bitterness, may effect their death. The unripe fruit is used in medicine for the same purpose. Pliny says, "the more walnuts one eats, with the more ease will he drive worms out of his stomach." The timber is used in this country for gun-stocks, being lighter in proportion to its strength and elasticity than any other. It is almost exclusively used in cabinet work in most parts of the continent. The young timber is held to make the finest-colored work, but the old, to be finer cambleted for ornament.

Varieties. Those commonly cultivated for their fruit are:

- The round early oval.
- Double large French.
- Tender shelled, and thick shelled.

Propagation. It has generally been propagated from the nut; and this mode is recommended by Miller and Forsyth; probably from their not having known that the tree may be continued by inoculation as practised successfully by Knight. Inarching, this tree was long ago recommended by Boutcher, who says, "he found the fruit in this way produced in one-third of the time necessary for plants raised from the nut." Knight, "having planted, in the spring of 1799, some walnut-trees, of two years old in garden-pots, raised them up to the bearing branches of an old walnut-tree, and grafted them, by approach, with parts of the bearing branches of the old tree. An union took place during the summer, and in the autumn the grafts were detached from the parent stock. The plants thus obtained were planted in a nursery, and, without any peculiar care or management, produced both male and female blossoms in the third succeeding spring, and have since afforded blossoms every season." *Hort. Trans.* i. 61.

After numerous trials, he also succeeded in propagating the walnut-tree from budding. "The buds of trees," he observes, "of almost every species, succeed with most certainty when inserted in the shoots of the same year's growth; but the walnut-tree appears to afford an exception; possibly, in some measure, because its buds contain, within themselves, in the spring, all the leaves which the tree bears in the following summer; whence its annual shoots wholly cease to elongate soon after its buds unfold; all its buds of each season are also, consequently, very nearly of the same age: and long before any have acquired the proper degree of maturity for being removed, the annual branches have ceased to grow longer, or to produce new foliage.

"To obviate the disadvantages arising from the preceding circumstances, I adopted means of retarding the period of the vegetation of the stocks, comparatively with that of the bearing tree; and by these means I became partially successful. There are at the base of the annual shoots of the walnut, and other trees, where those join the year-old wood, many minute buds, which are almost concealed in the bark, and which rarely or never vegetate, but in the event of the destruction of the large prominent buds, which occupy the middle, and opposite end of the annual wood. By inserting in each stock one of these minute buds, and one of the large and prominent kind, I had the pleasure to find that the minute buds took freely, whilst the large all failed without a single exception. This experiment was repeated in the summer of 1815, upon two yearling stocks which grew in pots, and had been placed, during the spring and early part of the summer, in a shady situation under a north wall; whence they were removed late in July to a forcing-house, and instantly budded. These being suffered to remain in the house during the following summer, produced from the small buds, shoots nearly three feet long, terminating in large and perfect female blossoms, which necessarily proved abortive, as no male blossoms were procurable at the early period in which the female blossoms appeared: but the early formation of such blossoms sufficiently proves that the habits of a bearing branch of the walnut-tree may be transferred to a young tree by budding, as well as by grafting by approach.

"The most eligible situation for the insertion of buds of this species of tree (and probably of others of similar habits) is near the summit of the wood of the preceding year, and of course, very near the base of the annual shoot; and if buds of the small kind above-mentioned be skilfully inserted in such parts of branches of rapid growth, they will be found to succeed with nearly as much certainty as those of other fruit-trees, provided such buds be in a more mature state than those of the stocks into which they are inserted."

Carlisle (*Hort. Trans.* ii.) mentions the case of a walnut-tree raised from the nut in the usual way, on a light soil, on a sandy sub-soil, and in a warm sheltered situation, which produced fruit in six years; but the usual period is eighteen or twenty.

Abercrombie says, "The walnut-tree is propagated, in general, by sowing well-ripened nuts of the finest varieties: but as seedlings are apt to vary, new plants are occasionally raised by layers and inarching, to continue particular sorts permanent. The nuts may be sown in autumn or spring, in drills, nine to twelve inches apart, and two or three inches deep; place the nuts two inches asunder, and having earthed them in, smooth the surface. They will come up in the spring. When of one year's growth, set out the plants, in nursery-rows a foot asunder, by six inches in the rows, to remain two years, then to be transplanted (doubling the distance) into other nursery lines. Train each with a single stem of six or seven feet high: then to be permitted to branch out above, and form a spreading head.

"Layers may be made, in autumn or spring, of young shoots produced near the ground from proper stools formed for that purpose: they will be rooted in one season, to plant off in nursery rows for training as above. Inarching may be performed in February or March upon seedling walnut stocks, advanced in proper stems.

Soil and Site. The walnut-tree will succeed in any common fertile soil, a light or

a clayey loam: so as the sub-soil be dry, and the site a little sheltered; but it thrives best where there is a good depth of loam mixed with sand or gravel rather than clay. As this tree is long before it bears fruit, there is a particular inducement for procuring plants from the nursery, either inarched, budded, or in as advanced a stage as it will be safe to remove them at. This may be when they are from eight to twelve years old, according as they may have been prepared by repeated transplantations.

" Walnut-trees may be planted in orchards or small paddocks in a row towards the boundaries; or in parallel double rows in a quincunx order, in extensive grounds, but detached from fruit-trees of more contracted growth. The line of walnut-trees, when fully grown, will serve as a screen to the fruit-trees occupying the interior ground. The plants should stand at twenty-five and thence to fifty feet distance.

" *Mode of Bearing*. On the extremities of the preceding years' shoots.

" *Pruning*. Walnut-trees, when finally planted, may be permitted to branch out in their natural order, with the exception of a little occasional pruning, to regulate any casual disorderly growth, to reduce over extending branches, and to prune up low stragglers.

" *Taking the Crop*. Walnuts should be taken for pickling while the internal parts remain tender and fleshy, which may be ascertained by probing them with a pin or needle. The nuts are ripe in September and October, and should then be gathered so as not to injure the tree, and housed in the proper manner for winter use." (See 1153.)

SUBSECT. 2. The *Chestnut*. — *Fagus Castanea*, L.; and *Castanea Vesca*, W. (*Eng. Bot.* 886.); *Monœc. Poly.* L.; and *Amentaceæ*, J. *Châtaigne*, Fr.; *Castanienbaum*, Ger.; and *Castagno*, Ital.

1478. This is a large tree, spreading its branches finely on every side where it has room, but, planted closely, will shoot up straight to a great height. The leaves are lanceolate, serrated, and very large. The aments or catkins of male flowers are pendulous at the ends of the branches; very long, resembling those of the walnut. They have a strong spermatic smell; the flowers are collected in remote little balls, and are sessile. The proportion of male flowers to the females is prodigious. The calyx of the female flowers becomes an echinate capsule of four valves, of a silky smoothness in the inside, and containing two or three nuts or one only. It flowers in May, and ripens its fruit in October. It is supposed to have been originally brought from Sardis to Italy by Tib. Cæsar. It is so common as to be considered a native in France and Italy; and some consider it as naturalized in England, though it is not likely to propagate itself in this country. Some of the oldest trees in the world are of this species; as that mentioned by Brydone on Etna, and the great tree at Tortworth in Gloucestershire.

Use. The fruit is a desirable nut for autumn and winter, and is eaten roasted, with salt, and sometimes raw. Abroad, it is not only boiled and roasted, but puddings, cakes, and bread are made of it. " Chestnuts stewed with cream," according to Phillips, (*Pomarium. Brit.* 95.) " make a much-admired dish, and many families prefer them to all other stuffings for turkeys." He says, " I have had them stewed and brought to table with salt-fish, when they have been much admired." The timber was formerly in very general use in house-carpentry, though some, with every appearance of reason, consider what is generally called old chestnut as old oak.

Varieties. There are none of any note. Some varieties ripen their fruit a few days earlier than others, but none of these have been fixed on and perpetuated by the nurserymen so as to be rendered available by purchasers.

Propagation. Miller and most gardeners recommend propagation from nuts; but, for fruit, the Devonshire practice of grafting is decidedly preferable. Sir Joseph Banks says, " the nurserymen there deal in grafted chestnut-trees;" and we may add, that they are now to be had in the London nurseries. *Hort. Trans.* i. 62.

Knight says, " The Spanish chestnut succeeds readily when grafted in almost any of the usual ways, and when the grafts are taken from bearing branches, the young trees afford blossoms in the succeeding year; and I am much inclined to think, from experiments I have made on this tree, that by selecting those varieties which ripen their fruit early in the autumn, and by propagating with grafts or buds from young and vigorous trees of that kind, which have just attained the age necessary to enable them to bear fruit, it might be cultivated with much advantage in this country, both for its fruit and timber." *Hort. Trans.* i. 62.

The chestnuts may be raised from seed, in the manner directed for walnuts (1477.).

Soil and Site. It prefers a sandy loam with a dry bottom; but will grow in any soil on a dry sub-soil. Distribute the plants towards the northern boundary of orchards; and, in larger groups, over any vacant tracts in extensive pleasure-grounds or parks, and to form spacious avenues, or a row along any out-boundary. A great number should not be placed close to a residence, as the smell of the flowers is offensive. Plant them at not less than thirty feet, and thence to fifty feet distance.

Subsequent Culture. "Permit the trees to branch out freely above, mostly in their natural order, to advance in large regular heads. Give occasional pruning only to very irregular and cross-branches, and low stragglers. After they have attained some tolerably branchy growth, they will come into bearing in moderate plenty; and when they have expanded into large full heads, they may be expected to yield considerable quantities of nuts.

Taking the Crop. "The nuts ripen from the end of September to the end of October. When the outer capsule containing the nuts begins to divide, and the nuts appear of a brown color, and some fall promiscuously from the tree, their full maturity is indicated. They may be gathered by hand, or beat down by long poles. Selecting the finest and best-ripened, clear them from the husks; let them be well dried, and deposited in the fruitery, upon shelves, &c.; and some packed in layers of very dry fine sand for longer keeping." *Abercrombie.*

Subsect. 3. *Filbert.* — *Corylus Avellana*, L. (*Eng. Bot.* 723.); *Monœc. Poly.* L.; and *Amentaceæ*, J. *Noisette*, Fr.; *Nussbaum*, Ger.; and *Avellano*, Ital.

1479. The common hazel-nut, or the filbert in its wild state, is a large-sized shrub, with an ash-colored bark, and alternate roundish cordate leaves. The male catkins appear on the preceding year's shoots in autumn, and wait for the expansion of the female gems in the spring. It is a native of Britain, very common in most woods, and extensively cultivated about Maidstone, in Kent.

Use. As a table nut it is in universal esteem; and the wood and twigs of the wild plants are useful for sticking peas, forming pegs, number-sticks, staking green-house plants and raspberries, and many other similar purposes in gardening.

Varieties. These are:

The common hazel nut
The red-kerneled (*Lang. P.* t. lvii. 2.)
The white-kerneled filbert, (*Lang. P.* t. lvii. 1.)
The red-kerneled filbert
The great cobnut, (*Hook. P. L.* t. xlix.)
The large long nut
The Barcelona or Spanish
The Constantinople or dwarf Byzantine
The cossford, (*Hort. Trans.* ii. 465.)

Estimate of Sorts. The common wood-nut, the least desirable for horticultural plantations, may be admitted for variety. The filbert merits culture in a large proportion, and its returns are very profitable for sale. The red-filbert is accounted to have a finer flavor than the white. The cob-nut is large, with a thick shell, but the kernel is considerable in size, and sweet. The Barcelona, a good large nut, with a thin shell, is well known, great quantities being imported as well as grown here. The long native nut seldom kernels well. The cossford is very sweet, kernels well, and the tree is a great bearer.

Soil and Site. Abercrombie says, "A cool, dry, poorish soil is to be chosen for filbert and nut-trees in general; for example, a sandy loam, mixed with minute shattery stones or grit, and with a low proportion of vegetable or animal remains; for the plants fruit best when but moderately strong. About Maidstone, according to the Rev. W. Williamson, they prefer a hazel loam of some depth, on a dry sub-soil, which they dress every year, as the filbert requires a considerable quantity of manure. They are generally planted in the orchard, or in the slips which surround the kitchen garden.

Propagation. "All the sorts can be propagated by grafting, by layers, by suckers, and by sowing the nuts. The most advisable methods, because they are certain to keep the respective variety permanent, are, either by grafting them in February or March upon seedling or sucker-stocks of the filbert or hazel; or by layers of the young wood in the spring. Sow the nuts in October or November, or in the spring, in a bed of light earth, covering them about two inches. The greater part will germinate in spring, and when the plants are one or two years old, plant them out in nursery-lines in autumn or spring. Train a principal supply in standards, half-standards, and dwarf-standards, each with a single clean stem, from six feet high down to twelve inches." *Abercrombie.* About Maidstone, according to W. Williamson, they are almost universally propagated by suckers.

Mode of Bearing. All the species bear principally upon the sides and ends of the upper young branches; and from small shoots, which proceed from the base of side-branches, cut off the preceding spur.

Insects. The leaves are little troubled with vermin of any sort; but the eggs of the weevil, *Curculio nucum* (*fig.* 352. *a*) and *C. pyri* (*b*) are deposited in the germen, and nourished on the kernel, which they effectually destroy. The only way of lessening this evil is by taking care to destroy all the nuts so infested, in order that the larvæ may never attain to the fly state.

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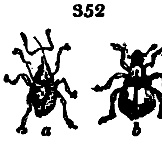

Final Planting. "The season for planting all the sorts is autumn or spring, or any interval in mild weather from October till the beginning of March. Allot detached standards, not less than ten, and thence to twenty feet distance, to have room to branch out in full-heads. In the filbert-grounds about Maidstone it is usual to plant hops, standard-apples, and cherries among the filberts. When the filberts come into a bearing state the hops are destroyed, and the fruit-trees only suffered to remain. The ground is then planted with gooseberries, currants, &c. and herbaceous vegetables." *Hort. Trans.* iv. 152.

Pruning. In the filbert-orchards, about Maidstone in Kent, it is a prevailing practice to train the trees with short stems, like a gooseberry-bush, but with the heads in the shape of a punch-bowl, and exceeding thin of wood, and to prune them with exact attention to the mode of bearing. The filbert is there propagated by suckers, and Williamson advises to plant them where they are to remain; to suffer them to grow without restraint for three or four years; and then to cut them down within a few inches of the ground. They will push five or six strong shoots, which the second year, after cutting down, are to be shortened one-third. Then place a small hoop within the branches, and fasten the shoots to it at equal distances.

" In the third year, a shoot will spring from each bud; these must be suffered to grow till the following autumn or spring of the fourth year, when they are to be cut off nearly close to the orginal stem, and the leading shoot of the last year shortened two thirds.

" In the fifth year, several small shoots will arise from the base of the side-branches, which were cut off the preceding year; from these the fruit is to be expected, and the future object of the pruner must be directed to produce an annual supply of these by cutting out all that have borne fruit. The leading shoot is every year to be shortened two-thirds or more, and the whole height of the branches must not be suffered to exceed six feet. Every shoot that is left to produce fruit should also be tipped, which prevents the tree from being exhausted in making wood at the end of the branch. Observe, in pruning early in spring, to have a due supply of male blossoms, and to eradicate all suckers."

Such is the Maidstone practice, which " has been long celebrated;" by which 30 cwts. of nuts per acre have been grown on particular grounds, in particular years; but 20 cwts. is considered a large crop, and rather more than half that quantity the usual one, with a total failure three years out of five, so that the average produce is not more than 5 cwts. per acre. W. Williamson thinks the failure, happening so often, may be owing to the excessive productiveness of the successful years owing to the mode of pruning, by which " the whole nourishment of the tree is expended in the production of fruit." He recommends leaving the trees rather more in a state of nature, and, from experiments in his own garden, thinks a regular crop in succession will thereby be obtained. *Hort. Trans.* iv. 154.

Taking the Crop. " The maturity of the fruit is indicated by the cup turning brown, and by the nuts, which have also become brown, readily quitting the husk. House a quantity for keeping; gather them in bunches as they grow. If a portion, after being properly dried, be laid in boxes, and covered with dry sand to exclude the air, it will tend to preserve the kernels from shrinking; and they will thus keep well for a month or two. W. Braddick's mode of keeping nuts two years by closing them up air-tight in emptied butter firkins has been already mentioned (1044.).

Subsect. 4. *Native, or neglected Fruits, deserving Cultivation.*

1480. Though some of the fruits in this class recommend themselves by their already-known utility, as the cranberry; yet others, as the sorb, haw, &c. are only mentioned with a view of directing scientific horticulturists of leisure and means, to try what can be done in improving them. We shall enumerate them in the order of stone-fruits and berries.

The *Sloe* is the *Prunus spinosa,* L. (*Eng. Bot.* 842.); *Icos. Monog.* L.; and *Rosaceæ,* J. Ripe, it makes an excellent preserve; unripe, the inspissated juice forms the German *acacia,* and affords an almost indelible ink used to mark linens. It is used in home-made wines, to communicate the color and roughness of red port; and the leaves are employed to adulterate the teas of China. Knight and others consider the sloe as the parent of the bullace (*P. insititia,*) and all the varieties of the common plum, (*P. domestica.*) As a shrubbery plant the sloe is most ornamental, blossoming before all others of the prunus tribe.

The *Bird-cherry* is the *Prunus padus* (*Eng. Bot.* 1383.). The fruit is nauseous to most palates; but infused in gin or whiskey it greatly improves these spirits, and is only surpassed by an infusion of peach leaves. A few trees are therefore desirable, especially in Scotland and Ireland.

The *Mountain-ash* is the *Sorbus Aucuparia,* L.; *Pyrus Aucuparia,* E. B. (*Eng. Bot.* 337.); *Icos. Di.-Pent.* L.; and *Rosaceæ,* J. The berries are eaten in some parts of Scotland and Wales, and afford an agreeable fermented liquor, and, by distillation, a strong spirit.

The *Wild Service, Pyrus torminalis*, W. (*Eng. Bot.* 298.), (*fig.* 353.); the *Bastard Service, P. pinnatifida*, E. B. (*Eng. Bot.* 2331.), (*fig.* 354.); and the *Whitebeam-tree, P. Aria*, (*Eng. Bot.* 1858.) afford agreeable mealy berries, with much less acid than those of the mountain-ash. These trees are most ornamental in shrubberies or on lawns; and the two last are not undeserving a place in orchards.

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The *Tree Currant, Ribes spicatum*, L. (*Eng. Bot.* 1290.); *Pentand. Monog.* L.; and *Cacti*, J.; affords a fruit somewhat smaller and more acid than the common red currant; but by crossing and cultivation might, no doubt, be greatly improved; and from its comparatively tree-like habits, might be a more convenient fruit-shrub in respect to crops below or around it.

The *Common Bramble, Rubus fruticosus*, (*Eng. Bot.* 715.); *Icos. Polyg.* L.; and *Rosaceæ*, J. The fruit is powerfully acid and astringent, forms agreeable pies and tarts, medicinal gargles, and may also be used raw. There are two single varieties, the white-fruited and smooth, and one with double blossoms.

The *Cloud Berry, Rubus Chamæmorus*, (*Eng. Bot.* 716.), (*fig.* 355.) "In Scotland," Neill observes, "the fruit is also called roebuck-berries or knot-berries, and they are perhaps the most grateful and useful kind of fruit gathered by the Scots Highlanders. On the sides and near the bases of the mountains it may be collected for several months in succession. It is not cultivated without difficulty, and it seldom yields its fruit in a garden." By raising from seed, and again from the seeds of plants so raised, and so on for six or eight generations, perhaps at the same time crossing the flowers with those of the bramble or raspberry, in all probability this plant might become a valuable accession to the kitchen-garden. Its berries are ripe in September. See a curious paper in *Caled. Hort. Mem.* i. 383.

The *Dwarf Crimson Bramble, Rubus arcticus*, (*Eng. Bot.* 1585.), (*fig.* 356.) produces an excellent berry, found only on the highest and wildest mountains of Scotland. By successional sowing of the seeds on different levels, doubtless it might be brought down, step by step, to live and produce fruit on plains, and in appropriate parts of gardens.

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The *Dewberry*, *Rubus cæsius*, (*Eng. Bot.* 826.), (*fig.* 357.); the *Stone Bramble*, *Rubus saxatillus* (*Eng. Bot.* 2233.), (*fig.* 358. *a.*); the *Upright Bramble*, *Rubus suberectus* (*Eng. Bot.* 2572.), (*fig.* 358. *b.*); afford agreeable acid and aromatic fruits, which come in late in the season, and merit attempts with a view to accommodating them to habits of cultivation. The same remarks will apply to a plant common in the woods of Russia and Poland, and which Dr. Clarke has figured, and named Cripsia; but which appears to be a species of rubus, and probably a variety of *R. suberectus*.

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The *American Cranberry* is the *Vaccinium macrocarpon*, L.; *Oxycoccus macrocarpus*, P. S. (*Hort. Kew.* ii. t. 7.); *Oct. Monog.* L.; and *Ericeæ*, J. It is a native of North America, and by the ingenuity of Sir Joseph Banks, it may be said to be now added to our cultivated fruits. The plant was known to Miller, who, of the cranberry tribe, in general, observes, " they can only be cultivated for curiosity in gardens, for they will not thrive much, nor produce fruit out of their native swamps and bogs." A very interesting account of the mode adopted by the illustrious horticulturist above mentioned is given by himself in the *Hort. Trans.* i. 71. and of the produce, which was large and uniform. In one year, viz. 1813, from three hundred and twenty-six square feet, or a bed about eighteen feet square, three and a half Winchester bushels of berries were produced, which, at five bottles to the gallon, gives one hundred and forty bottles, each sufficient for one cranberry pie, from two and a half square feet.

" Wherever there is a pond," Neill observes, " the margin may, at a trifling expence, be fitted for the culture of this plant, and it will continue productive for many years. All that is necessary is to drive in a few stakes, two or three feet within the margin of the pond, and to place some old boards within these, so as to prevent the soil of the cranberry-bed from falling into the water; then to lay a parcel of small stones or rubbish in the bottom, and over it peat or bog-earth, to the depth of about three inches above, and seven inches below the usual surface of the water. In such a situation the plants grow readily; and if a few be put in, they entirely cover the bed in the course of a year or two, by means of their long runners, which take root at different points. From a very small space a very large quantity of cranberries may be gathered; and they prove a remarkably regular crop, scarcely affected by the state of the weather, and not subject to the attacks of insects."

The cranberry will also succeed when planted as an edging to any pond, provided some bog-earth be placed for its roots to run in; or if a bed of bog-earth be sunk in any shady situation, so as its surface may be a few inches below the general level, for the sake of retaining water, the plant will thrive well, and being regularly watered in the driest weather, produce abundant crops. (See 1108.) " The American cranberry," Salisbury observes, (*Hort. Trans.* ii. 96.) " may be cultivated very successfully in situations not positively wet, if only planted in bog-earth, which retains moisture longer than any other soil; for a few plants, even in pots, which had stood some time neglected under a hedge, so that their branches were matted together, produced a plentiful crop."

The *Common Cranberry*, *Oxycoccus Palustris*, P. S. (*Eng. Bot.* 319.), may be subjected to the same treatment. " Great quantities of this berry are gathered in upland marshes and turf-bogs, both in England and Scotland. The berries are made into tarts, and have much the same flavor as the Russian-imported cranberries, or those procured by cultivation." *Neill.*

The *Snowberry* is the *Gaultheria serpyllifolia*, Ps.; *Vaccinium hispidulum*, L.; and *Chiogenes of Salisbury*, (*Mich. Am.* i. t. 23.); *Decan. Monog.* L.; and *Ericeæ*, J.

"At Shaw-hill, near Halifax, it produced fruit abundantly, planted under a north stone wall, shaded behind by high trees, in a border of sandy peat; and it succeeded pretty well in nearly a similar situation at Chapel Allerton, during the eighteen years of my residence at that place, often ripening its berries; but they being little esteemed, I only preserved a patch of it as a rare plant. The flavor of the fruit, however, is exceedingly agreeable to some persons, being strongly perfumed, like *eau de noyau*, or bitter almonds, and mixed with a pleasant acid. I now regret that I never tried the berries baked with sugar in a tart: if gathered before they are too soft, they may, no doubt, be preserved in bottles, like cranberries, and possibly prove a valuable addition to our winter-fruits of that sort." *Salisbury in Hort. Trans.* vol. ii.

The *Purple* or *Common Bilberry, Blackberry,* or *Whortleberry, Vaccinium Myrtillus,* L. (*Eng. Bot.* 456.); is another bog-plant common in Britain and the north of Europe. The berries are gathered in autumn for making tarts; in Devonshire they are eaten with clotted-cream; in Poland they are ripe in July, and, being mixed with wood-strawberries, and eaten with new milk, are considered a great delicacy. In the Highlands of Scotland they are eaten with milk, and made into jellies. They may be successfully cultivated in a shady border of bog-earth.

The *Red Bilberry* or *Cowberry, Vaccinium Vitis Idæa,* (*Eng. Bot.* 598.) The fruit is acid and somewhat bitter, but makes a very good rob or jelly, which in Sweden is eaten with all kinds of roast meat, and forms a sauce for venison, which is thought superior to currant-jelly. In Wales we have experienced it to be an excellent addition to roast mutton. It may be cultivated in a moist shady border of bog-earth, like the common bilberry.

Chap. X.

Horticultural Catalogue. — Exotic Fruits.

Under this title we comprehend such fruits as require the aid of artificial heat to bring them to perfection, and among these we have included the vine and the fig; for though these fruits ripen in the open air in very favorable situations and warm seasons, yet it is allowed on all hands, that, in by far the greater number of situations and seasons, grapes and figs, grown in the open air, do not attain any thing like their proper size and flavor.

Exotic fruits may be arranged as follows:

Those in *general cultivation;* as the pine, vine, fig, melon, and cucumber.

Those *well known,* but neglected, as such; as the orange, pomegranate, olive, Indian fig, torch thistle, and strawberry pear.

Those *little known,* some of which seem to merit cultivation; as the akee tree, aligator pear, anchovy pear, bread fruit, cocoa nut, durion, guava, granadilla jamrosade, malay apple, lee chee, loquat, mango, mangosteen, pishamin, and various others.

Exotic esculents not hitherto cultivated as such; as the yam, sweet potatoe, salsilla, bread root, water-chestnut, ground almond, &c.

Sect. I. *Exotic Fruits in general Cultivation.*

This section includes the three first fruits cultivated in Europe; the pine pre-eminent for its flavor; the vine, for its generous and enlivening juice; and the melon, approaching in flavor to the pine.

Subsect. 1. The *Pine Apple.* — *Bromelia Ananas,* L. (*Bot. Mag.* 1554.); *Hexan. Monog.* L.; and *Bromeliæ,* J. *Ananas,* Fr. Ger. and Ital.

1481. This plant is described in Miller's *Dictionary,* (art. *Bromelia,*) as herbaceous; but is by others considered as a shrub. Its common name of *pine-apple* is supposed to be derived from the resemblance of the fruit in shape to the cone of some species of pine-tree. In richness of flavor this fruit stands unrivalled; and, as Neill observes, "it is one of the greatest triumphs of the gardener's art, to be able to boast that it can be produced in Britain in as high perfection as in a tropical climate."

The leaves of the pine-plant are long, narrow, channelled, and in general furnished with spines or prickles on the edges. The flowers are in a loose spike, on a scape, which is leafy at top; "as the spike ripens, it takes the form of a fleshy scaly strobile, vulgarly called the fruit, and composed of many coadunate berries, which have scarcely any cells or seeds." Professor Martyn doubts whether there may not be some of the fruits with male flowers only, and others with hermaphrodite flowers; "because those fruits which have seeds are remarkably different from the others when cut through the cells, in which the seeds are lodged; for in these they lie near to the centre of the fruit, whereas in those which have abortive cells, they are chiefly close to the rind."

South America is generally considered the native place of the pine, though it is indigenous in uncultivated places in Africa, in great abundance. Linnæus ascribes it to New Spain and Surinam; and Acosta says, that it was first sent from the province of Santa Croce, in Brasil, into the West, and afterwards into the East Indies. Professor Martyn thinks it may be common to the tropical parts of the three continents.

The pine-plant has been long cultivated in Jamaica, and other West India islands with great success, and was introduced to the gardens of Europe by Le Cour, of Leyden, about the middle of the seventeenth century. This gentleman, Miller informs us, received his first plants from America, and "after a great many trials with little or no success, did at length hit upon a proper degree of heat and management, so as to produce fruit equally good (though not so large) as that which is produced in the West Indies."

From Le Cour "our gardens in England were first supplied with this king of fruits;" and it is "commonly said that Sir Matthew Decker, of Richmond, was its earliest cultivator;" but, as a botanical plant, it was introduced so far back as 1690, by Bentick. See *Hort. Kew.*

Miller informs us, that at first the plants were kept in dry stoves, during winter, placed on scaffolds, after the manner in which orange-trees are placed in a green-house; and that in summer, they were removed to hot-beds of tanner's bark, under frames. They soon, however, began to erect "low stoves," called succession-houses, and bark-pits under deep frames, for the suckers and crowns. Bradley informs us, that by the year 1730, pine-stoves of the different kinds were established in all the principal English gardens; and Justice, in his *British Gardener's Directory*, published in 1744, states, that pine-apple stoves had also been erected in Scotland, and he gives the plan of one erected by him in his own garden at Crichton, near Edinburgh. He recommends such as intend cultivating this fruit, to get their plants and furnaces (the latter cast in one piece) of James Scott, of Turnham Green, London, and their thermometers from Coles, in Fleet-Street.

Use. It is the first of dessert fruits; and is also preserved in sugar, and made into marmalades and other confectionaries. In preparing to eat this fruit, first twist out the crown and then cut the fruit into horizontal slices: these being served, the rind and scales of the pips are passed off by the guest with a knife and fork. *Speechly.*

Varieties. There are many varieties of this fruit, independently of some distinct species, as the *B. Penguin* and *B. Karatas*; the fruit of these species being sometimes eaten in the West Indies. If the seeds of the ananas were sown frequently in their native country, professor Martyn considers that varieties might be rendered as numerous as those of the apple and pear. Miller, in sowing the seeds, found a variety of sorts produced from the same fruit; and Speechly mentions, that he raised in 1768 above seventy plants, from seeds sent to the Duke of Portland from the West Indies, most of which varied in some distinctive circumstance, either in their leaves or fruit. Many of these fruits turned out of inferior quality, probably from the seeds having been gathered indiscriminately. The most esteemed varieties in present cultivation are:

The Old Queen. Fruit oval-shaped, and of a gold color. Esteemed the hardiest kind, and fruited in fifteen or eighteen months. The fruit grows to a large size, often weighing from three to four pounds. It is much more certain of shewing fruit at a proper age and season than most of the other sorts, and has a just preference in most hot-houses.

Ripley's New Queen. A sub-variety of the *old queen*, with a large elegant fruit; fruited also in an equally short period.

Welbeck Seedling; fruit small, generally broader at the head than at the base; of a pale yellow, or sulphur color, with very flat pips; flesh white and tender, rich in flavor, with less acidity than is found in most other pines. *Hort. Trans.* iv. 213.

Pyramidal, or Brown Sugar-loaf. Cone-shaped, and dark colored till it ripens; the leaves brownish, the flesh yellow.

Prickly Striped Sugar-loaf. Cone-shaped, the fruit of a golden color, the leaves striped with black or purple lines.

Smooth Striped Sugar-loaf; similar to the above, but the leaves not prickly.

Havannah. Tankard-shaped; dark colored till it ripens.

Montserrat. The leaves of a dark brown, inclining to purple in the inside; fruit middle-sized and tun-shaped, and the pips or protuberances of the fruit being larger and flatter than in the other kinds.

King Pine, or Shining Green. The leaves of a grass-green, the pulp hard and rather stringy, but of good flavor when ripe.

Green, or St. Vincent's Pine. A rare variety; when ripe the fruit is of an olive hue, middle-sized, and pyramidical.

Black Antigua. The fruit is shaped like the frustum of a pyramid; leaves of a brownish tinge, and drooping at the extremities, with strong prickles, thinly scattered. The pips of the fruit are large, often an inch over; and it attains a large size, weighing from three to four pounds. It is of a dark color till it ripens; very juicy, and high flavored.

Black Jamaica. The fruit is large, and the plant similar in character and habits to the above.

Providence Pine. There are two varieties, the white and green; the fruit is larger than that of any of the kinds cultivated in this country; the form inclining to pyramidical; the color at first brownish grey, but when mature of a pale yellow. The flesh yellow and melting, abounding with quick lively juice. Speechly produced in the gardens at Welbeck, in 1794, a fruit that weighed five pounds and a quarter, or eighty-four ounces, and from a plant that was not a large one. Griffin had, in 1803, two plants placed under his care, which fruited in July 1804, the fruit of one plant weighing *seven pounds two ounces*, and the other *nine pounds three ounces*, avoirdupois. This sort, and the two preceding, require generally three years, and sometimes four or five to produce their fruit.

Blood-red; fruit equal in bulk at both ends. Pips of moderate size, color brick-red; flesh white and opaque; leaves of a changeable hue; the flavor of the fruit being inferior to that of most others, this is to be considered merely as a curious variety. *Hort. Trans.* iv. 214.

Silver Striped Queen. Leaves beautifully striped with white, yellow, and red; but the plant, though elegant, is a reluctant fruiter.

Variegated-Leaved Pines. Besides the *Striped-Leaved Queen*, there are several sorts with beautifully varied leaves and fruits; but in general they are tardy in fruiting, and more to be considered as ornamental than as useful varieties.

New Sorts. Pine plants are frequently imported from the West India islands, and in this case generally bear their names. In general, however, these plants are far inferior, both as to kinds and condition, to those grown, and to be procured from nurserymen in this country. They are generally infested with the bug, and very uncertain in their time of fruiting, as well as to its flavor. If these were to be enumerated, the list of pines known in this country would amount to upwards of forty sorts. Specimens of above thirty sorts are grown in the gardens of J. Gunter, at Earl's-court.

Varieties. Those commonly cultivated for their fruit are:

The round early oval.
Double large French.
Tender shelled, and thick shelled.

Propagation. It has generally been propagated from the nut; and this mode is recommended by Miller and Forsyth; probably from their not having known that the tree may be continued by inoculation as practised successfully by Knight. Inarching, this tree was long ago recommended by Boutcher, who says, "he found the fruit in this way produced in one-third of the time necessary for plants raised from the nut." Knight, "having planted, in the spring of 1799, some walnut-trees, of two years old in garden-pots, raised them up to the bearing branches of an old walnut-tree, and grafted them, by approach, with parts of the bearing branches of the old tree. An union took place during the summer, and in the autumn the grafts were detached from the parent stock. The plants thus obtained were planted in a nursery, and, without any peculiar care or management, produced both male and female blossoms in the third succeeding spring, and have since afforded blossoms every season." *Hort. Trans.* i. 61.

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"To obviate the disadvantages arising from the preceding circumstances, I adopted means of retarding the period of the vegetation of the stocks, comparatively with that of the bearing tree; and by these means I became partially successful. There are at the base of the annual shoots of the walnut, and other trees, where those join the year-old wood, many minute buds, which are almost concealed in the bark, and which rarely or never vegetate, but in the event of the destruction of the large prominent buds, which occupy the middle, and opposite end of the annual wood. By inserting in each stock one of these minute buds, and one of the large and prominent kind, I had the pleasure to find that the minute buds took freely, whilst the large all failed without a single exception. This experiment was repeated in the summer of 1815, upon two yearling stocks which grew in pots, and had been placed, during the spring and early part of the summer, in a shady situation under a north wall; whence they were removed late in July to a forcing-house, and instantly budded. These being suffered to remain in the house during the following summer, produced from the small buds, shoots nearly three feet long, terminating in large and perfect female blossoms, which necessarily proved abortive, as no male blossoms were procurable at the early period in which the female blossoms appeared: but the early formation of such blossoms sufficiently proves that the habits of a bearing branch of the walnut-tree may be transferred to a young tree by budding, as well as by grafting by approach.

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Carlisle (*Hort. Trans.* ii.) mentions the case of a walnut-tree raised from the nut in the usual way, on a light soil, on a sandy sub-soil, and in a warm sheltered situation, which produced fruit in six years; but the usual period is eighteen or twenty.

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Soil and Site. The walnut-tree will succeed in any common fertile soil, a light or

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1486. *Propagation*. The vine is propagated from seed, layers, cuttings, grafting, and inoculation. By seed, for the sake of obtaining new varieties; by layers, to get strong shewy plants the first year; by cuttings, for economy in management, and to get plants with tops proportioned to their roots; and by grafting and inoculation, for various useful and curious purposes.

By Seed. The first thing is to select the seeds. If the object be to propagate an esteemed variety from which cuttings cannot be obtained, or to procure a sub-variety of any esteemed sort, then select the largest and best-ripened berries from the largest and best-formed bunches, out of which to take the seeds. But if the object be to procure an entirely new variety, then the first preparatory steps must be taken when the vines are in flower, either by bringing two or more sorts so near together as that the pollen of the anthers may effect a promiscuous impregnation, as was practised be Speechly; or by cutting out, with small scissars, the stamens from the flowers to by impregnated, before their anthers had burst, and introducing the pollen of the variety with which it is to be crossed or impregnated, by dusting the stigma with the ripe anthers, as was practised by Knight. This is the most certain and effectual method; the most certain, because if the blossom destined to bear seeds be fecundated or set, it must evidently have been set through the influence of the stranger pollen; and the most effectual, because the stranger pollen operating alone must have more influence on the progeny than when operating in conjunction with that of the blossom to be crossed.

As some guide for the selection of sorts to breed from, (to borrow the phraseology of a sister art,) we may state, that the legitimate object which ought to be had in view should not merely be to obtain a *new* variety, but one, either superior in the size, both of the bunch and berry, superior in flavor and delicacy of skin and flesh, superior in point of hardiness and bearing, or in earliness or lateness. In connection with each of these particulars, the form of the bunch, and the length of the foot-stalk of the fruit, and even the size of the leaves and the length of their foot-stalks, are also objects deserving attention; close-growing grapes, which always have short foot-stalks, being subject to many misfortunes.

" All the sorts of Frontignac grapes," Speechly observes, " are proper to add an excellency of flavor to other kinds; but there is a superior richness in the black, blue, and red Frontignacs; and they do not partake so much of the strong muscat flavor as the white and grizzly do. But it must be considered, that the blue Frontignac grows close upon the bunch, and therefore is only proper to be coupled with the loose-growing kinds, that have long foot-stalks. The white muscat of Alexandria produces large loose growing bunches, and the berries being very large and well-flavored, it must be a proper kind to be coupled with many sorts. There is a peculiar delicacy in the flesh of the white sweetwater; it is also a remarkably thin skinned grape, with large berries; consequently, it is a proper kind to couple with various sorts that are small and less delicate. Were the red Frontignac and white sweetwater wedded together, their union would probably produce a very valuable sort, as there would be a good chance of its being both large and delicate, and well flavored. The Syrian vine is only admired for producing most astonishingly large bunches, and, therefore, I would not advise the joining this coarse sort to any other except the following, as, in all likelihood, the offspring would only produce bunches much less ponderous. But the white muscat of Alexandria, having larger berries and longer footstalks, there would be a probability of producing a kind between this and the Syrian grape, that would exceed the original parents both in size and flavor.

The following kinds also admit of a junction with great propriety, viz. " the black Damascus and grizzly Frontignac; the flame-colored Tokay and red Frontignac; the white muscat of Alexandria and white sweetwater; the black Frontignac and white muscadine; the St. Peter's grape and white muscat of Alexandria." Other examples might be cited, but these Speechly considers as " sufficient to stimulate persons of taste and curiosity to pursue an amusement that one may venture to pronounce will contribute both to their advantage and pleasure." He augurs, " that the best sort of grapes hitherto known will at some future day be esteemed only as secondary kinds." *Treatise on the Vine*, p. 44.

Neill observes, that as several persons are now engaged in the raising of seedling vines, in all probability some excellent and hardy kinds will soon be produced; so that another generation may once more see vineyards common in this country. *Ed. En.* art. *Hort.*

Grapes, for seed, should be permitted to remain on the plant till the fruit is perfectly mature, and the seeds of a very dark brown color. They should be separated from the pulp, and preserved till February or the beginning of March. They should then be sown " in pots filled with light fresh mould, and plunged in a moderately warm hot-bed; they will come up in four or six weeks, and when the plants are about six inches high, they should be transplanted singly, into forty-eights, and afterwards into pots of larger size. Water gently as circumstances require, allow abundance of light and air, and carefully avoid injuring any of the leaves. Cut down the plants every autumn to two good buds, and suffer only one of these to extend itself in the following spring. Shift into larger pots as occasion requires, till they have produced fruit. This, under good management, will take place in the fourth or fifth year, when the approved sorts should be selected and the rest destroyed, or used as stocks on which to graft or inarch good sorts.

Forsyth, and some other authors, advise planting seedling vines the second year of their growth, against a wall in the open air, and there letting them remain till they produce fruit. Where there is abundance of walling to spare, and no great haste requisite for proving the fruit, this is a very good mode, as the fruit in such a case is certain of growing larger, and therefore affording a better opportunity of judging of its merits, as to size of bunch and berry. Keeping the plants in large pots, on the other hand, though the bunches and berries may not grow quite so large, yet as both the wood and fruit may be ripened under glass, is a more eligible mode; the plants will produce fruit sooner, and that fruit will be of better flavor.

It would not be prudent, Speechly observes, "to furnish a wall, or any part of a hot-house, with seedling vines in their untried state, or before they have produced fruit; for although the prospect of obtaining good kinds from seed saved in a hot-house, be more promising and certain than that of getting them from seed of grapes in vine countries, (because there, when the vines flower, the very air is impregnated with the farina of the grapes of the vineyard, which are, generally, of sorts of harsh, austere qualities, esteemed only for making wine, and not at all fit for eating); yet many of the new kinds from seed, will prove to be worse sorts than the originals from which the seed was saved. A specimen, therefore, of the fruit, should be obtained from each plant, be tried and tasted before it is permitted to be planted against the walls in a vinery or hot-house, or in any permanent situation. The fruit of seedlings is not even always such as to render it advisable to introduce the plants in a vineyard; for though it may not have the sweetness, flavor, bulk, or precocity desired in an eating grape, it may be of that insipid large-berried kind, which is fit only for making the most inferior wines. In most vine countries, a small black berry, with an austere taste, and aromatic flavor, and a close bunch like that of our black cluster, is preferred to all others. *Treat. on the Vine*, 8vo. edit. p. 60.

It may be observed, that though vine-plants raised from the seeds of black or red grapes will generally produce red or black berries, yet they will occasionally produce white ones; and the produce of white berries will sometimes, in like manner, be berries of other colours. Thus plants, from the stones of the peach, will sometimes produce nectarines; and though a nectarine-stone will, in general, produce a tree of the same kind as Collinson experienced (*Smith's Correspond. of Linn.* 71.); yet it will sometimes also, as the French gardeners declare, produce trees bearing peaches.

By Layers. The advantages of layers are generally stated to be that of procuring large showy plants that come immediately into bearing, and we have given (1217.) a successful instance of this practice from layers made in a vinery; but when taken from stools in the open air, it happens almost always that the roots of the layer are not ripened; the consequence of which is, that their extremities rot off, and the following year the plants make hardly any shoots. Layering without, or but with a trifling incision, as is too frequently done in the hurry of nursery business, greatly contributes to this effect, by obliging the shoot to derive all its nourishment from the parent plant or stool, to which, in autumn, the descending sap is returned. Whereas, when a deep incision is made, or a ring of bark taken off in Knight's manner (883.), less sap ascends, the shoot is not so long, it ripens sooner, and the descending sap reposes in, and ripens the roots. It is not easy to conceive in what way plants so raised can be inferior to those raised from cuttings of one or of several eyes; though it appears to be the general opinion that they are not so long-lived as plants raised from one eye. "Vine-plants raised by layers," Speechly observes, "are much inferior to plants raised by cuttings, both in point of future vigor and durability." Hitt wonders how any one can prefer cuttings to layers, since the former are always one year behind the latter.

By Cuttings. The advantages of propagating by cuttings are economy in labour, economy in the wood or shoots to be propagated from, and tops or shoots proportioned to the roots. There are three kinds of cuttings used in propagating vines.

Long Cuttings. The *first* are from a foot to eighteen inches long, consisting of new or young wood, with a joint or two of that of the preceding year. This is the sort recommended by Miller; adopted in forming vineyards on the continent; and formerly also in this country in planting walls or vineries. They are inserted so as to leave only two eyes above ground; the earth is firmly pressed round the lower part, to which the old wood is attached; they are mulched, and water is supplied regularly in dry weather. Cuttings of this sort, so treated, strike freely, as Speechly observes, either with or without bottom heat. We have seen them in some French nurseries producing luxuriant shoots and branches of grapes the first year. Justice says he prefers stocking a vinery from such cuttings to using rooted plants.

Short Cuttings. The *second mode* is that of forming the cuttings with only one eye on young or one-year old wood, and a few inches of that of the preceding year attached. "Each cutting should have two inches of the old wood, with one eye of the new. The bottom part should be cut perfectly smooth; plant in pots, one cutting in each pot, which, as to size, should be a forty-eight. When the plants begin to get strong, and the pots full of roots, it will be necessary to shift them from the forty-eights to the thirty-twos." *Speechly.*

Single Eyes. By the *third mode*, the cuttings have only a single eye on young or one-year old wood. This mode was first adopted by the Rev. M. Mitchel, and by him communicated to Speechly, about the year 1770. The following is Speechly's reasoning in its favor: "It is allowed," he says, "that cuttings are generally preferable to layers, and that plants of any sort raised from small cuttings, commonly make the best plants. The new plant is injured in proportion as it partakes too abundantly of its original or mother plant. Hence, the less the bulk of the matter that forms the new plant the better; for plants raised from seed have the smallest beginning of any, and are preferable both to layers and cuttings." *Tr. on Vine*, 52.

Perhaps, the chief advantage of propagating by eyes in preference to short or long cuttings or layers, is, that the sets are more manageable, and can be more readily potted and placed in pits or frames, to receive bottom heat; on which, applied early in spring, and continued through summer, accompanied by proper shiftings and waterings, much more than on the form of the cuttings, depends abundance of roots, and fitness for bearing the second year. We have seen single eyes raised in pineries, produce strong shoots from ten to twenty feet the first year, and others, in cold frames or pits, with only a little bottom heat to start the plants in spring, produce weak shoots, not longer than two or three feet.

Ripe wood is to be chosen for propagating by eyes; and though some are of opinion that cuttings taken from the lower part of the vine are preferable to those that grow higher and at a distance from the root, yet Speechly says, he never could find any difference, provided the wood was equally well-ripened. Forward shoots, from vines forced early, he considers as the most eligible; and these will generally be found at the most distant parts from the root, as vines generally break first at the extremities of the shoots; and at these extremities will be found both the strongest, earliest, and best ripened wood, and largest and most abundant bunches of fruit. Very strong shoots abound too much with pith to make good cuttings, the requisites to which are as follow: "1. The eye or bud should be large, prominent, and bold. 2. The shoots should be moderately strong, round, and short-jointed. 3. The texture of the wood should be close, solid, and compact; and the best criterion of its maturity is, its solidity, and having very little pith." *Tr. on Vine*, 57.

Choose fit shoots at the pruning season, and preserve them till wanted in spring, by cutting them into moderate lengths, and placing their lower ends in earth, which must be moistened, if it get very dry.

"Cut the upper part of the shoot sloping, with a sharp knife, about a quarter of an inch above the eye; and, at about three inches below the eye, cut off the wood horizontally, or right across, and smooth the section."

In some of the London nurseries, Speechly's mode of forming vine-cuttings is reversed, and the wood is cut off horizontally close below the eye, and at three inches above it: others cut at equal distances from the eye, and bury the whole cutting in the soil, with the eye uppermost, which appears superior even to Speechly's mode, where no bottom heat can be afforded, as affording a greater supply of nourishment to the young shoot. Plant in pots and apply bottom heat as in propagating by short cuttings.

By Grafting. The advantages of this mode of propagation may not at first sight appear, but they are, Speechly observes, "many and important." *First*, when a wall, or vinery, is planted with inferior kinds of vines, the usual method of stubbing them up and supplying their places with better sorts, is attended with much expense and loss of time: as several years must elapse before the wall can be completely furnished with new vines; but, by grafting, the nature of the vines may be changed without expense or loss of time; for I constantly have good grapes from the same year's graft; and in a hot-house the grafts, if permitted, will frequently shoot thirty or forty feet the first summer. *Secondly*, in small vineries, or vine-frames, where it would be inconvenient to have any considerable variety of sorts from roots, they may be procured by grafting different kinds upon one and the same plant. A Syrian vine now (1759) growing in the hot-house at Welbeck, produces sixteen different sorts of grapes. But the most important advantage, Speechly considers to be, "the improving the various kinds of grapes, and particularly the small kinds, which generally make weak wood. By grafting the weak and delicate growing vines, as the blue Frontignac, upon robust and vigorous stocks, as the Syrian, it will produce well-sized handsome bunches, almost as large as those of the Hamburgh." The Syrian vine, raised from seed, is greatly preferable to all others for stocks. If the seed degenerate to a kind of wildness, so much the greater will be the vigor of the plants, and the higher the flavor of the sorts grafted on them.

At the pruning season select cuttings for grafts from the best bearing branches, in general preferring the bottom part of last year's shoot; preserve them, by inserting them three parts of their length in pots, till wanted. The season for grafting in stoves is the beginning of January; in the open air, the middle of March. On small stocks not more than one inch in diameter, cleft-grafting will be found the most proper; but, upon larger stocks, whip-grafting is to be preferred. As vine-grafts do not take so freely as those of most other fruits, the operation must be performed with the greatest care. But the most eligible mode of grafting vines is that by approach, in which case either the stock or scion must be growing in a pot. Strong plants, two years potted, are to be preferred for the open air; but for a vinery, or hot-house, plants from the nursery may be potted, or shifted, if already in pots, and inarched the same season. In whip or cleft grafting, the clay may be taken off when the scion has made shoots five or six inches long; but here both clay and bandage should remain two or three months after the graft has formed a union, lest the grafted part spring from the stock.

1487. *Culture.* For the culture of the vine in the forcing department, see Chap. VII. sect. 2. What follows concerns chiefly the management of vines in the open air.

Soil. The vine will thrive in any soil that has a dry bottom; in such as are rich and deep, it will grow luxuriantly and produce abundance of large fruit; in shallow, dry, chalky, gravelly, or schistous soils, it will produce less fruit, but of better flavor. The greater part of the vineyards of France, Bosc observes, (*Cours complet d'Agricultur*, &c. art. *Vigne*,) are on a soil *argil-calcareous;* sometimes primitive, as those near Dijon; and sometimes secondary, as those at Bourdeaux. Argillaceous gravel is the next in frequency, as near Nismes and Montpelier, and that which produces the *Vins des Graves* of Bourdeaux. Both good and bad wines are produced from the *debris* of granites; among the former are the *côtés roties* and hermitage on the Rhone. The excellent wines of Anjou are made from vines growing among schistous rocks. Wines which are made from vines planted in chalky soils, are weak, colorless, and do not keep well, as those of Champaigne. Wines grown on the ashes discharged from volcanoes are excellent, as those of Vesuvius and Etna. Soils surcharged with oxide of iron, red or yellow, are not less proper for making good wine.

Retentive clays are the worst soils for the vine; the flowers are in great part abortive; the fruit, if it sets, does not ripen; the shoots not ripening well are more easily affected by frosts, and the wine, if any can be made, is weak and flavorless. Such a soil, even when in a warm climate, is particularly obnoxious to the vine, as Bosc observed in the botanic garden established at Charlestown, in South Carolina, by Michaux. There vines brought from France produced for six months in the year, buds, leaves, and shoots; flowers, the greater part of which proved abortive, and green and ripe berries. This circumstance, he considers, will prevent the successful culture of the vine in that part of America.

Switzer observes, that the soil for the vine should be light, having a bottom of chalk or gravel, under a surface of about two feet deep and free from springs; it cannot be too hot nor too dry, provided it be not in its own nature so very barren that nothing will grow upon it. If given to brambles, it is a certain sign of fitness, as no plant whatever is so co-natural to the vine as this shrub. In chalky-bottomed lands, and in gravel, which is not springy or spewy, grapes are the largest and sweetest of any; and where these are most abundant, we dare challenge even Paris itself to excel us. *Pr. Fruit Gard.* 149.

Hitt, having observed a vine at Belvoir-castle growing out of the stony foundation of a wall, without any other roots than what were fixed therein, producing better fruit, and earlier ripe, than any other in the open ground in these gardens, advises the mixture of lime-rubbish, brick-bats, &c. for a foot deep in the bottom of wall-borders destined for the vine. *Tr. on Fr. Tr.* 12.

Laurence says, "he cannot easily be brought to think that any soil or situation can be too dry for the roots of the vine, after having seen at Barnwall, near Oundle, a flourishing vine grow from between the joints of an old castle-wall, near twenty feet high from the ground, and which produced admirable crops of grapes when well managed." *Fruit-Gard.*

Speechly says, "the soil in which I have known the vine to prosper in the most superlative degree without artificial aid, was a kind of rich sandy loam, intermixed with beds of materials like jointed slate, or stone, so very soft in its nature as almost to be capable of being crumbled between the fingers." Strong and deep lands most suitable for tillage are the least so for vines, and hence the introduction of vineyards would have no bad effect respecting agriculture. *Tr. on the Vine*, 29.

Manures. Dung, Speechly observes, should not be permitted to approach the roots of vines till it be perfectly reduced to a kind of black mould. Soot, wood-ashes, pigeons' and hens' dung, he considers too hot for the root of the vine; pond mud and moor earth too cold. Stable-yard dung is too spirituous, hot, and fiery, when introduced before its heat is thoroughly abated. Some sorts of lime are bad; but others might be advantageous, if introduced into vine compost. "Vines are greatly injured in their roots by the common practice of laying lime-rubbish for the bottom-floor in the preparation of the ground. Blood, the offal of animals, or shambles' manure, horn-shavings, old rags, hair shavings of leather, bone dust, dung of deer and sheep, and human ordure," are admissible when duly meliorated by time, a winter's frost and repeatedly turning over. The dust and dirt of roads, Speechly greatly esteems as a manure for vines; its fertile nature he attributes, "in part, to the dung, urine, and other rich materials of which it is composed; and in part to a kind of magnetic power impressed upon it by friction, and its perpetual pulverization." *Tr. on the Vine*, p. 37.

Cow-dung is generally preferred for the vine in France; but the vine growers take every sort they can get: the more careful, however, form composts of earths, leaves, weeds, cleanings of ditches, rivers, and ponds, which they turn over a year at least before using. In some places, littery dung is buried in trenches between the rows; but in general, the dung, of whatever kind, is spread on the surface, and regularly dug in. Green crops are sown and dug in in some places. *Cours Complet, &c.* art. *Vigne.*

Forsyth considers the best manure for vines to be a mixture of vegetable mould, rotten spit dung, and fresh loam; these ingredients should be thrown into a heap, and frequently turned a year or two before it is used.

The vine is allowed by all gardeners to be a gross feeder; the fertility of both the Hampton-court and Valentine's vines are attributed to their roots having found their way, the former into a large common sewer, and the latter into a pond of stagnated muddy water (*Hort. Tr.* iii. 337.) Some vines in the hot-houses at Earl's court produced abundance of blossoms the second year from the eye, and the young wood of the same vines the third year is now (June 1, 1820) throwing out laterals with large bunches of flowers; so that these vines the third year are producing two crops, one of which is now ripe and the other in blossom. The cause of this extraordinary fertility appears to be the soil of the border, which is composed of equal parts of garden-earth and blood mixed together, and repeatedly turned over one year before using.

Vine Walls. A south wall is always to be preferred for vines; though, in some years, the hardier sorts may attain a tolerable degree of perfection on a wall considerably inclined to the east or west. Vines, Speechly observes, do well on low walls six feet high; and it has been found that the plants grow stronger, and afford larger grapes when they do not exceed four or five feet in height; they enjoy in this way both the reflected heat of the wall and of the earth. Flued-walls have been tried for vines in some parts of the north of England; but Speechly, and English gardeners in general, do not approve of the practice. In Scotland, though flued-walls are more common and better understood, yet vines are seldom planted in the open air.

For standards or plantations in the way of vineyards, Switzer recommends, "that side or declivity of a hill lying to the south or south-east, which, if favored with other hills, somewhat higher, cloathed with wood on the north, north-east, and north-west, will break the severity of those perishing quarters." Speechly concurs in this opinion, adding, that the hills in the counties bordering on the English channel, have in general declivities tending to the south, and are, therefore, highly favorable for vineyards. Steeps of poor gravelly and rocky soils, in warm situations, would produce more under vines than under any other crop.

Sorts for the open air. Some of these have been already enumerated. (1484.) And an addition may be made from the hardy sorts described in the table.

Planting. Where a wall is to be entirely covered with vines, three plants of a sort may be planted at the distance of three, or if a large-leaved kind, of four feet from each other; the two outer plants to be considered as temporary to fill the wall, and produce a supply of fruit; and the centre plant to be considered as permanently to fill the space occupied by the other two. The temporary plants will, therefore, be trained chiefly on the upper part of the wall, and the permanent ones below; and in four or five years the latter will be in a state to cover the wall, when the former may be rooted out. When vines are only planted in the intervals between other fruit-trees, or on piers, to be trained within a narrow upright ace, then one plant to each is sufficient. Some, however, as Forsyth, place two against a pier, one on each side; but this is more to obtain a variety of sorts than to fill the space.

1488. *In pruning and training* in the open air, any of the modes described as applicable to forced vines (1219.) may be adopted. As they break more regularly in the open air than when forced, the spur-method (*fig.* 314.) and the fruit-tree method (*fig.* 315.) seem to deserve the preference.

Williams, of Pitmaston, (*Hort. Trans.* iii. 250.) describes a mode of training so as to fill up the vacancies of other fruit-trees, which seems well-deserving attention. "A vine," he says, "might be trained horizontally under the coping of a wall to a great distance, and by inverting the bearing-shoots, the spaces between the other fruit-trees and the top of the wall could readily be filled up, and if different vines were inarched to the horizontal branch, the south wall of a large garden might be furnished with a variety of sorts from the stem and root of a single plant, the roots of which would not encumber the border in which the other fruit-trees are growing. I have an experiment of this kind now in progress in my garden. Within a few years past, I have gradually trained bearing-branches of a small black cluster-grape to the distance of near fifty feet from the root, and I find the bunches every year grow larger, and ripen earlier as the shoots continue to advance. According to Knight's theory of the circulation of the sap, the ascending sap must necessarily become enriched by the nutritious particles it meets with in its progress through the vessels of the alburnum; the wood at the top of tall trees, therefore, becomes short-jointed and full of blossom buds, and the fruit there situated attains its greatest perfection. Hence we find pine and fir trees loaded with the finest cones on the top boughs, the largest acorns grow on the terminal branches of the oak, and the finest mast on the high boughs of the beech and chesnut; so likewise apples, pears, cherries, &c. are always best flavoured from the top of the tree. But I suppose there are certain limits beyond which the sap would be so loaded with nutriment that it could not freely circulate."

Training the shoots of vines along the ground like those of melons and cucumbers has been proposed by Vispre, (*Dissert. on the Growth of Wine in Eng.* Bath, 1786.) and was practised by him on a small scale at Chelsea, where "the grapes were considerably larger than those of the same kind growing on a south wall, and well ripened." Bacon had before suggested this mode, from a report that "in some places vines are suffered to grow like herbs, spreading upon the ground, and the grapes of these vines are very large, &c." It appears from Vispre, that the Rev. M. Le Brocq had taken out a patent for training trees in this manner. Speechly says, "Fruit-trees of various sorts have been so trained at Welbeck for fourteen years;" and we have seen the practice adopted in the Earl of Selkirk's garden at St. Mary's Isle in Kirkcudbrightshire, above fifteen years ago.

1489. *Growing the Vine on Espaliers.* This may be done, following the same directions in all respects as for walls; but it is evident that, under such treatment, the fruit will not come to the same degree of maturity as when enjoying the shelter and reflection of a compact screen. Where wine is made from green grapes, as is now frequently done, the practice may be preferable to growing the vine as dwarf-standards.

Growing the Vine as Standards. This practice may be adopted either in the borders of gardens, or in extensive plantations as vineyards, and the plants may be trained either like red currants or raspberries. In the former case no stakes are used; but about a foot from the ground, three or more shoots, eighteen inches or two feet in length, diverge from the stem, and supply young wood annually for bearing. The summer-pruning consists in removing shoots which have no fruit, or are not wanting for the succeeding season; in topping fruit-bearing shoots, and also those for the succeeding years, when inconveniently long and straggling. For as by this mode the shoots destined to bear are all cut into three or four eyes at the winter season, no inconvenience arises from their throwing out laterals near the extremities, which stopping will generally cause them to do. This mode is adopted in vineyards on dry rocky situations where they do not run much to wood. In training standard vines, as raspberries, the single stem at bottom is not allowed to exceed six or eight inches in height, and from this two or three shoots are trained or tied to a single stake of three or four feet in length. These shoots bear each two or three bunches within a foot or eighteen inches of the ground, and they are annually succeeded by others which spring from their base; that is, from the crown or top of the dwarf main stem. This is the mode practised in the north of France and in Germany; in the south of France and in Italy, the base or main stem is often higher, and furnished with side-shoots, in order to afford a greater supply of bearing wood, which is tied to one or more poles of greater height.

The summer-pruning in this case is nearly the same as in the last. In the winter-pruning, the wood that has borne is cut out, and the new wood shortened in cold situations to three or four eyes, and in warmer places to six or eight eyes.

1490. *Formation of Vineyards.* A vineyard is a collection of standard-vines, planted in rows of a greater or less width, according to the height and mode of training proposed to be adopted; and according as the soil may be rich and deep, or poor and thin, or its surface flat or inclined. A square yard of surface to each plant, when they are kept low, may be considered as a desirable medium.

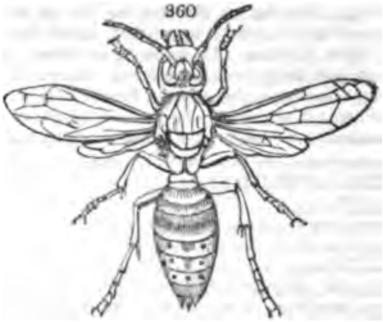
Where plantations of vines are made on the sides of very steep hills, it is sometimes customary to form the surface into terraces or horizontal beds rising one above another. The widths of these beds or terraces depend on the regular or irregular declivity of the hill. When the declivity is regular and the hill steep, each terrace is narrow and supported by a wall, against which the vines are planted and trained as on low garden-walls or espaliers; but, in general, the irregularity of the declivity and surfaces of hills, causes a very great inequality in the breadth and height of the terraces, and in these cases the vines are planted as standards, according to the room afforded by the platforms of the terraces. The walls which support these platforms in vine-countries, are generally too rude to admit of training against them, and therefore one of the standard modes above described is almost always adopted.

Sorts of Grapes proper for a Vineyard. On the continent the vines reckoned best for making wine are by no means the most agreeable to eat; and there is always a clear distinction made between fruits to eat, and fruits for the press, by the nurserymen, who, in general, have only plants of the former sort for sale. The names of vineyard grapes vary in every district; so that were it desirous to procure sorts from France or Germany, only a general order could be given. In this country, however, it would probably, in the event of planting a vineyard, be found preferable to select from the sorts already acclimated, and rendered hardy by many years' culture and propagating from seed, such as the clusters, sweet-waters, esperione, &c. The sorts planted in the vineyard at Painshill, were the Burgundy, or large black-cluster, and the Miller-grape, or small black-cluster.

1491. *Making of Wine from Grapes.* The making of wine is a part of domestic economy that can hardly be considered as included under gardening. We shall, therefore, merely suggest, that where grapes are to be pressed in any quantity, the management of the liquor should not, if possible, be left to mere empiric practitioners. Some knowledge of the general principles of fermentation will help to guard against accidents, and direct in doubtful cases. The assistance, therefore, of a person possessing some knowledge of chemistry, or one who has been concerned in the manufacture of British wines, will be found desirable on such occasions. An excellent paper "On the Processes of Wine-making" will be found in the second volume of the Memoirs of the Caledonian Horticultural Society, by Dr. Macculloch, of Woolwich. H. S. Matthews, (in the *Hort. Trans.* ii.) has given a receipt for making a very tolerable sort of red-wine from the leaves of the claret-grape; these leaves, it is suggested, might be employed to give color to wine produced from certain sorts of white grapes, green gooseberries, or other fruits producing a colorless fermented liquor.

1492. *Insects which infest the Vine.* The red spider, of which there are many sorts, attacks the leaves in spring, or early in summer; increases prodigiously in dry weather, and soon damages and destroys the foliage. Speechly says, red-spiders "generally reside and breed on the under side of the leaves, and the infested leaves are very distinguishable as soon as they are attacked by them, for the insect wounds the fine capillary vessels with its proboscis, and this causes the upper surface of the leaf to appear full of very small dots, or spots of a light colour. When the acari are very numerous, they work a fine web over the whole under-side of the leaf, as also round the edges thereof; and it is curious enough to observe, that they commonly carry this web in a straight line, from one angular point of the leaf to another, on which boundary line, in a warm day, they pass and re-pass in very great numbers. Watering is the only effectual means of destroying this insect. (*Tr. on the Vine,* 162.) The thrips, (*Thrips,* L. Latr. and Leach.) is more injurious to vines in the forcing department than to those in the open air. However, if young shoots chance to receive any injury from late spring frosts, the tender part of the leaf will immediately curl up, and change to a dark-brown colour; and in this state, the thrips generally attacks them with great greediness, especially the white sweet-water, and white muscadine kinds. The green-fly, sometimes attacks vines; but seldom so as materially to injure them. Smoking destroys both insects. There are two or three kinds of *cocci,* or pine-bug, that sometimes infest the vine, (*Coccus Hesperidum* and *adonidum,*) but they rarely do much injury in the open air.

The blue-fly, (*Musca vomitoria,* Latr.) attacks the fruit when nearly ripe, before the wasp or birds begin to devour it. Forsyth says, "As soon as it makes its appearance, you must provide betimes plenty of bottles, a little more than half filled with some sweet liquor to entice them to enter and be drowned. Hang the bottles on the nails, at proper distances, all over the vines, and also place some of them at the bottom of the wall."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The wasp, (*Vespa vulgaris*,) and in some places the hornet (*V. Crabro, fig.* 360.) attacks the fruit, like the blue fly, and is to be destroyed in a similar manner; or by tying up the bunches in gauze bags.

Birds of various species, but chiefly the smaller kinds which may abound in the neighbourhood, also attack grapes. A few of them may be shot and hung up as scares; or bagging may be adopted; or where there is a full regular crop over the wall, trellis, or standards, the trees may be protected by netting or bunting. The latter will protect them also from the fly and wasp.

Subsect. 3. The *Fig-Tree.* — *Ficus Carica*, L. (*Trew. Ehret.* t. 73, 4.); *Polygam. Diœc.* L.; and *Urticeæ*, J. *Figuier*, Fr.; *Feigenbaum*, Ger.; and *Figo* or *Fico*, Ital.

1493. This is a low tree or shrub, a native of Asia and Barbary; naturalized in Italy and the south of France, and enduring the open air in Britain. The fig-tree in France and Italy grows as large as our apple-trees, but in this country seldom exceeds two yards in height; the trunk is about the thickness of the human arm, the wood, porous and spongy; the bark, ash-colored; the branches smooth with oblong white dots; the leaves annual in Europe, but perennial within the tropics; cordate, ovate, three or five-lobed, thick, and the size of the hand. The fruit is a berry, turbinate and hollow within; produced chiefly on the upper part of the shoots of the former year, in the axils of the leaves on small round peduncles. The flower is produced within the fruit; what is considered as the fruit being a common calyx or receptacle: the male flowers are few, and inserted near the opening in the extremity of the receptacle, or fruit; the female flowers are very numerous, and fill the rest of the hollow space within. The greater part prove abortive, both with and without the process of caprification.

The fig forms an important article of culture in the isles and borders of the Mediterranean sea, and especially in Greece, Italy, and Spain. It is also much cultivated for drying in the south of France; and for the table, at Argenteuil, near Paris. The earliest notice we have of its culture in England is by Turner in 1562. The first trees were brought over from Italy by Cardinal Pole, in 1525, during the reign of Henry the Eighth, and yet exist in the gardens of the archbishop at Lambeth. They are of the white Marseilles kind, and still bear delicious fruit. They cover a space fifty feet in height, and forty in breadth; the circumference of the trunk of two of the trees is twenty-eight, and of another twenty-one inches. At Oxford, in the garden of the Regius Professor of Hebrew, is a fig-tree, which was brought from Aleppo, and planted by Dr. Pocock in 1643. It is in a thriving condition, and bears a black fig.

Gerarde says, "The fig requires a hot wall;" and Parkinson, that they are planted in great square tubs, to be removed into the sun in the summer-time, and into the house in winter. The culture of the fig was little known here till the time of Miller, who introduced above a dozen new sorts from Italy. He observes, that the generality of Englishmen are not lovers of this fruit, and that, therefore, few trouble themselves with the culture of it. Since Miller's time, the fig has been introduced to the forcing department, and there cultivated to a much higher degree of perfection than before on open walls; and though it be still true, that a taste for the fig in its green or fresh state is less prevalent in England than elsewhere, yet, by those who have been some time abroad, it is generally much esteemed.

Use. It is cultivated here entirely for the desert; but in fig countries it is eaten green or dried, fried or stewed, and in various ways, with or without bread or meat, as food. Abroad the fig is introduced during dinner, as well as at the desert. In common with the melon, it is presented after soup; and the person who cuts a fig, holds it by the small end, takes a thin circular slice off the large end, and then peels down the thick skin of the fruit in flakes, making a single *bonne bouche* of the soft interior part.

All the species of the genus *Ficus* have more or less the quality of intenerating animal fibre, like the papaw-tree (*Carica papaw*); the F. *elasticus* in the greatest degree, and next, the common fig. The milky sap may be used as rennet, and for destroying warts. Philips says, "a gentleman who lately made the experiment, assured me that a haunch of venison, which had lately been killed, was hung up in a fig-tree when the leaves were on, at about ten o'clock in the evening, and was removed before sunrise in the morning, when it was found in a perfect state for cooking, and he adds, that in a few hours more, it would have been in a state of putrefaction." (*Pom. Brit.*

169.) Burying in the soil for ten or twelve hours is a well-known and effectual resource for intenerating recently killed fowls, or tough butcher-meat.

1494. *Varieties.* These, in fig countries, are almost as numerous as those of the grape; new sorts being readily procured from seed, and continued by cuttings, layers, or grafting. Bosc says, that even in France new sorts are continually produced, and as quickly falling into neglect. The varieties most esteemed in England are the following: those marked thus * will ripen as standards under favorable circumstances.

**Brown Chesnut-colored Ischia.* This is one of the largest that we have: it is of a brown or chesnut color on the outside, and purple within; the grains are large, and the pulp sweet and high-flavored. It ripens in August; and if planted against a hot-wall, two crops may be obtained annually.

**Black Genoa Fig.* This is a long fruit of a dark purple color, the inside being of a bright-red, and the flesh very high-flavored. It ripens in the latter end of August.

**Small White early Fig. Langley Pom.* t. 52. The skin of this fruit is of a pale yellow when ripe: the flesh is white and sweet. It is ripe about the latter end of August or beginning of September.

**Large White Genoa Fig. Poit. et Turp. Fr.* t. 4. This is a large fruit, the skin is thin and yellow when ripe, and red within. It is a good fruit, and is ripe about the latter end of August. This and the preceding bear two crops annually.

Black Ischia Fig. This is a middle-sized fruit; the skin is almost black when ripe, and the inside of a deep red. The flesh is high-flavored, and the trees good bearers.

Brown and Black Small Italian Figs. These are cultivated in pots; the fruit is small, round, and very delicious. Forsyth gathered from one plant in a twenty-four pot, two dozen of figs at one gathering.

Malta Fig. This is a small brown fig; the skin of a pale brown, the inside of the same color; the flesh is sweet and high-flavored. It is ripe in August and September.

Murrey; Brown Naples Fig. This is a pretty large fruit, of a light-brown color, and the inside nearly of the same color; the flesh is well-flavored; and it ripens about the middle of September.

Green Ischia Fig. This is an oblong fruit with a green skin; but being thin, is stained through of a brownish cast by the pulp when full ripe. The inside is purple, and the flesh high-flavored. It is ripe about the middle of September

Madonna, Brunswick; or Hanover Fig. This is a large pyramidal fruit; the skin brown, the flesh a lighter brown, coarse, and has but little flavor. It ripens about the middle of September.

Common Blue or Purple Fig. Duham. n. 2. tab. 2. f. 1. This is a large oblong fruit, ripens in August, and is a good bearer.

Long Brown Naples Fig. The skin of this fruit is of a dark brown when ripe, the flesh inclining to red; it has large grains, and a good flavor, and ripens about the beginning of October.

Small Brown Ischia Fig. This is a small pyramidal fruit; the skin of a light brown; the flesh of a purple cast, and of a high flavor. It ripens in October.

Yellow Ischia Fig. This is a large fruit, the skin yellow, and the flesh purple and well-flavored. It ripens in October.

Gentile Fig. This is of a middle size; roundish fruit, the skin yellow, and the flesh inclining to the same color. It has large grains, and a good flavor; ripens very late, and the trees are but indifferent bearers.

According to Forsyth, the figs proper for a small garden are, the

Large white Genoa, Early white, Murrey fig, and Small brown ischia, and Black ischia.

1495. *Propagation.* Figs may be propagated from seed, cuttings, layers, suckers, roots, and by ingrafting; the most generally approved method is by layers or cuttings, which come into bearing the second, and even the first year.

By Seed. Here the same process as that directed for raising seedling vines is to be followed, with this difference, that the young plants should not be cut down on account of their mode of bearing. They will produce fruit in the sixth or seventh year The process of crossing to obtain new varieties can here be performed only in the general way, of placing two or more sorts together; or of introducing with a small hair pencil the pollen from the father variety, to take effect in conjunction with that of the male blossoms in the plant destined to bear seed. Possibly, however, some curious horticulturist may find a mode of cutting out the male blossoms without destroying the females; in which case the pollen from the father variety may be introduced to take effect alone. J. Lee, of Hammersmith, has raised several new sorts from seed.

By Cuttings. These are formed of young wood from eight inches to twelve inches in length, with an inch or two of old wood attached. They should be taken from the most fruitful, well-ripened, short-jointed boughs in autumn, and either preserved from the frost till spring, or planted in pots or in a bed of earth from six to nine inches deep, without cutting off their tops. The soil should be a loam inclining to sand, and in a warm situation; it should be covered with old bark, leaves, or ashes, to keep out the frost in spring, and the drought in summer. If the cuttings have been planted in autumn, then their tops will require the additional protection of haulm or litter during winter. Give water and keep clear of weeds during summer, and by the following autumn, the plants will be fit to be transplanted into nursery rows; where they must be again mulched at root, and protected at top. They require no pruning farther than what may be required to rear them with a single stem, and keep their heads of a regular shape; the second or third year they may be removed to where they are finally to remain. Cuttings of roots readily make plants, but the process is too slow for general use, and the plants so produced are not likely to come so soon into bearing as by the layers or cuttings.

By Layers. This is the quickest mode of getting bearing trees, as shoots of two or three years' growth, if laid down, will make abundant roots the first summer, and admit of being taken off and placed where they are finally to remain in the autumn. Miller says, "young shoots or suckers produced from old stools should never be taken, as they are too soft and spongy, liable to be affected by frost, and not likely to prove goodbearers."

By Suckers. This is an easy, but a bad method, for a common reason, that all trees raised from suckers are subject to send out great quantities of suckers again from their roots, which branches are never compact and fruitful, because too luxurious to be ripened in our climate. Miller, says, " this vicious habit, contracted while the trees are young, may be afterwards corrected."

By Grafting. This mode can only be advantageously adopted in cases similar to those recommended for grafting the vine (1486.). The process by any of the modes readily succeeds, and we have seen in Italy above a dozen sorts of figs on one tree.

1496. *Culture.* For the culture of the fig in the *Forcing Department*, see Chap. VII. sect. 5. In the open air, the plants are grown as standards, espaliers, and against walls; but, as already observed, the fruit produced in any of these situations is of very inferior flavor to that grown under glass. A crop of figs, Miller observes, is generally more uncertain than that of any other fruit: and Neill says, Britain is certainly not the country for figs. From the attention now paid to this fruit, however, by some eminent horticulturists, we may hope for improvement, and, at any rate, for a more general taste for the fruit.

Soil. The fig-tree thrives in all soils not wet at bottom; but they produce a greater quantity of fruit upon a strong loamy soil than on dry sandy ground, a dry soil being apt to make them cast their fruit. Miller says, "I have always observed those fig-trees to bear the greatest quantity of well-flavored fruit which were growing upon chalky land, where there has been a foot or more of a gentle loamy soil on the top. They also love a free open air; for although they will shoot and thrive very well in close places, yet they seldom produce any fruit in such situations." Smith, (*Caled. Hort. Mem.* vol. ii.) after trying several soils, found the fig-tree thrive best in a rich friable loam, free from latent water at bottom.

As Standards. In fig countries, this tree is always grown as a standard; and here dwarf-standards, planted in very warm situations, will, in very favourable seasons, afford tolerable crops of fruit. Some of the best in England are at Arundel Castle; and there is a fig-orchard of 100 trees at Tarring, near Worthing. Those at Arundel are planted six or eight feet apart, and from a single stem, allowed to continue branching into regular conical heads; pruning chiefly irregular and redundant growths, and cutting out decayed or injured wood. Miller says, standard fig-trees, when protected during winter, generally bear better than those against walls, which, however, may be considered as in great part owing to the mode of training and pruning figs in the latter situation not having then been generally understood.

At Argenteuil, where the fig is cultivated in immense quantities for the supply of the table, the plants are grown as dwarf-standards; and the chief part of their culture, Bosc observes, consists in keeping their branches short, low, and spreading, to enjoy both the heat of the sun and reflection of the earth. The ground is manured occasionally, and stirred at least once a year; and for protection from the frost during the winter, the circumferential low branches are buried six inches in the soil, and the central ones enveloped in litter.

On Espaliers. Where figs will succeed as standards, they will also thrive against espalier rails; in which situation they admit of being more readily covered or protected during winter. The plants may be placed at ten or twelve feet distance, and trained in the fan or horizontal manner.

On Walls. This is unquestionably the best mode for our climate, as it admits of more readily protecting the plants during winter, and is more likely to bring the fruit to maturity in the summer or autumn. The distances at which the plants are placed will depend on the height of the wall. In general, a low wall is to be preferred, both because the fig is naturally adapted for being kept low, and because, when low, it admits more readily of protection. The plants may be placed from fifteen to twenty feet apart, with temporary trees of the fig, peach, or any other fruit between.

Mode of Bearing. "The fig-tree," the Hon. W. Wickham observes, "is distinguished from most, if not from all other trees, by this extraordinary property, that it bears, and, in warmer climates, brings to maturity, in every year, two successive and distinct crops of fruit, each crop being produced on a distinct set of shoots. The shoots, formed by the first or spring sap, put forth figs at every eye, as soon as the sap begins to flow again in July and August. These figs (which form the *second crop* of the year,) ripen, in their native climate, during the course of the autumn; but rarely if ever, come to perfection in England, where, though they cover the branches in great abundance, at the end of that season, they perish, and fall off, with the first severe frosts of winter. The shoots, formed by the second flow of sap, commonly called midsummer shoots, put forth figs in like manner, at every eye, but not until the first flow of sap in the following spring. These last-mentioned figs, which form the first crop of each year, ripen, in warmer climates, during the months of June and July, but not in this country before September or October. In warmer climates, indeed, very little attention is given to this first crop, because the midsummer shoots, on which it is borne, are commonly in the proportion only of one to six or eight in length, when compared with the shoots of the spring, which produce the second crop; and the crop itself is always small, in the same proportion. But in England, it is the reverse. As no care or skill of the gardener can ever insure a second crop of ripe figs in the open air."

1497. *Pruning and Training.* Most gardeners, Miller observes, imagine that fig-trees should never have much pruning; or, at least, that they should always be suffered to grow very rude from the wall to some distance. *A pruned fig-tree never bears*, is a common saying, " nor, according to W. Wickham, can its truth be denied, when applied to the most common method of pruning these trees, *i. e.* by cutting away or shortening the last year's shoots, instead of cutting away old wood, and training those shoots to the wall in its place." This horticulturist recommends a system of pruning which may increase the proportion which the Midsummer shoots (the only ones, as stated above, which produce fruit that ripens in this country,) bear to the spring shoots, both in number and length. For this purpose, he breaks off the spring shoots as they nearly attain their full growth, and just as the spring sap in each begins to abate something of its full vigor. He breaks them at moderate distances (six to fifteen inches, according to the strength of each shoot), from the place whence they severally spring, taking care that enough of the shoot be left to admit of its being bent back, and nailed close to the wall at the ensuing winter pruning, and that one eye, at least, be left uninjured by the fracture, and always preserving a quantity unbroken, sufficient to keep up a future supply of branches and wood. The shoot may be either broken short off, or left suspended by a few ragged filaments, which may afterwards be separated with a knife, when the spring sap has ceased to flow. The former mode is less unsightly, and will therefore be generally preferred by the gardener; but the latter has been found more successful in practice. It is of consequence, however, to the full success of this system, that the shoots should be broken and not cut. If left to their natural growth, or shortened by a sharp smooth cut with a knife, (instead of a fracture), they would produce, at their extremities, only one single midsummer shoot, being a simple prolongation of the wood, formed in the spring; but when the shoot is broken at the time, and in the manner above described, it generally happens that, on the second flow of sap in July, two or three or more shoots (forming a kind of stag's-horn), are pushed from the fractured part instead of one; and it is hardly necessary to add, that each of these, according to its length, will produce several figs in the ensuing spring, (making the first crop of that fruit), all of them capable of being ripened by our ordinary summer and autumn heats.

" A sufficient supply of midsummer shoots being thus procured during the summer, room must be made for them at the succeeding winter pruning, by cutting away so much of the old wood as will admit of their being all trained in, at full length, and nailed close to the wall, which should always be done before the first severe frosts. Keeping this object in view, the knife cannot well be used too freely in cutting away the old wood, nor is there any reason to fear that its free use will either injure the future crops, or deprive the tree of its regular supply of branches. The midsummer shoots being trained in, each of them will produce, in the following year, one spring shoot, at least, at its extremity, whilst another will rise from each eye of the remnants of the old spring shoots that had been preserved in the manner above described, when these shoots were broken, in the preceding month of June. From this fresh supply, by pursuing the system here explained, either wood or fruit, or both, may be obtained for the succeeding year, at the discretion of the gardener. Where he wishes for wood, he must suffer these new shoots to grow to their full length; where fruit, and not wood, is desired, he must break them in the month of June, in the manner and with the precautions that have been minutely explained." *Hort. Trans.* iii. 74. et seq.

T. A. Knight disapproves highly of training the branches of fig-trees perpendicularly, as encouraging too much the prolongation of the shoots; he approves of Wickham's mode in warm situations, but in high cold situations, he radiates his branches from the top, and parts near it, of a single stem. He says, " Let the stems, if there be, as usual, many within a narrow space, be gradually reduced to one only; and from the top, and parts near it, of this, let lateral branches be trained horizontally and pendantly, in close contact with the wall. Under such treatment, all troublesome luxuriance of growth will soon disappear; the pendant shoots will not annually extend more than a few inches, and few or no more leaves will be produced than those which the buds contain before they unfold. The young wood consequently ceases to elongate very early in the season, and thence acquires perfect maturity; and by being trained close to the wall, is placed secure, or nearly so, from injury by the severest frost. The quantity of mature and productive young wood thus necessarily become very great, relatively to the size of the tree; and the fruit being in contact with the wall, and not shaded by excess of foliage, acquires an early and perfect maturity." *Hort. Trans.* iii. 307.

The Rev. G. Swayne, from the various papers on the culture of the fig-tree, published in the Horticultural Transactions, but particularly from that of W. Wickham, infers, " that the principal defect requiring a remedy is a deficiency of fruitlings, or bloom, in the early spring, on the whole of the last year's shoots, excepting on the few joints at their extremities," and he describes a remedy which he has for a long time been in the habit of using, and which h e" considers as a specific." It is simply to rub off, as soon as they can be discovered by the naked eye, all the figs which are produced after Midsummer on the same year's shoots. The object is not only to prevent those figs which would never ripen without artificial heat, to exhaust the tree, but to give it sufficient time to employ the strength which would have been employed in nourishing these "sterilizing incumbrances," in the seasonable preparation of new embryo figs for the following year. "If this operation," he says, "be performed in due time, it will not fail to prepare on one, and often on both sides, of almost every fig so displaced, such embryos. For this purpose, the trees should be examined once a week, from the beginning of August, at which time the figs of this second crop usually begin to shew themselves, and this examination must be repeated as long as any of these make their appearance." Most gardeners, he says, omit removing these late figs at all, or delay the practice till October or November, when no benefit is derived from it. He trains the trees horizontally, and does not prune them till late in the spring, when he can plainly distinguish between a leaf and a fruit-bud, as well as appreciate the whole of the mischief occasioned by the frosts of the preceding winter. (*Hort. Trans.* iv. 430.) The above practice, in connection with the mode of training recommended by T. A. Knight, would, we think, effect an important improvement in the culture of this fruit. W. Wickham's mode appears to excite too much the powers of the tree; and the common mode of fan-training from three or four root-stems, which are in fact so many suckers, is only calculated to produce wood and leaves. Training the fig-tree on walls, as a rider, and in the stellate manner (*fig.* 274. *c.*), and pinching off all the embryo fruit after Midsummer, would probably effect every thing that can be desired in the culture of this tree on the open wall in this country.

1498. *Protecting during Winter.* This is found necessary in many parts of France, and every where in Britain. Miller recommends tying together the branches of standards, and applying peas-haulm, straw, or any other light covering; rolls of reeds to be placed on each side of espaliers, removing these coverings in mild weather, to prevent the figs from coming out too early. Forsyth covers fig-trees against walls with "laurel, yew, fir, or spruce boughs," and then "tucks in short grass or moss among the branches. Smith covers with spruce fir branches, from three to six feet long, fastening them to the wall by the middle rib of the branches, at two different places. "To prevent any friction by the wind, the branches should be made to fit each other, that the covering may be of a regular thickness over every part of the trees. As the covering is generally put on the trees in the month of December, the branches remain green all the winter; and in the month of March, when the days get long, the leaves begin to drop from the branches, and continue falling through April; and by the beginning of May, when the covering is entirely removed, only the ribs of the branches are found remaining. Thus, the progress of the season reduces the covering in a gradual manner, so as not to expose the trees to any sudden check, which might otherwise be the case, if they were all at once laid open to the weather."

Mean (*Hort. Trans.* vol. ii.) adopted the French mode of burying the branches in the soil in 1789, and has practised it with success ever since.

It is observed by the Right Hon. W. Wickham, (*Hort. Trans.* iii. 80.) in respect to covering fig-trees, that "much must be left to the care and skill of the gardener, whose precautions must be determined, as well as varied, by the situation, aspect, and local shelter belonging to each particular tree, and by the varying temperature of each particular winter; it may, however, be laid down as a general rule, that the covering, where used, should be as thin and light as a due consideration of all the above circumstances will admit, and that it should generally be removed in the day-time, and always on the return of moderate weather."

Ripening the Fruit. Williams suggests that the practice of taking off a circular ring of bark from the lower part of the branches of the fig, in the manner he has so successfully practised on the vine, might accelerate the maturity of the fruit; and the suggestion well merits a trial. A very general French practice is to prick the fruit with a straw or quill dipped in olive oil. In Italy, a wound with a knife is sometimes made on the broad end of the fig, or a very small part of the skin of the fruit removed for the same purpose. Brandy is also sometimes applied, either by a puncture on the side of the fruit with a bodkin dipped in the spirit, or by dropping a small quantity in the eye of the fruit.

"Plums and pears," Tournefort observes, (*Travels*, letter viii.) "pricked by insects, ripen the faster for it, and the flesh round such puncture is better tasted than the rest. It is not to be disputed but that considerable change happens to the contexture of fruits so pricked, just the same as to parts of animals pierced with any sharp instrument.

The process of caprification of figs is performed in the Levant to hasten the maturity of the autumnal crop, and consists in placing on the fig-trees what are called *figues-fleurs*, or spring-figs, in which a certain insect of the gnat species (*Cynips*, L.) has deposed its eggs. From these eggs, in the spring figs, proceed a multitude of gnats, which, in their turn, deposit their eggs in the autumn figs, or rather in their flowers, effecting in their passage the fecundation of these flowers, and, by consequence, hastening the maturity of the fruit.

The most enlightened French naturalists are of opinion that this is a very unnecessary part of the culture of the fig. Olivier, member of the Institute, and author of a Journey through the Ottoman Empire, considers it as "a tribute which man pays to ignorance and prejudice." "In many countries of the Levant," he says, "it is not performed, nor is it done in France, Italy, or Spain; and it is now neglected in some of the isles of the Archipelago, where it was practised formerly."

Bosc says, "The larva of the *Cynips*, in eating the interior of the figs, can be no otherwise useful than the larva of the *Pyrale pommonelle*, Hübner (*Phalæna*, Linn.), or apple worm, can be in hastening the maturity of the apple: and who would take it upon him to advise rendering apples worm-eaten in order to enjoy the advantage of eating them a fortnight sooner?" This observation, it may be observed, rather confirms the idea that caprification hastens maturity, which, from what we have seen in the neighbourhood of Rome and Naples, we believe to be the case Though we agree with Olivier, that it is by no means absolutely necessary to fecundation; and even if it were, that fecundation is not essentially requisite to the swelling and ripening of the fig.

Insects and Diseases. The fig is subject to few of either of these in this country. In forcing houses it is liable, in common with other plants, to the attacks of the red spider, and coccus, and aphides, and occasionally also on garden walls. The remedy is obvious. In France they are attacked by a species of Coccus, vulgarly called the fig-louse, which proves very injurious, and is only to be destroyed by rubbing them off with a coarse cloth.

Subsect. 4. The *Melon.* — *Cucumis Melo*, L.; *Monœc. Monadelph.* L.; and *Cucurbitaceæ*, J. *Melon*, Fr.; *Melone*, Ger.; *Mellone*, Ital.

1499. This is a tender annual, producing one of the richest fruits brought to the desert, and cultivated in England since 1570; but the precise time of its introduction, or the native country of the plant, are both unknown. It was originally brought here from Jamaica, and was, till within the last fifty years, called the musk-melon. The fruit, to be grown to perfection, requires the aid of artificial heat, and glass, throughout every stage of its culture. Its minimum temperature may be estimated at 65°, in which it will germinate and grow; but it requires a heat of from 75° to 80° to ripen its fruit, which, in ordinary cases, it does in four months from the time of sowing the seed.

Varieties. There are numerous varieties, many of which, especially those raised from seeds brought from Italy and Spain, are not worth cultivating. The best sorts are included under the name of cantaleups, an appellation bestowed on them from a seat of the Pope near Rome, where this variety is supposed to have been originally produced. The general character of the *Cantaleups* is a roundish form, rough, warty, or netted outer coat; neither very large in fruit or leaves. The *Romanas*, the Italian sort next in esteem, are generally oval-shaped, regularly netted; the fruit and leaves middle-sized, and the plants great bearers. Many varieties of both these sorts, however, that were formerly in esteem, are now lost, degenerated, or supplanted by others of Spanish or Persian origin. The following are among the best both of the old and new varieties.

The Early Golden Cantaleup. It is deep-furrowed, middle-sized, longish, golden colored; flesh not very high-colored nor high-flavored. The plant grows freely, shows early, sets its fruit well; and is a very great bearer.

The Orange Cantaleup. Smaller than the above, round, and pale yellow. The flesh, when just fit for cutting, is orange; but when riper, it is more red. As it swells and ripens, it becomes partly netted. In respect to flavor, it is excelled by none of the melon kind; being juicy, sugary, and rich. The plant is a free grower, an early setter, and a great bearer.

The Netted Cantaleup. This is equally juicy and high-flavored as the last-mentioned; a good deal larger, round, solid, and very ponderous; having a very small vacuum for the seeds; and it may be eaten nearer to the rind than most other kinds. The plant sets freely and is a good bearer.

The Silver Cantaleup. Round, of a middle size, shallow furrowed; and when full-grown, before it begins to color, is all over mixed silver and green. A very good bearer.

The Black Rock Cantaleup. This is a very large growing melon; round, black, or very dark green when full grown, but yellow when ripe. It is juicy, but not so high-flavored as any of the above cantaleups, except the first-named; nor is the plant so good a bearer. Four or five fruit in a light is a medium crop.

The Carbuncled Rock Cantaleup. Two varieties, a large and a small; both very similar to the black rocks, as to color and flavor; but flat or cheese-shaped, and covered with large protuberances or carbuncles. The small kind bears pretty freely, and the large sort less so.

Lee's Rock Cantaleup. Rather long than round, and more green than black. The flesh and flavor much the same as those of the last-mentioned variety.

The Italian Green-fleshed Cantaleup. Small, nearly globose; usually about four inches and a half in diameter; coat pale greenish white, moderately thin; flesh opaque, soft, and melting; in flavor both rich and sweet. *Hort. Trans.* iv. 319.

The Smooth Scarlet-fleshed Cantaleup. Roundish, inclining to oval; outside greenish-yellow, with fine white vermicular reticulations; flesh nearly an inch and a half in thickness, of an uniform bright scarlet from the edge of the coat to the centre, and tolerably firm; it is particularly high-flavored. *Hort Trans.* iv. 320.

The Montagu Cantaleup, is a variety produced from the two last-named sorts; intermediate in size between them; greenish-white without, the flesh an inch and half in thickness, not very high colored, but soft and juicy, completely melting in the mouth, and with a very sweet and delicate flavor. *Hort. Trans.* iv. 120.

The Green-fleshed Ionian Cantaleup. Lemon colored and lemon-shaped; large, thin skinned, no great bearer, and does not readily mature seeds, but of excellent flavor. *Caled. Mem.* iv. 210.

The Green-fleshed Egyptian Melon. Middle-sized, round, netted; in habits and flavor resembling the last-named variety. *Caled. Mem.* iv. 210.

Lee's Romana. Middle-sized, longish; shallow-furrowed, solid, and ponderous. Rind hard, partly netted, and pale yellow, flesh a full yellow, pretty high-flavored, but not very juicy. Plant a good bearer.

The Large Netted Romana. The largest of the romanas, regularly netted all over, shallow-furrowed, oval, solid, and very ponderous, often attains to nine or ten pounds in weight. Rind hard, pale yellow when fit to cut; the flesh a full yellow, but not very juicy; very high-flavored, if eaten sharp-ripe. The plant is a better bearer than any other large sort.

Fair's Romana. Small, oval, smooth, solid and ponderous; the rind hard, greenish-yellow when fit to cut; and the flesh a pale yellow, not very juicy; well-flavored and agreeable; may be pared very near to the rind. The plant is a very great bearer.

The Polignac. A rich-flavored middle-sized oval fruit, in frequent cultivation.

The Small Portugal, or *Dormer,* noted as a good bearer, and a very early variety.

The Black Portugal, or *Galloway.* A sub-variety of the former.

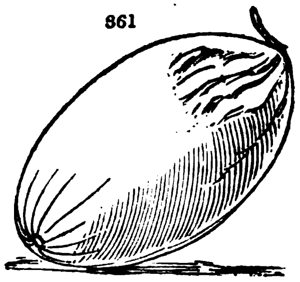
The Salonica, nearly spherical, and without any depressions on its surface; color that of gold, pulp, pure white; improves in flavor and richness till it become quite soft, consistence of its pulp is nearly that of a water-melon, and it is very sweet. A full-grown specimen of the fruit generally weighs about 7lb. *Knight in Hort. Trans.* ii.

The Dampsha Melon. A variety from Persia; nearly cylindrical and netted; color varying from pale yellowish-green to dark olive: flesh bright and deep green near the skin; pale towards the centre, quite melting, and of excellent flavor: hung up by the stalk, or in nets in a dark room, it keeps until the winter months. *Oldacre in Hort. Trans.* iv. 212.

The Sweet Melon of Ispahan. Fruit ovate, varies in length from eight to twelve inches; nearly quite smooth, of a deep sulphur color; skin very thin, flesh white, extending about half way to the centre; crisp, sugary, and rich in taste. *Hort. Trans.* iii. p. 117.

The Winter Melon (*fig.* 361.) Cultivated in various countries bordering on the Mediterranean sea, and particularly in the orange gardens at Hieres, near Toulon, whence its fruit is sent to Paris. Skin thin, flesh white, firm, saccharine, and juicy; not rich, but pleasant. The shape oval, size, about a foot long, and eight inches broad; color a dark-green. This fruit is regularly imported, and may be had in the fruit-shops from September to January. *Hort. Trans.* iii. p. 116.

The Water Melon. C. Citrullus. (See 1301.)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"In the cultivation of the melon," Knight observes, "it is a matter of much importance to procure proper seed. Some gardeners are so scrupulous on this point that they will not sow the seeds unless they have seen and tasted the fruit from which they were taken. It is proper at least not to trust to seeds which have not been collected by judicious persons. Some make it a rule to preserve always the seeds of those individual specimens which are first ripe, and even to take them from the ripest side of the fruit. A criterion of the goodness and probable fertility is generally sought by throwing them into a vessel containing water; such as sink are considered as good and likely to prove fertile, those that float, as effete. It is remarked of seeds brought from the continent, that they must have more bottom heat, and the young plants less water, than are necessary for seeds ripened in this country, or young plants sprung from these (1271).

For the *entire course of culture* of the melon, see Chap. VII. sect. 7.

Subsect. 5. *The Cucumber.* — *Cucumis sativus,* L.; *Monæc. Monadelph.* L.; and *Cucurbitaceæ,* J. *Concombre,* Fr.; *Gurke,* Ger.; and *Citriuolo,* Ital.

1500. This is a tender annual, a native of the East Indies, and introduced in 1573. It is a trailing and climbing plant, with large roundish rough leaves, furnished with tendrils, and if sown in the open air in May, produces flowers from July to August. The cucumber is of nearly as great antiquity as the vine, for Moses, the earliest Jewish author, mentions it as abounding in Egypt, when the children of Israel were there above three thousand years ago, (*Numbers,* chap. ii.) In England it is cultivated generally and extensively, in forcing frames and in the open air, and especially near large cities and towns. "Not only gentlemen," as M'Phail observes, "but almost every tradesman who has a garden and dung, have their cucumber frame." In Hertfordshire, whole fields are annually seen covered with cucumbers without the aid of dung or glass, and the produce of which is sent to the metropolis for pickling. In March, cucumbers fetch in the London market a guinea a dozen; in August and September one penny a dozen. The village of Sandy, in Bedfordshire, has been known to furnish 10,000 bushels of pickling cucumbers in one week.

Use. The green fruit is used as a salad; it is also salted when half-grown; and preserved in vinegar when young and small. In Germany and Poland, barrels of half, and also full-grown cucumbers, are preserved from one year to the other, by immersion in deep wells, where the uniform temperature and exclusion of air seem to be the preserving agents.

Varieties. The principal of these are:

The Early Long Prickly; from five to seven inches long, of a green color, with few prickles. The plant is a good bearer; and upon the whole, this is accounted the best cucumber for the general summer crop, the pulp being very crisp and pleasant.

Longest Green Prickly; from seven to ten inches in length; it has a dark green skin, closely set with small prickles. This is a hardy sort, but does not come early.

Early Short Prickly; not more than four inches long; the skin green, rather smooth, but with a few small black prickles. This is one of the hardiest and earliest sorts, and is often preferred for the first crop.

Dutch, or *White Short Prickly,* though not much cultivated, is recommended by some, as preferable even to the early long prickly; it has fewer seeds; is evidently different in taste from most other cucumbers, but of agreeable flavor.

Cluster Cucumber; a very early sort, the flowers appear in clusters of three or four together; the fruit is seldom more than five inches long; it is at first of a fine green color, but becomes yellowish as it ripens. The stems of this variety are much inclined to climb by means of their tendrils upon sticks; the leaves are small, and the plant altogether occupies but little room.

Smooth Green Roman; an early sort; the fruit becomes large and long, and is quite smooth; the plants grow very strong, and require a good deal of room.

White Turkey; the stalks and leaves are larger than in the other varieties; the fruit also is very long, sometimes from ten to fifteen or even twenty inches; it is quite straight, and has a smooth skin destitute of prickles; it is produced sparingly, and late in the season.

Long Green Turkey; sometimes sown for the late crop. Late cucumbers, however, are much less cultivated than the early varieties; most gardeners being of opinion, that those kinds which are best for the early crops are also best for the late.

Nepal; fruit very large, usually weighs upwards of twelve pounds' weight, measures in girth twenty-four inches, and in length seventeen inches; flavor pleasant and esteemed for stewing. Sent to the Horticultural Society from Calcutta by Dr. Wallick. *Hort. Trans.* iv. 156.

Culture. The culture of the cucumber, as a table esculent, is chiefly carried on by artificial heat or protection, and is therefore treated of under the *Forcing Department*, Chap. VII. sect. 6. For pickling, it is chiefly cultivated in the open ground, by what is termed drilling, and which forms the only branch of the culture of this vegetable reserved for this article.

" To have a crop in the natural ground, the seed is sown in warm compartments of rich earth, towards the end of May, or beginning of June, when the weather is settled, warm and dry. The plants should mostly remain where sown, to produce late fruit, towards the end of July, or more generally in August and September, small for picklers, and in larger growth for ordinary consumption. Sow a portion in a warm border, and the main crop in an open compartment. Dig the ground neatly even. Trace lines with intervals of five or six feet; and in the lines mark stations three and a half feet distant; then, with a trowel at each of these spots, form shallow circular saucer-form cavities in the surface, ten or twelve inches wide, and about an inch deep in the middle. Sow in the middle of each cavity eight or ten seeds, half an inch deep.

" When the plants are come up, and begin to put forth the first rough leaves in the centre, thin them to three or four of the strongest in each hole. Earth these up a little, between and close round the stems, pressing them a little asunder; and give them some water, to settle the earth below and above. In their advancing growth, train out the leading runners. Supply them with requisite waterings, in dry weather, two or three times a week, or sometimes every day in very dry hot weather, in July, August, or September. At this season, water early in a morning, or late in the afternoon, towards evening.

Gathering. " The crop comes in sometimes towards the end of July, but more generally not before August in full production; continuing till about the middle or end of September, when the plants decline. Be careful to gather the fruit in a prime state, both for pickling and other purposes. They must be quite young for pickling, not exceeding two or three inches in length." *Abercrombie.*

SECT. II. *Exotic Fruits, well known, but neglected as such.*

Under this head we include the orange tribe, one of the most beautiful, and also, a very useful class of fruits. The culture of oranges and lemons for the table is not at present common in England; but, in our opinion, it might be pursued with much enjoyment to the amateur, since, independently of the gratification of seeing fruit of one's own growth at the desert, no object of the fruit-tree kind can be more splendid than a large healthy orange-tree covered with fruit. The pomegranate seems also to merit culture, both for its singular beauty while on the tree, and the addition it would make to the desert.

SUBSECT. 1. *The Orange Tribe.* — *Citrus*, L.; *Polyadel. Polyan.* L.; and *Aurantiæ*, J.

1501. There are five species or leading sorts, of which the fruit are used; all natives of Asia, viz. the common orange, the lemon, the citron, the lime, and the shaddock. The common character of the plants bearing these fruits is that of low evergreen trees, with ovate, or oval lanceolate, entire or serrated, leaves. On the ungrafted trees are often axillary spines. The flowers appear in peduncles, axillary or terminating, and one or many flowered. The fruits are large berries, round or oblong, and generally of a yellow color.

The species seem best distinguished by the petiole, which, in the orange and shaddock, is winged; in the citron, lemon and lime, naked. The form of the fruit, although not quite constant, may also serve for a distinction. In the orange and shaddock, it is spherical, or rather an oblate spheroid, with a red or orange-colored rind; in the lime, spherical, with a pale rind; in the lemon, oblong, rough, with a nipple-like protuberance at the end; in the citron, oblong, with a very thick rind. The flowers of the citron and lemon have ten stamens, and those of the orange more.

Professor Martyn observes, that it is very difficult to determine what is a variety, and what is a species in this genus. The trees in the eastern countries, where they are natives, vary in the size and shape of the fruit and leaves; and many of those considered varieties in Europe, preserve their differences in their native woods. He has no doubt that any one who would pursue this subject in the native countries of these fruits, would detect varieties connecting all those generally considered as species. This opinion appears highly probable when we examine the catalogues of the continental writers on this fruit; who, in general, finding it difficult to make botanical distinctions, are obliged to rest satisfied with popular descriptions. In *Nouveau Cours, &c.* art. *Oranger*, those cultivated in France, and in Dr. Sickler's work, and that of Gallesio, those of Italy, are so described.

Dr. Sickler, who spent several years in Italy, and paid great attention to the kinds and culture of the orange, published, in 1815, *Der Vollkommene Orangerie-Gartner* (*the Complete Orange Gardener*), in which he describes above seventy sorts of *citrus*, including all the species above mentioned. He arranges the whole in two classes, and these classes into divisions and subdivisions, without regard to their botanic distinctions or species, thus:

Lemons…	Cedrates or Citrons	……………	4 sorts.
	Lemons…	Round-shaped lemons…	6 ditto.
		Pear-shaped ditto..	11 ditto.
		Cylindrical ditto..	4 ditto.
		Gourd-shaped ditto .	12 ditto.
		Wax lemons…………	5 ditto.
	Cedrate lemons or citronates……		6 ditto.
	Lumies or Lomies	Lumies……………	5 ditto.
		Apple lumies………	3 ditto.
	Limes……………		4 ditto.
Oranges…	Bitter oranges……………		6 ditto.
	Sour oranges……………		6 ditto.
	Sweet oranges……………		12 ditto.

The names and some descriptive traits of these seventy-four sorts of Citrus will be found in "A Short Delineation of Dr. Sickler's Treatise, by Dr. Noehden." *Hort. Trans.* vol. iii. App.

Gallesio (*Traité du Genus Citrus*, &c. Savonna, 1818.) has given a synoptic tree, (*fig.* 362.), in which he has introduced ramifications which display an arrangement of the forty principal sorts cultivated in Italy.

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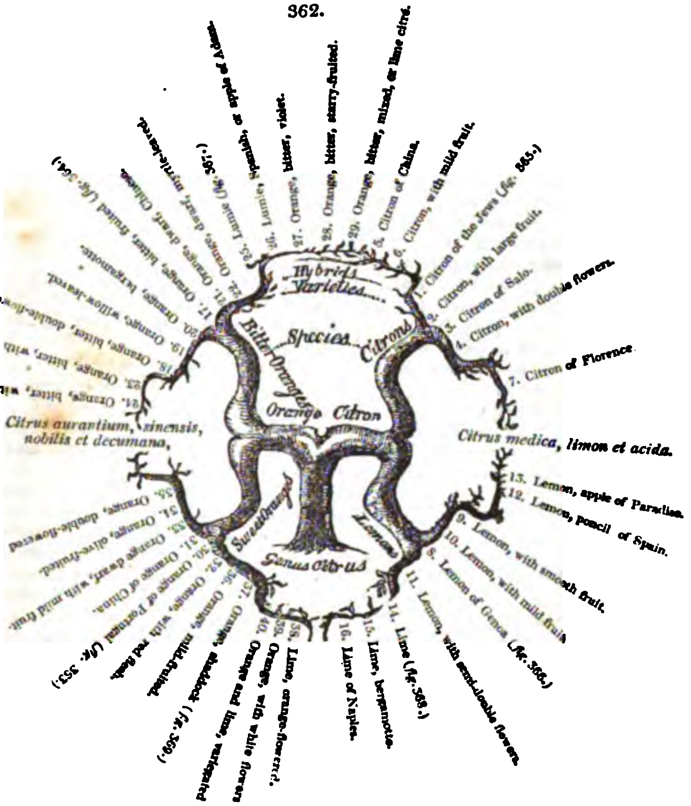

Hybrids
Varieties
Species
Bitter Oranges
Citrons
Orange
Citron
Sweet Oranges
Lemons
Genus Citrus
Citrus aurantium, sinensis, nobilis et decumana,
Citrus medica, limon et acida.
24. Orange, bitter, with mild
23. Orange, bitter, with mild fruit.
18. Orange, bitter, double-flowered.
19. Orange, willow-leaved.
20. Orange, bergamotte.
17. Orange, bitter, fruited (fig. 364.)
21. Orange, dwarf, Chinese.
22. Orange, dwarf, myrtle-leaved.
25. Lumie (fig. 367.)
26. Lumie, Spanish, or apple of Adam.
27. Orange, bitter, violet.
28. Orange, bitter, starry-fruited.
29. Orange, bitter, mixed, or lime citré.
5. Citron of China.
6. Citron, with mild fruit.
1. Citron of the Jews (fig. 365.)
2. Citron, with large fruit.
3. Citron of Salo.
4. Citron, with double flowers.
7. Citron of Florence.
13. Lemon, apple of Paradise.
12. Lemon, pencil of Spain.
9. Lemon, with smooth fruit.
10. Lemon, with mild fruit.
8. Lemon of Genoa (fig. 366.)
11. Lemon, with semi-double flowers.
14. Lime (fig. 368.)
15. Lime, bergamotte.
16. Lime of Naples.
38. Lime, orange-flowered.
39. Orange, with white flowers
40. Orange and lime, variegated
37. Orange, shaddock (fig. 369.)
36. Orange, mild-fruited.
32. Orange, with red flesh.
30. Orange of Portugal (fig. 353.)
31. Orange of China.
33. Orange dwarf, with mild fruit.
34. Orange, olive-fruited.
35. Orange, double-flowered.

The most splendid work on oranges which has yet appeared is the "*Histoire Naturelle des Orangers*," by A. Risso, of Nice, and A. Poiteau, of Versailles, (*Paris*, fol. 1818.) Here 169 sorts are described, and 105 of them figured, and their French and Italian culture given at great length. They are arranged as sweet oranges, of which they describe 43 sorts; bitter and sour oranges, 32 sorts; bergamots, 5 sorts; limes, 8 sorts; shaddocks, 6 sorts; lumes, 12 sorts; lemons, 46 sorts; citrons, 17 sorts.

All the species of this tribe of plants endure the open air at Nice, Genoa, and Naples; but at Florence and Milan, and often at Rome, they require protection during winter, and are generally placed in conservatories and sheds. The largest conservatory in Italy is that of Prince Antonio Borghese, at Rome, which contains seventy select sorts of *agrumi*. The largest trees are at Sorenta, Teracina, Gaeta, and Naples; but the most regular and garden-like culture of the orange is in the orange orchards at Nervi, Monaco, and other places in the neighbourhood of Genoa. At Nervi are also the orange-nurseries which may be said to supply all Europe with trees; they are, in general, wretchedly cultivated, and the stocks inoculated in the most unscientific manner; but the fine climate, strong clayey soil, and abundant manurings, supply in a great degree the nicer practices of gardening. There the names of varieties vary as much as those of gooseberries do in England; and from upwards of one hundred names, not above forty distinct sorts can be procured. (26.)

Good plants of the Maltese and other varieties of orange may be procured from Malta; and some sorts also from Lisbon. From the nurseries at Paris about thirty sorts may be obtained, much smaller plants than those from the other places named, but more scientifically grafted or inoculated. The catalogues of London nurserymen enumerate above thirty varieties of orange, twelve of lemon, and several varieties of the other species; the plants are generally inoculated, and small, and are more calculated for pots than for planting in the soil for producing fruit. As being most useful for the British horticulturist, we shall place under each species the names of the varieties which may be procured in England.

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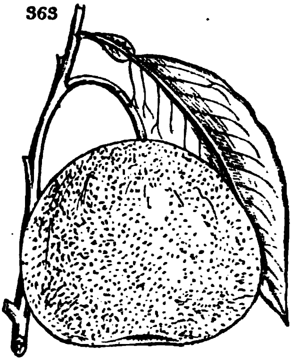

1502. The *Common Orange*, is the *Citrus Aurantium*, L.; the *Orange* of the French; *Pomeranze* of the Germans; and *Arancio* of the Italians. (*fig.* 363.) It is a middle-sized evergreen tree, with a greenish brown bark; and, in its wild state, with prickly branches. The fruit is nearly round, from two to three inches in diameter, and of a gold color. It is a native of India and China, but now cultivated in most countries of Europe; in the open air in Italy and Spain; and in conservatories or green-houses in Britain and the north of Europe. The orange is supposed to have been introduced into Italy in the fourteenth century, above a thousand years after the citron. In England, the tree has been cultivated since 1629. Parkinson, writing at that time, says, "it hath abiden with some extraordinary looking and tending, when neither citron nor lemon trees could be preserved any length of time."

In Gibson's edition of *Camden's Britannica*, it is stated, that "the orange trees at Beddington, in Surrey, introduced from Italy by a knight of the noble family of the Carews, were the first that were brought into England; that they were planted in the open ground, placed under a moveable cover during the winter months, and that they had been growing there more than a hundred years; that is, before 1595. It has been said, that these trees were raised by Sir Francis Carew, from seeds brought to England by Sir Walter Raleigh: but as such trees would not have readily borne fruit, Professor Martyn thinks it much more likely that they were plants brought from Italy. Bradley says, they always bore fruit in great plenty and perfection; that they grew on the south side of a wall, not nailed against it, but at full liberty to spread; they were fourteen feet high, the girt of the stem twenty-nine inches, and the spreading of the branches one way nine feet, and twelve feet another. These trees, Evelyn informs us, were neglected in his time during the minority of their owner, and finally entirely killed by the great frost in 1739-40.

During the latter end of the seventeenth and beginning of the eighteenth centuries, the orange tree was a very fashionable article of growth in conservatories, when there were but few exotics of other sorts kept there. The plants were procured from Genoa, generally with stems from four to six feet in height; they were planted in large boxes, and were set out during summer to decorate the walks near the house in the manner still practised at Versailles and the Thuilleries. About the middle of the eighteenth century, when a taste for botany and forcing exotic fruits became general, that for superb orange trees began to decline; many of these large trees have decayed through neglect; and those which are now to be found in the greater number of green-houses, are generally dwarf plants bearing few fruit, and those of small size. In some places, however, are still to be found large and flourishing trees. Those at Smorgony in Glamorganshire, are the largest in Britain; they are planted in the floor of an immense conservatory, and bear abundantly. It is said the plants were procured from a wreck on the coast in that quarter, in the time of Henry VII.

At Nuneham, near Oxford, are some very fine trees, planted under a moveable case, sheltered by a north wall. In summer, the case is removed, and the ground turfed over, so that the whole resembles a native orange grove. At Wormleybury, Hertfordshire, and Shipley Hall, in Derbyshire, are very fine large orange and lemon trees grown in borders, and in boxes. *Hort. Trans.* vol. ii. 295. and iv. 306.

At the Wilderness, Kent, (Marquis Cambden's), are three trees in boxes, not surpassed by any trees so grown in Europe. C. Bingham, at Isleworth, possesses a very fine collection ; and various others might be enumerated.

At Woodhall, near Hamilton, trees of all the species of *citrus* are trained against the back wall of forcing houses, in the manner of peaches, and produce large crops of fruit.

Oranges and lemons, trained as peach trees against walls, and sheltered only with mats of straw during winter, have been seen in a few gardens in the south of Devonshire, and particularly at Saltcombe, one of the warmest spots in England, for these hundred years. The fruit is as large and fine as any from Portugal. Trees raised from seed, and inoculated on the spot, are found to bear the cold better than trees imported.

Use. As a desert fruit, the orange is well known. The varieties imported, which are most esteemed for this purpose, are the China, Portugal, and Maltese. It is also used in confectionary, both ripe, and when green and not larger than a pea : it forms various liquors and conserves, either alone or with sugars, wines, or spirits ; and either the pulp or skin, or both, are used for these purposes. In cooking, it is used to aromatize a number of dishes. The juice of the Seville orange is used in medicine, in febrile and inflammatory disorders ; and that of the other sorts possesses the same qualities in a lesser degree. The acid of oranges, Dr. Cullen says, unites with the bile, takes off its bitterness, and may prove useful in obviating disorders arising from its redundancy and acridity. In perfumery, the orange is used to form various perfumes and pomades ; and the flower distilled, produces orange water, used in cooking, medicine, and as a perfume.

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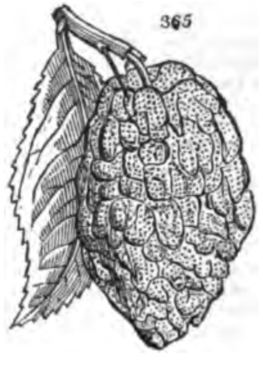
Varieties. These are very numerous in the eastern countries, and even in Italy and France. About forty sorts are cultivated in the neighbourhood of Paris, and about thirty in the London nurseries, of which we shall give a list. The two principal varieties are the sweet or China orange, the *orange douce* of the French, and *porto-gallo* or *poma de sino* of the Italians ; and the bitter or Seville, the *bigarade* of the French, and *arancio volgaro* of the Italians. The Maltese orange, distinguished by its red pulp, is also a noted and much-esteemed sort. The box-leaved, willow-leaved, and some others, are cultivated more as curious varieties than for their fruit.

Common orange.
Bloody fruited.
Broad leaved.
Burgamot large.
Burgamot small.
Cluster fruited.
Curled leaved.
Double flowered.
Fine leaved.
Laurel leaved.
Lisbon.
Maltese.
Bloody Maltese.
Monstrous.
Myrtle-leaved large.
Myrtle small.
Narrow leaved.
Oval fruited
Pale leaved.
Seville, or bitter orange, (*fig.* 364.), chiefly used for making marmalade.
Spike flowered.
Striped common
Striped curled leaved
Striped gold
Striped silver.
Striped tricolor.
Striped willow-leaved.
Sweet skinned.
Sweet China.
Tanjierano.
Thick-leaved.
Weeping.
Willow-leaved.
Clove, or mandarin, *C. Nobilis*, H. K. (*Bot. Rep.* 608. and 211.), distinguished from the common orange by its curious form, and by the pulp adhering so loosely to the rind as to be separable from it by the slightest effort, and leaving in many places a considerable opening between them. It is the most delicate of the orange-tribe, whence its name by the Chinese, of mandarin, or noble orange.

1503. The *Citron* is the *C. Medica*, L. ; (*Gær. fru.* 2. t. 121. f. 2.) The *Citron* of the French ; the *Citronier* of the Germans ; and *Cedrate* of the Italians. (*fig.* 365.) In its wild state the tree grows to the height of about eight feet, erect and prickly, with long reclining branches. The leaves are ovate, oblong, alternate, subserrate, smooth, pale green. The fruit or berry is half a foot in length, ovate, with a protuberance at the tip. There are two rinds, the outer thin, with innumerable miliary glands, full of a most fragrant oil ; the inner thick, white, and fungous.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The citron was introduced into Europe from Media, under the name of *malus medica*, and was first cultivated in Italy by Palladius in the second century. The date of its introduction into England is not exactly known ; it would probably be coeval with that of the lemon, which was cultivated in the botanic garden at Oxford in 1648. The fairest fruit, Miller states, was in the Duke of Argyle's garden at Whitton, where the trees were trained against a south wall, through which there were flue for warming the air in winter, and glass covers to put over them, when the weather began to be cold. Thus the fruit was as large and as perfectly ripe, as it is in Italy or Spain. In Italy citrons and lemons are generally trained on walls or espaliers, because, being considerably more tender than the orange, they require, at least in the north of Italy, some protection in winter; the fruit does not ripen regularly at one time, like that of the orange, but comes successionally to maturity almost every month in the year.

Use. The fruit is seldom brought to the desert in a raw state, but it forms excellent preserves and sweetmeats, to furnish the table when other fruits are scarce. The juice, with sugar and water, forms lemonade, a most refreshing, salubrious, and universally esteemed beverage. Its use in punch and negus is well known. It is much used in medicine, and also in perfumery and dyeing.

Varieties. Dr. Sickler enumerates only about a dozen citrons and citronates as grown in Italy. The French nurseries have nearly twenty names in their lists. In England the six following are cultivated for sale:

The common citron.
The flat fruited.
The rough fruited.
The forbidden fruit.
The grape fruited Barbadoes. *Hort. Tr.* vol. iii. p. 358.
The round fruited.
The thick leaved.

1504. The *Lemon* is the *C. Medica var. Limon*, W. (*Blackw.* 362.) The *Limon* of the French; *Limonier* of the Germans; and *Limone* of the Italians. (*fig.* 366.) The distinction between the lemon and citron are very trifling. The fruit is less knobbed at the extremities, is rather longer, and more irregular, and the skin is thinner than in the citron; the wood is more knotty, and the bark rougher. Cultivated in the Oxford garden in 1648.

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The *Uses* of the lemon are the same as those of the citron.

Varieties. Dr. Sickler enumerates twenty-eight as grown in Italy. The French, according to Ville Hervé, have eleven sorts; in the London nurseries are cultivated the twelve following:

Common.
Broad-leaved.
Chinese.
Imperial.
Pear-shaped, or Lumie, (*fig.* 367.)
Rough-fruited.
Smooth-leaved.
Striped gold.
Striped silver.
Striped three-colored.
Upright.
Warted fruited.

1505. The *Lime* is the *Citrus Acida*, Rox. (*Brown's Jam.* 308.) by some esteemed a variety of the *C. Medica*. The *lime* of the French, Italians, and Germans. (*fig.* 368.) The sour lemon, or lime, grows to the height of about eight feet, with a crooked trunk, and many diffused branches, with prickles. The leaves are ovate, lanceolate, almost quite entire. Berry an inch and a half in diameter, almost globular, with a protuberance at the top; the surface regular, shining, greenish yellow, with a very odorous rind, enclosing a very acid juice. It is a native of Asia, but has long been common in the West Indies, where it is grown both for its fruit and for fences.

The *Uses* of the lime are the same as those of the lemon, to which, in the West Indies, it is preferred; the juice being reckoned more wholesome, and the acid more agreeable to the palate.

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Varieties. By the catalogue in *Nouveau Cours*, &c. the French have two sorts of lime; and according to Dr. Sickler, the Italians have four varieties. The following five kinds are grown in the London nurseries:

The common lime. | The bread leaved. | The Chinese spreading. | The weeping. | The West India.

1506. The *Shaddock* is the *C. decumana*, W. (*Rump. am.* 2. t. 24. f. 2.) The *Orange Pampelmouse* of the French; and the *Arancio Massimo* of the Italians. (*fig.* 369.) The tree is above the middle size, with spreading prickly branches The leaves are ovate, subacute, seldom obtuse; the petioles are cordate, winged; the wings as broad as the leaves. The berry spheroidal, frequently retuse at each end, of an even surface, and greenish yellow colour; pulp, red or white; juice, sweet or acid; rind, white, thick, fungous, and bitter. Thunberg says, the fruit in Japan grows to the size of a child's head, and Dr. Sickler states its weight as fourteen pounds, and its diameter as from seven to eight inches. It is a native of China and Japan, and was brought to the West Indies by Captain Shaddock, from whom it has derived its name. From the West Indies it was sent to England, and cultivated by Miller in 1739.

Use. The shaddock is certainly the least useful of the species enumerated, and is cultivated chiefly for shew. Where several sorts of oranges are presented at the desert, it makes a striking addition to the variety. The juice is of a subacid sweetness, and excellent for quenching thirst; and the fruit, from the thickness of its skin, will keep longer in sea voyages than any of the other species of citrus.

Varieties. The Italians, according to Dr. Sickler, have one; and the French, according to the *Nouveau Cours*, &c. four sorts. The following four are grown in the English nurseries.

The common shaddock. | The rough fruited. | The largest fruited. | The West India.

1507. *Propagation*. All the sorts may be propagated by seeds, cuttings, layers, and grafting, or inoculation.

By Seed. The object of raising plants from seed is either to obtain new varieties or stocks for grafting. To attempt raising new varieties in Britain will in general be found a tedious process, as the trees do not even in Italy shew fruit for six or eight years or more; and there is now in the botanic garden at Toulon, a large handsome tree, of twenty-five years' growth, which had not in 1819 blossomed. However, if new varieties are attempted, select the largest and best formed ripe fruit of the kind to be raised, extract the seeds, dry them, and sow and nurse as hereafter directed for raising stocks.

Where trees are to be raised for stocks to bud oranges, Miller advises to procure citron seeds, as stocks from these are preferable to any other for quickness of growth; and also that they will take buds of either orange, lemon, or citron. Next to these are the Seville orange seeds; and the best of either sort are to be had from rotten fruits.

Prepare in spring a good hot-bed of dung or tan, and when it is in moderate temper sow the seeds in pots of light earth; plunge them, give water frequently, and raise the glasses in the heat of the day. In three weeks the seeds will come up, and in a month's time be fit to transplant into single pots. Then renew the bed, and fill pots of five inches diameter, half full of good fresh earth, mixed with very rotten cow-dung: shake out the seedlings, and plant one in each pot, filling it up with the same earth, and replunge as before. Give a good watering at the roots, and repeat this often, as the orange tribe in a hot-bed require a good supply of water. Shade in the day-time, when the sun is powerful, and give air so as not to draw the plants.

By this method, with due care, the plants will be two feet high by July, when they must be hardened by degrees, by raising the glasses very high, and afterwards, in fine days, taking them entirely off, shading the plants from the sun with mats or other screens. Towards the end of September, house them in a dry part of the green-house, near the glass, where they will not be liable to damp off. During winter refresh them with water, and in April now and then wash their stems and leaves, to clear them from any filth they may have contracted. Place them again in a moderate hot-bed, and harden them by the beginning of June, that they may be in right order to bud in August.

Budding. Make choice of cuttings from trees, that are healthy and fruitful, observing that the shoots are round; the buds of these being much better and easier to part from the wood than of such shoots as are flat or angular. After performing the operation, remove the plants into the green-house, or under glass frames, to defend them from wet, turning the buds from the sun; but let them have as much free air as possible, and refresh them often with water. In a month it will be observable which has taken, then untie them, and let them remain in the green-house all the winter. In spring cut off the stocks about three inches above the buds, and place them in a moderate hot-bed, giving air and water, and shading as before. By the end of July they will have made shoots of two feet or more; then harden them before the cold sets in, that they may the better stand the winter. In the first winter after their shooting, you must keep them very warm, for by forcing them in the bark-bed, they will be somewhat tenderer; but it is very necessary to raise them to their height in one season, that their stems may be straight, for in trees which are two or more years growing to their heading height, the stems are always crooked. In the succeeding years their management will be the same, as for full-grown trees.

1508. *Italian process of Raising and Budding.* In the orange nurseries at Nervi, the seeds of the citron or orange, as it may happen, are sown in beds in the open ground in February or March, and in September planted out in quarters, in rows generally about eighteen inches wide, and the plants six or eight inches in the row. They are placed thus close to draw them up with clean straight stems. There they remain generally four years, and in April or May of the fifth year they are taken up, their roots cut within four or six inches of the tap root, which is also shortened to six or eight inches, according to the size of the tree. The stem, if it has any side shoots, is pruned clean, and sawn off horizontally, at such a height as that the section is from half an inch to an inch in diameter, (*fig.* 370. *a*) The general heights are one foot, which forms the lowest growing plants; eighteen inches for trees to be sold in Italy; from two to four feet for trees to be sent abroad; and five or six feet for extraordinary orders. These last are not so common; as the stocks require six or eight years' growth, and some care to attain that height with clean stems, and a diameter of three quarters of an inch.

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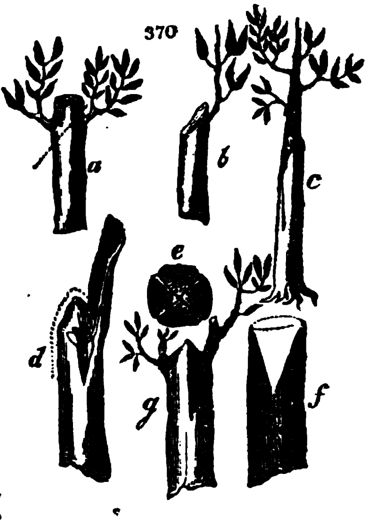

The plants thus pruned are budded, sometimes when out of ground, and sometimes after planting. One bud is inserted on each side of the stock (*a*), within an inch of the section. In a month buds and roots begin to push, and in December or January following these plants are in fit state for taking up for exportation. After being taken up, the roots, now well furnished with fibres, are enveloped in a ball of stiff clay; this is covered with moss carefully tied on, and in this way they are laid in boxes, or in casks, and sent not only to most parts of Europe, but to North and South America.

The chief defect in this system is the naked horizontal section at the top of the stem (*a*), which, not being smoothed with the knife and covered with clay or any other protection, to cause the bark to grow over it, indurates and cracks with the drought; retains moisture and decays, so that in almost all trees that have been budded in this way, a dead stump, or a rotten hole, may be observed during the whole period of their existence. This evil is often lessened by covering with a cap of lead or a patch of wax; but it might readily be obviated by peeling off a piece of bark from one side of the part of the stock to be sawn off (*d*), letting it remain attached to the lower part or stem; and after removing the head, bringing it down close over the section, inserting its end under the bark in the opposite side, somewhat in the manner of saddle-grafting; or the manner employed by surgeons in amputating a limb, (*e*,) might be adopted. A similar object might probably be effected by removing a wedge-shaped section from the top of the stock (*f*), and then compressing its sides, so as to present a wedge-shaped termination covered with bark (*g*). But the gardeners at Nervi are too indolent and obstinate (26.) to hear of any thing new, and will persist in their present plan till the credit of Genoa for orange-trees is gone, or till some strong necessity urges them to improvement.

The Maltese, aware of the defects in Italian trees, make a sloping section (*b*), paring it clean, and budding on one side only; the consequence of which is, that the section becomes covered with bark, and, which it never does in the Italian method, as sound and healthy as any part of the stem. The French graft and inoculate in a very neat manner (*c*), and indeed their orange trees, though small, are much handsomer than the Italian ones.

1509. *By Grafting.* This mode is occasionally resorted to in Italy, and is that most generally adopted in the nurseries at Paris. The stocks, when of two years' growth, and not much thicker than the scion, are cut over within six inches of the ground, and then grafted in the whip manner. The trees continue small, but have clean stems of from one to three feet, and generally make handsome plants, prolific in flowers and fruit, of a small size.

Grafting, both by the whip manner and by approach, is frequently practised in England, in nearly the same circumstances of age, size, and effect, as practised in France. A variety of the whip-manner is described by Cushing, in which the top of the stock is left on, but the scion is cut off as in grafting. "Form the scion as for the common whip-graft, and then, without taking off the head of the stock, cut from the clearest part of its stem an equal splice as smoothly as possible; do not tongue the scion, but tie it on neatly and firmly with matting and clay, in the manner of a graft: plunge them in a hot-bed, and cover with a cap-glass till the scion begins to grow, and then cut away the top of the stock, and remove the matting by degrees." *Exotic Gard.* 103.

Whip-grafting in the common way has lately been successfully performed, even with fruit or flowers, on the scion, by John Nairn, who gives the following account of the process: "Let the operator select as many orange or lemon stocks as he wishes to work, and place them on a moderate hot-bed, for a fortnight, by which time the sap will have risen sufficiently to move the bark; the stocks must then be cut off, about two inches above the surface of the pot, and an incision made with a sharp knife, similar to what is done for budding, separating the bark from the wood on each side. Let the scion be cut thin, in a sloping direction, and thrust between the bark and wood, and then bound tight with woollen yarn; but very great care must be taken, in binding, to prevent the bark from slipping round the stock, which, without attention, it is very apt to do. After it is properly and neatly bound, put a little loam, or clay, close round the stock, to the surface of the pot, then, with a glass of a proper form (*fig.* 371.), to prevent the damp from dripping on the scion, cover the whole, and press it firmly into the mould, to prevent the air or steam from getting to the plant; the glass must not be taken off, unless you find any of the leaves damping, and then only till this is remedied, when it must be immediately returned. The stocks must next be placed on a brisk hot-bed of dung, and in about six weeks, the glasses may be taken off, and the clay and binding removed; but it will be necessary to bind on a little damp moss, in lieu of the clay, and to keep the glasses on in the heat of the day, taking them off at night; when, in about three weeks or a month, they will be fit to be put into the green-house, where they will be found to be one of the greatest ornaments it can receive.

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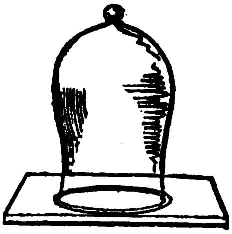


"I should recommend the *mandarine orange* for the first trial, as the fruit is more firmly fixed than that of any of the other sorts. I have, by the above method, had seven oranges on a plant, in a pot, commonly called a small sixty, which I conceive to be both curious and handsome." *Hort. Trans.* iii.

By Cuttings. This method, though little practised on the continent, where the object is large trees and fine fruit, is frequently adopted by the British gardener, whose object is generally small handsome plants. Two methods are adopted; the first is to take young succulent wood as soon as it has done growing, and the lower end has become somewhat mature. These cuttings, prepared properly (919.) are inserted with a small dibber in pots of light sandy loam, with two or three inches of gravel or broken pots at bottom. They are then covered close with a chrystal bell, and plunged in a gentle heat, and shaded. The glasses are taken off only to wipe them when damp, and to remove any decaying leaves. In two months such cuttings either strike or rot off.

The second method is in spring to take the shoots of last year; to prepare and plant them as above; but after covering them with glasses to plunge them in a cold frame, where they remain in a state of apparent inaction for three or four months, when they either form a callous excrescence at the lower end of the cutting, and push at top, or die off. After preserving them in a low temperature through the winter, they are placed the succeeding spring in a gentle hot-bed, where they will push freely, and make tolerable plants. The success of either mode may be facilitated by taking care to place the cuttings so as their ends may touch the bottom of the pot, or the potsherd or gravel with which that is covered. The advantages of so placing cuttings is generally known to gardeners, and has been noticed by Hawkins in the *Hort. Trans.* vol. ii. p. 12.

By Layers. This mode is occasionally practised both on the continent and in England. At Monza, near Milan, there is a very fine collection of lemon trees in boxes, trained as espaliers, which were so raised. The trees are five feet high, and each box has a portion of trellis attached to it of that height, and ten or twelve feet long, which is wholly covered with branches. Where laying is adopted, the plants may either be laid down on their sides, and laid as stools, or pots may be raised and supported under the branches to be propagated from. These branches, or their shoots of one or two years' growth, may then be cut or ringed, and bent into the pot, or drawn through the hole in the bottom, and treated in the usual manner, taking care to supply water with the greatest regularity. Shoots layered in March will be fit to separate from the stools as mother-plants in the September following. In general, it may be observed, that the citron tribe, like other fruit-bearing plants raised from cuttings or layers, though they may prove very prolific trees, yet seldom grow with that vigor and produce such large fruit as those propagated by budding or grafting on seedling stocks.

1510. *Culture.* The first object of consideration here is the *soil* most suitable for the citron tribe. At Genoa and Florence they are grown in a strong yellow clay, which is richly manured, and this soil is considered by the first Italian gardeners, as best suited to their natures. At Rome and Milan the natural soil is lighter; but a strong soil is adopted generally for all the *agrumi*, and particularly in the garden of his Holiness the Pope. At Naples, where the trees are always planted in the open ground, the soil is lighter and of volcanic origin. A strong soil, in imitation of that of Nervi, is recommended and adopted by the Dutch. See *Van Osten. Nied, Hesperides,* &c.

The French gardeners, according to Bosc, (*in N. Cours d'Ag.* &c. *in loco,*) in preparing a compost for the orange-tree, endeavor to compensate for quantity by quality; because the pots or boxes in which the plants are placed, ought always to be as small as possible, relatively to the size of the tree. The following is the composition recommended:

To a fresh loam which contains a third of clay, a third of sand, and a third of vegetable matter, and which has lain a long time in a heap, add an equal bulk of half-rotten cow dung. The following year turn it over twice. The succeeding year mix it with nearly one-half its bulk of decomposed horse-dung. Turn it over twice or three times, and the winter before using, add a twelfth part of sheep's-dung, a twentieth of pigeon-dung, and a fortieth of dried ordure.

The best compost for orange-trees, according to Miller, is two-thirds of fresh earth from a good pasture, and one-third part of neat's-dung. These should be mixed together at least twelve months before using, turning it over every month to mix it well and to rot the sward. Pass it through a rough screen before using.

M'Phail and Abercrombie recommend "three-eighth parts of cow-dung, which has been kept three or four years; a fourth part vegetable mould from tree-leaves; one-sixth part of fine rich loam; and one-twelfth part of road-grit; to this may be added one-eighth part of sheep's-dung." *G. Rem.* 242. *Pr. Gard.* 574.

The following mixture has been tried by James Mean (*Hort. Trans.* ii. 295.) and with which he has "every reason to be satisfied." "Well-prepared rotten leaves, two to three years old, one-half; rotten cow-dung, two, three, and four years old, one-fourth; mellow loam, one-fourth; with a small quantity of sand or road-grit added to the compost, which ought not to be sifted too fine."

R. Ayres, who grows excellent table-fruit of the citrus at Shipley, uses ten parts of strong turf-loam, seven of pigeon's-dung, seven of garbage from the dog-kennel or butchers'-yard, seven of sheep's-dung, seven of good rotten horse-hung, and ten of old vegetable mould, mixed and prepared a twelvemonth before using. *Hort. Trans.* iv. 310.

Temperature. The standard temperature for the citrus tribe is 48°; but in the growing season they require at least ten degrees of additional heat to force them to produce luxuriant shoots. The air of the house in which the plants are kept, whether in boxes or in the ground, should never be allowed to fall under 40°, for though the orange, like the pine-apple, will endure a severe degree of cold for a few hours without injury, yet, as Mean has observed, the leaves once injured the trees will require three years to recover their appearance. Ayres never suffers his orangery to be heated above 50° by fire heat, until the end of February; when the trees show blossom, it is increased to 55°, but never allowed to exceed 60° by sun heat, the excess of which he checks by the admission of air till the early part of June, when he "begins to force the trees, by keeping the heat in the house up as near as possible to 75°. For I do not consider (he adds) that either citrons, oranges, lemons, or limes, can be grown fine and good with less heat." *Hort. Trans.* iv. 311.

The orange, Humboldt observes (*De Distrib. Plant.* 158.), which requires an average temperature of 64 degrees, will bear a very great degree of cold if continued only for a short time. This is proved by an observation of Dr. Sickler, who says, "It is remarkable how much cold and snow the common lemons and oranges will bear at Rome, provided they are planted in a sheltered situation, not much exposed to the sun. Thus I saw in the two winters of 1805 and 1806, under my windows, on Monte Pincio three standard orange-trees in the open ground, heavily covered with snow for more than a week. The green leaves, but still more the golden fruits, nearly ripe, looked singular but beautiful amidst the snow; neither fruits nor trees had suffered, being in a sheltered place, while many branches and leaves of other trees of this kind, which were exposed to the sun, turned black and died, rendering the whole tree sickly." *Volk. Oran. Gart.* 9. It appears that the snow had been thawed from off these trees gradually, and more by the temperature of the atmosphere than by the direct rays of the sun, or a current of heated air. This resulted from their sheltered and partially shaded situation; and, as Dr. Noehden has remarked (*Hort. Trans.* iii. 43.), it proves the truth of the observation of T. A. Knight, that it is more the sudden transition from cold to heat and the contrary than the degree of either, which destroys vegetables. Whenever orange-trees or any tender exotics have been touched during night by frost, they should either be immediately shaded by mats from the next day's sun, or thawed by water at not more than 32 or 33 degrees of temperature. In the northern regions the same treatment is successfully applied to animals. See *Hort. Trans.* iii. 42. and 144.

Water. Orange-trees, like other evergreens which delight in a strong soil, are not naturally fond of water; but in this country those in boxes are often much injured for want of a due supply of this material; for the earth becoming indurated, the water wets only the surface, and runs over and escapes by the sides of the pot or box; so that while the mass of earth below is dry, the surface has a sane moist appearance. Mean says, "When I think, from the appearance of a plant, that the water does not freely enter by the middle or sides of the box, a sharp iron rod, about three feet long, is made use of to penetrate to the bottom of the earth, and to form a channel for the water, too little or too much of which is equally injurious to orange-trees."

Knight (*Hort. Trans.* ii. 129.) watered an orange-tree with very strong liquid manure, and found it grow with equal comparative vigor to the vine and mulberry. Ayres, after the fruit is set, waters with water, in which, at the rate of three barrows of fresh cow-dung, without litter, two barrows of fresh sheeps' droppings, and two pecks of quick lime have been added to every hogshead; when used, the water is about the consistence of cream. *Hort. Trans.* v. 310. The French water once after shifting with a very strong lessive, they also mulch with recent cow and horse droppings, renewing these once a month or oftener during summer, that there may be always abundance of soluble matter for the water to convey to their roots. *Nouveau Cours,* &c. art. *Orange.* M'Phail mentions a case in which very large orange trees in the border of a conservatory looked sickly; when, on digging deep into the borders to examine the cause, he found the earth quite dry, and by afterwards continuing to water them regularly he recovered them. *G. Rem.* 242.

Air. During the winter season, Miller observes, orange-trees require a large share of air when the weather is favorable; for nothing is more injurious to these trees than stifling them. The prevention of damp, Mean observes, is as essential to the perfection of the plants as the exclusion of cold. Where these trees are kept in old-fashioned opaque-roofed green-houses, these cautions as to air and damp deserve particular attention. Ayres says, the more air orange-trees have during the blossoming season, the more certain will they be of setting the fruit.

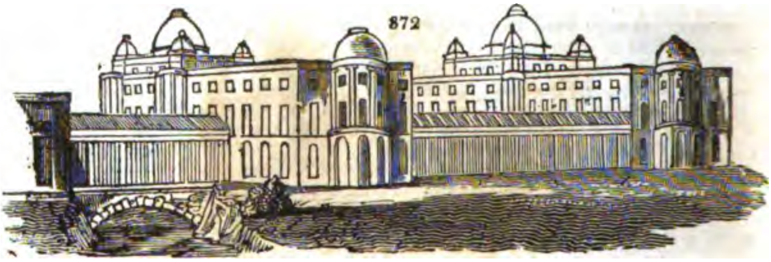
Light. Many gardeners are of opinion that the orange tribe do not require so much light as other exotics, which may have arisen from the gloomy conservatories in which they used to be formerly kept during winter; for certainly to look at the orange-houses at Versailles and Kew, one would not conclude light to be a very essential requisite. But though these trees, like other evergreens, when in a state of inaction, will live with less light than evergreens or deciduous plants in a growing state, they always suffer for the want of it, which is indicated by the paleness of the leaves in spring, and by their falling off when set out in the open air and fully exposed to the influence of day. Whoever intends to grow the orange in any degree of perfection, should adopt houses, if not with glass on all sides, at least with glass fronts and roofs. When the plants are placed in the naked ground as standards, glass on all sides is highly desirable; for otherwise their leaves and shoots will all be turned to the south, and the north side of each tree will in a short time become naked and unsightly.

Manner of Growing the Trees. All the species may either be grown as dwarfs in moderate-sized pots or boxes; as standards with stems from two to six feet high in large boxes; as standards planted in the naked ground; and either as dwarfs or standards planted and trained against a wall or trellis under glass.

The two first modes are more adapted for ornament than producing crops of large fruit; for all the art of the gardener will never make plants grow as vigorously in boxes as in the free ground. Standards planted in the free ground or floor of the conservatory, combine both elegance and utility, as in a house properly constructed, they will make handsome heads, and produce abundant crops of fruit.

The last mode, or that of planting against walls or trellises, is much the most certain way of having large crops. Every part of the plant above ground can thus be brought near the glass and equally exposed to the sun's influence and that of the air and heat: they can be more readily pruned, and correctly trained, watered and washed; and they occupy less room in proportion to the produce. The trees at Wood-hall, in West Lothian, some of those at Shipley, and at some places in Devonshire, are trained in this way. In a very few favorable situations in the south of England, as at Gerston and Woodville, in Devonshire, they are trained against walls in the open garden.

1511. *Plans for Orange-Houses.* These must naturally depend on the mode of growing. For plants in moderate-sized pots and boxes, a common green-house is the obvious habitation; for being plants of ornament, they require merely the treatment of that department. The conservatories in Italy have generally opake roofs, but some of the more enlightened nobles of Lombardy have lately erected splendid constructions with glass roofs, in which they combine the culture of the citron tribe with other large growing exotics. (*fig.* 372.)



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For trees in large boxes, a proportionably large and lofty house is requisite; it may be opake on the north side, with a glass roof, front, and ends, of any convenient or desired length, width, and height. For one of moderate size, the height at the back wall may be fifteen feet, at front ten feet, and the width of the house fifteen feet. The floor may either be perfectly level, and the boxes placed on it, the largest behind, so as their tops may form a slope to the front glass, as in the conservatory of Prince Borghese, at Rome; or if the trees are young, a stage may be erected for a few years, in order to raise the plants to the light: but if the trees are of a considerable size, the best way is to have square pits in the floor at regular distances, somewhat larger than each box, and in these to sink the boxes, covering them with mould, sand, or moss nearly to the level of the pavement, so that each tree so placed and dressed, will appear as if planted in a small compartment of earth. Such is the plan of the large conservatory in the royal gardens at Monza.

The walk, unless where a stage is adopted, should be in the front of the house, with corresponding doors in each end; but where the trees are young, and placed on a stage, like green-house plants, the walk should be in front, as in no other situation could the eye of the spectator meet the foliage of the plants. Where the walk is in the middle, and a double row of trees on each side, as at Monza, the effect in winter is truly magnificent and gratifying.

Where the trees are to be planted as standards in the borders or floor of the house, it is essentially requisite to the health and beauty of the plants that the building be glazed on all sides; (*fig.* 373.) Showers might be supplied in Loddige's manner; heat by steam

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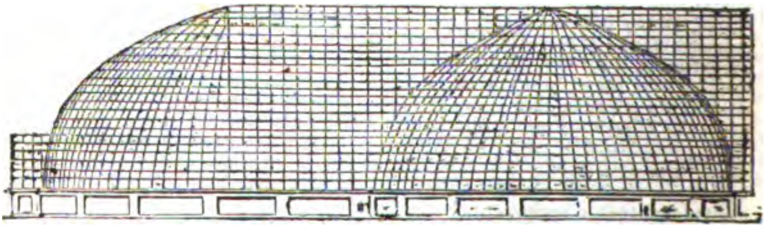

or flues (*fig.* 374. *a*); and, in winter, the beds (*b*) might be covered with turf, strewed with daisies, violets, and primroses; these would come early into flower, and if the turf were kept very short about the roots of the flowering plants, and the trees in excellent condition, only those who have seen the first-rate, regularly planted, standard orange-groves of Nervi could form an idea of the effect, which, by contrast with the external winter, would be felt as luxurious, and as anticipating real spring.

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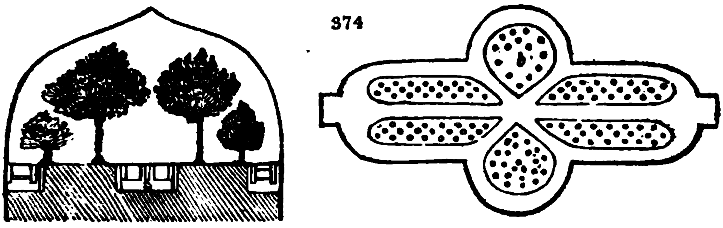


Where orange-trees are to be trained either against the back wall or a trellis, under the glass, the forms adopted for common peach-houses or vineries are perfectly suitable, but as by training close under the glass, as is done with vines, much of the beauty of the foliage would be lost, training on a trellis a few feet distance, with a path between it and the glass, is preferable.

1512. *Plans for Pots, Tubs, and Boxes.* Unglazed pots of earthenware are preferable to glazed stone ware or China pots; the form need not be different from that in common use, and the size must depend on that of the plants. At Florence, where the largest and best garden-pots in Europe are made, the rim and part of the outside of pots destined for oranges and ornamental plants is often decorated with festoons of flowers or fruit, and lions' heads, or other ornaments; which some potters near London have begun to imitate.

Tubs may be of any size, and in these and in boxes, trees thrive better than in pots. One advantage of tubs is, that by unhooping them, the staves are instantly removed, and the roots examined and dressed, and by having a cooper at hand they are immediately replaced; thus saving much of the trouble necessarily incurred in shifting plants in pots or boxes.

Boxes. All boxes which are larger than the largest-sized pots, should be contrived to take to pieces, in order to examine the roots, or to shift into larger boxes. Square boxes, held together by an iron hoop, and taking to pieces on the principle of tubs are most convenient for trees which do not require more than five or ten cubic feet of earth; and such as are used at the Thuilleries and by Mean (*figs.* 91 to 93.) answer very well for plants requiring from ten to sixty cubic feet. Those of Mean contain sixty-four cubic feet of compost.

Proportioning the Size of Boxes to that of the Plants. The general opinion of gardeners is in favor of small pots or boxes; and where the object is dwarf plants, or merely to preserve the trees without much increasing their size or regarding their fruit, they are the most proper. But where the object is luxuriance of growth and fruit, it does appear to us that the pots or boxes cannot be too large; unless, as *Van Osten* observes, it is meant to be asserted that plants grow larger in pots than in the free ground. It may, however, be expedient to plant at first in small boxes, and remove into larger ones by degrees. The largest boxes in use in Holland and France are four feet square, which serve for trees with stems from six to eight feet high, with globular heads of six feet diameter, and above a century old.

1513. *Choice of Sorts.* Where the object is more ornament than fruit for the desert, a selection may be made from the varieties of each species at pleasure; where the object is fruit for the desert, the following sorts are to be preferred: the common, bloody-fruited, Burgamot, Maltese, sweet China, Seville, and Mandarin oranges. The common lemon, citron, and lime, and one or two plants of the shaddock. These include all the essential varieties of the orange tribe as far as respects fruit, variations in the leaves and mode of growth concern the genus citrus as belonging to the green-house.

Choice of Plants. For moderate-sized trees to be treated like green-house plants, such as are raised in this country or in the Parisian nurseries are preferable; but where the object is large handsome trees in boxes, standards in the free soil, or trained trees, then plants from Genoa or Malta are decidedly preferable; indeed, no plants fitting for the purpose of standards could be elsewhere procured. Miller is of this opinion, observing, that "by much the quicker way of furnishing a green-house with large trees, is to make choice of such as are brought over every year in chests from Italy; for those which are raised from seeds in England will not grow so large in their stems under eighteen or twenty years, as those are when brought over; and although their heads are small when we receive them, yet in three years, with good management, they will obtain large heads, and produce fruit."

When the plants are purchased in London, at the Italian warehouses, without names, the greater number will be found to be of the shaddock and citron kinds; as the Italian gardeners find these sorts make stronger shoots and more shewy plants, and therefore send a less number of the less luxuriant but more useful varieties. But the best way is to send an order, through a British merchant who has a correspondent at Genoa, for named sorts, ordering so many of each class, either from the table of Dr. Sickler (1500.) or the Synopsis of Gallesio, (*fig.* 362.)

1514. *Management in Pots and Boxes.* The management of dwarf English or French plants in moderate-sized pots or boxes for the green-house stage, consists in common green-house treatment. Being potted in the proper soil, the roots are to be annually examined before the growing season in spring, and when matted or diseased, trimmed off and repotted, or shifted into larger pots at discretion.

But for Italian plants, destined to grow large trees and produce crops of fruit in boxes or tubs, the treatment requires to be more particularly detailed. The following are Miller's directions: — Having furnished yourself with a parcel of trees, prepare a moderate hot-bed of tanner's bark, in length and breadth according to the number of trees to be forced; then put your trees into a tub of water upright, about half way of the stems, leaving the head and upper part of the stem out of water, the better to draw and imbibe the moisture. In this situation they may remain two or three days, according to their plumpness when you received them; then take them out and clean their roots from all filth, cutting off all broken or bruised roots, and all the small fibres which are quite dried by being so long out of the earth, and scrub the stems with a hard hair brush, cleaning them afterwards with a cloth; then cut off the branches about six inches from the stem, and having prepared a quantity of good fresh earth, mixed with very rotten neat's-dung, plant your trees therein, observing never to put them into large pots; for if they are but big enough to contain their roots it is sufficient at first planting. Wrap the stems round with haybands from bottom to top to prevent the sun from drying their bark: plunge the pots in the bark-bed, watering well to settle the earth to their roots, frequently repeating the same all over their heads and stems, being very careful not to over-water them before they have made good roots, and shade from the sun in the middle of the day.

If they have grown kindly they will have made strong shoots by the beginning of June; at which time stop them to obtain lateral branches to furnish their heads; harden them to admit their removal into the open ground in July: house them about the end of September, and during winter, water frequently but moderately, guarding against frost. In the following spring clean the stems and leaves of the plants, top-dress the earth, and mulch, with rotten cow-dung, round the edges of the pots, taking care that none touch the stems. Remove to a sheltered situation in the open air by the end of May. As the trees advance, stop strong irregular-growing shoots in the summer season, to force out lateral branches, to fill the head, and render it regular and free from weak, trifling branches. The trees will require to be shifted and new-potted every other year, in April.

In performing the operation, having drawn the trees out of the pots, cut off all the roots round the outside of the ball of earth, and take away all mouldy roots; then with a sharp iron instrument, get as much of the old earth from between the roots as possible; then set the root of the tree into a large tub of water, for about a quarter of an hour, to soak the under part of the ball of earth, then clean the stems. Re-pot the trees and water, letting them remain in the house till they have taken root.

When the plants become very large, the operation of shifting is much facilitated by adopting boxes, as already described, which admit of being taken to pieces; the balls of earth can thus be slid from one box to the other instead of being lifted out of the box. Where the boxes do not separate, the tree and ball must be lifted out by fixing one end of a rope to the stem of the tree, and passing the other over a pulley suspended from a triangle. This mode is recommended by Van Osten, while some French authors recommend a carriage lever and rope. The tree and ball of earth are thus, by either mode, suspended in the air, the latter is examined, the roots pruned, &c.; and this done, the same or a larger box is placed directly below the ball, with a proper quantity of compost in the bottom, and into this the tree is lowered, and the sides filled with earth, &c. The worst thing attending this mode is the liability of injuring the bark of the stem by the noose of the suspending rope.

Renovating Old Trees in Pots or Boxes. Where orange-trees have been ill-managed, and their heads become ragged and decayed, Miller directs to restore them by cutting off the greatest part of their heads early in March; drawing them out of the pots or tubs, and shaking off the earth from their roots; then cutting away all small fibres and mouldy roots; and next soaking and cleaning their roots, stems, and branches, planting them in good earth, plunging them in a hot-bed, and treating them as directed for trees received from abroad.

1515. *Management of the Citron Tribe as Standards.* Prepare foreign plants as directed above, and instead of planting in pots, plant in the border or floor. This must have been laid dry by proper drains; and if on a wet sub-soil, floored, to prevent the roots from penetrating into it. On this, lay the sort of earth, or compost, most approved of, to the thickness of three or four feet; care having been taken in constructing the house, that all the walls, (excepting the north wall, if the house be opaque on that side,) flues, paths, &c. be supported on pillars or piers, so as the compost may extend under them, and ten or twelve feet without the house, according to circumstances.

Plant the trees either in squares, or better in quincunx, allowing six or eight feet between the trees, which will give thirty-six or sixty-four square feet to each plant. This distance will suffice for several years, and afterwards every other tree can be taken out. After planting, which should be finished in April, water at the root, and morning and evening sprinkle a little over the tops to assist in causing them to break freely. Apply fires, and keep the house close night and day, with a moist heat of from 55° to 60°, till the plants have made shoots of three or four inches; then begin to give a little air, gradually increasing it, but still keeping up the heat till the growth of the shoots is completed, when the sashes should be taken off to harden and colour the shoots and leaves. It will be necessary to attend to the above directions annually, for three or four years, in the growing season, in order to procure as much wood in a short time as possible. Keeping the heads open and regular, with the common routine culture, is all that is necessary at other seasons.

On Walls and Espaliers. Prepare the plants and the border as before, and plant about ten or twelve feet distance, allowing a larger space for the citron, lemon, and shaddock, than for the common orange, as the former grow faster and more luxuriantly. In the growing season, observe the directions already given, continuing them annually. The fan-manner of training is that generally adopted.

1516. *Pruning.* The French pay great attention to this part of the culture of the orange tribe; and, indeed, display greater art in pruning every sort of tree, than the British. They have their winter *taille*, and their *ebourgeonnement*, or summer-pruning, of the orange-tree, as of the peach and vine. Those at Versailles and the Thuilleries are looked over every year, and receive a very elaborate pruning every sixth or eighth year. The object of this pruning is to keep the head proportioned to the capacity of the box containing the roots. The heads of these trees, notwithstanding the annual prunings, become too large and show indications of suffering for want of nourishment every sixth or eighth year. The shoots are then shortened to within an inch or two of the old wood, and the tree, thus almost completely deprived of leaves, does not produce blossoms during the two next years: it pushes, however, vigorous shoots, which are trained to form a bushy well-furnished head of the same shape and size as before. Such has been the practice of the late M. Pethon, who was head-gardener at Versailles for forty years. The form of the heads of the trees at Versailles is that of a cylinder, spreading out at top, of which the height is greater than the breadth; those in other places are ovate, globular, or mushroom-shaped, and some are even square and triangular. See *Van. Osten.* c. xi.

Any pruning which orange-trees receive in England, does not differ, in general, from that given to any green-house tree or shrub; and the consequence is, handsome bushes or trees, with the blossoms and fruit on the surface of the foliage. But when the orange-tree is cultivated for fruit, whether as standards or against walls, the branches ought to be kept thin, like those of other fruit-trees, so as to admit the sun, air, and water, freely to every part, and thus have the blossoms and fruit regularly distributed from the centre to the extremities. This is readily effected where the trees are flat-trained, which, where fruit is the object, is a great argument in favour of that mode of culture.

In pruning, with a view to fruit, it must be considered, that the most useful blossoms of most sorts of citrus are produced in the form of terminating peduncles, on the wood of the current year; and hence, the grand object of the pruner ought to be to encourage the production of young wood in every part of the tree; by cutting out naked wood, and shortening vigorous shoots where wood is wanting. A powerful co-operating measure is the exposition of all the parts of the tree to the light and air, which, as already observed, is only to be done in standards, by keeping the trees open, or by flat training. There are also blossoms produced by various sorts of citrus, in tufts, directly from the axillæ of the leaves of the wood of the preceding year: these expand earlier than the others, but generally drop off in plants kept under cover. Ayres cuts away the old and least promising branches, in February, to make room for younger and more productive wood, and shortens very strong branches to keep the trees in proper shape.

After the fruit is set, it ought to be thinned, seldom leaving more than one on a peduncle. In France they thin the flowers, which, by that means, they are enabled to use for distillation. The thinned fruit is used in confectionary. Mean observes, "In regard to the necessity of thinning the fruit, lest the trees should exhaust themselves, it appears to me to depend on the state of the trees: if they are flourishing, I never observed that it was at all required, either here or at Bromley Hill, where the orange trees belonging to the Right Honourable Charles Long, are very fine, and loaded with peculiarly large fruit." Ayres thins when the fruit are about the size of green-gage plums, and never leaves two fruit together.

Will standard-trees, pruned with a view to fruit, be equally beautiful with the compact geometrical-headed trees of Paris, and the old conservatories of this country? Those who prefer a full-bottomed periwig to a natural disposition of the hair will not think so. The two beauties, or effects, are of different kinds; the latter has utility to recommend it; the former, associations of the pomp and formal grandeur of past times. Quintency, and other French authors, direct the wounds or sections made in pruning orange-trees, to be covered with a composition to exclude the air; which deserves to be attended to, as the growth of the bark is otherwise very slow over wounds in these trees.

Manure. About Genoa, the best cultivated orange groves are manured annually. In France and this country, the best practitioners stir the surface and apply a top-dressing of rich compost when the trees begin to grow, generally in April or May. Ayres top-dresses in June.

Insects and Diseases. The chief insects injurious to the citrus tribe, are the coccus and red-spider; both to be removed or destroyed by water applied with a brush or sponge. Mean, early in March, when he top-dresses his plants, applies a copious washing with the engine; then shuts up the house close for three or four hours, which produces a strong heat, as high as 70°, which effects the destruction of the red-spider; while the stems and leaves are wiped with a wet sponge to remove other insects and dirt." *Hort. Trans.* ii. 296.

Gathering the Fruit. In the Italian gardens, and those at Hieres in France, where the fruit of the orange is raised for sale, it is gathered every year, generally in May. If not then gathered, it will hang on the tree for one or two years longer; but when the young fruit is green and swelling, the old ripe fruit becomes somewhat shrivelled, and if then gathered is found almost void of juice. But as the new fruit begins to arrive at maturity, the juice begins to return to the old fruit; so that both old and new crops are in perfection together the following May. In this way, at Genoa, the orange is sometimes allowed to remain on the tree three years, and being then gathered, has a peculiar sub-acid sweetness and flavor, and is sold at a very high price to connoisseurs at Milan, Turin, and other places. The lemon differs from the orange in that it ripens irregularly, and drops off when ripe. It is therefore gathered at almost every season.

The orange-tree, kept in conservatories, generally requires fifteen months to ripen its fruit, and hence, both green and ripe fruit are together on the tree. Some authors assert, that the leaves remain on the same period with the fruit; but Quinteney says, "on a vigorous plant they will remain three or four years." In Britain they often remain three years on moderately strong plants without fruit.

In gathering for the table in this country, the fruit should not be pulled with the hand, but carefully cut off with a few leaves attached, and thus garnished, sent to the desert. By allowing them to hang two years, the trees will at all times have green and yellow fruit, which, in connection with their shining green leaves and fragrant blossoms, forms, early in spring, in such a house as we have hinted at (1510.), and *fig.* 373.), one of the most splendid of horticultural scenes.

Subsect. 2. The *Pomegranate.* — *Punica Granatum*, L.; (*Bot. Mag.* 634.) *Icos. Monog.* L; and *Rosaceæ.* J. *Grenadier*, Fr.; *Granatenbaum*, Ger.; and *Melagrano*, Ital.

1517. This is a low, deciduous tree, rising fifteen or twenty feet high, thickly clothed with twiggy branches, some of which are armed with sharp thorns. The leaves are long and narrow, of a light shining green with red veins. The flowers are produced at the ends of the branches, in the shoots of the same year, single or three or four together; frequently one of the largest terminates the branch, and immediately under that are two or three smaller buds, which continue a succession of flowers for some months, generally from June to September. The calyx is very thick and fleshy, and of a fine red color; the petals are scarlet. The fruit is a berry covered with a hard coriaceous rind, and beautifully crowned with the tube of the calyx, which is sharply toothed, and remains even after the fruit is ripe, contributing greatly to its singular and beautiful appearance. The fruit ripens in October, and, in a greenhouse, will hang on the trees till the spring or summer following. It is a native of most parts of the south of Europe and of China. In Languedoc, and some parts of Italy, it is used as a hedge plant. It was cultivated in England in 1596, by Gerarde; but though it grows very well in the open air, it seldom ripens its fruit so as to render them worth any thing. It used formerly to be kept in boxes, and housed like the orange-tree, which is still the practice near Paris and in the Netherlands. Some of the orange and pomegranate-trees in the orangery at Versailles, Risso informs us, are believed to be between two and three hundred years old.

Use. The fruit having an acid pulp is very refreshing, and is eaten like the orange; its singular and beautiful appearance contributes to the variety of the desert. It is used medicinally in fevers and inflammatory disorders; being powerfully acid and astringent.

Varieties. The Paris nurseries propagate the following sorts: those marked thus (*) may be had in the London nurseries.

The wild or very acid fruited.
The sub-acid fruited or cultivated.*
The sweet fruited.
Large flowered single red and white.
The semi-double, and double red and white.*
The yellow flowered.*
The variegated flowered.
The proliferous; in which a shoot proceeds from the middle of the flower.

Propagation. The single-flowering sorts may be raised from seed, and all the varieties by cuttings, suckers, or layers, or by inoculation or grafting on the wild sort. The last is considered much the best mode where fruit is the object; and the next best is by layers, but the common mode is by suckers, which these plants send up abundantly. Inoculated plants, both of the single and double sorts, may be procured from Genoa; and this is the most desirable plan where the plant is to be cultivated for its fruit.

Culture. The directions given for raising and cultivating the orange-tree, may be considered as equally applicable to the pomegranate, which, with the olive, was formerly the common companion of these trees in conservatories. Miller has observed, "that both the single and double pomegranate are hardy enough to resist our most severe winters in the open air; and that if planted against walls, the former will often produce fruit, which ripen tolerably well in warm seasons, but ripening late, are seldom well-tasted." Where it is to be grown for fruit, therefore, either the standard or flat-trained mode, under glass, as recommended for oranges, should be adopted. A few trees may be introduced along with those of the citrus tribe.

Soil. Miller recommends a strong rich soil, in which he says, "they flower much better, and produce more fruit than if planted on dry, poor ground." In regard both to soil and mode of growth, the pomegranate bears a close resemblance to the hawthorn.

Pruning and Training. As already mentioned, the flowers of this tree always proceed from the extremity of the branches produced the same year, hence all weak branches of the former year should be cut out, and the stronger shortened in order to obtain new shoots in every part of the tree.

When the trees are trained against a wall, the shoots having small leaves, may be laid in four or five inches asunder. The season for the winter-pruning, Miller says, is about Michaelmas; for if left till spring before they are pruned, they seldom put out their shoots so early. In summer they require no other dressing than pinching off foreright and over vigorous shoots, as it is the middling only which are fruitful. In a warm situation Miller obtained a great quantity of fruit from trained trees; which, though not very well-flavoured, were of full magnitude, and made a very handsome appearance on the trees. The double and other varieties, cultivated for the sake of their flowers, should be pruned, whether in boxes or against walls, on the same principle.

Subsect. 3. The *Olive.* — *Olea Europæa*, L. (Fl. Græc. i. t. 3.) *Diand. Monog.* L.; and *Oleinæ*, B. P. *Olive*, Fr.; *Oehlbaum*, Ger.; and *Uliva*, Ital.

1518. This is a low branchy evergreen tree, rising from twenty to thirty feet, with stiff, narrow bluish green leaves. The flowers are produced in small axillary bunches from wood of the former year, and appear in June, July, and August. The fruit is a berried drupe of an oblong spheroidal form, hardish thick flesh, of a yellowish green-color, but turning black when ripe. The tree is supposed to be originally from Greece; but it is now naturalized in the south of France, Italy, and Spain, where it has been extensively cultivated for an unknown length of time, for the oil expressed from its fruit. The tree attains an incredible age. Near Terni, in the vale of the cascade of Marmora, is a plantation above two miles in extent, of very old trees, and supposed to be the same plants mentioned by Pliny, as growing there in the first century. It appears to have been cultivated in the botanic garden of Oxford, in 1648, and is generally treated as a greenhouse plant. With protection from severe frost, Miller says, "it may be maintained against a wall in the latitude of London." In Devonshire, some trees have stood the open air for many years; but the fruit does not arrive at maturity. Some trees planted against a warm wall at Camden House, near Kensington, succeeded so as in 1719 to produce fruit fit for pickling.

Use. At the desert, and frequently also during dinner, unripe olives appear as a pickle; which, though to those who taste it for the first time, appears somewhat harsh, yet it soon becomes extremely grateful; and is said to promote digestion and create an appetite. Pickled olives are prepared by steeping in an alkaline lessive, to extract a part of their bitter; they are next washed in pure water, and afterwards preserved in salt and water, to which an aromatic, as fennel, &c. is sometimes added.

The ripe olive, pressed and washed with hot-water, furnishes, when skimmed, the well-known condiment and corrective salad oil, employed both in food and medicine. It may be considered as the butter of Italy and Spain.

Varieties. In the olive countries these are as numerous as the sorts of the grape and fig. The French (*N. cours,* &c. *in loco*) describe between thirty and forty sorts. The six following are grown in English nurseries:

The common. | Large leaved. | Broad leaved. | Iron coloured. | Twisted leaved. | Box leaved.

Propagation. By seeds, cuttings, layers, suckers, and inoculation. The last mode is adopted where the culture of the olive is conducted with care; but the *olivettes,* or olive plantations, are generally furnished from suckers, which arise abundantly from the roots of old trees. In England, as a greenhouse plant, it is raised from cuttings; but where it is intended to grow a few trees in the forcing-department, for the sake of their fruit, we would recommend procuring budded stocks from Genoa: these will produce fruit in three or four years, but the others not for an unknown length of time.

Culture. Some plants used formerly to be received by the Italian merchants along with their imports of orange trees, and were planted, like them, in pots or boxes; but in order to grow the tree for fruit, the modes to be adopted are either planting as standards in the area, or training on a wall, as recommended for the orange and pomegranate. If a house is not devoted to this fruit, one might be appropriated for it and the pomegranate; giving each their respective soils, and recollecting that the olive will not bear a very high degree of heat.

Soil. The olive will grow luxuriantly in a strong clayey richly-manured soil, but will not prove nearly so prolific as in a dry, calcareous, schistous, sandy, or rocky situation; which ought to be imitated in some degree in the composition prepared for the area or border of the olive-house.

Temperature. That suitable for the orange will agree with the olive; but it cannot bear so high a degree of heat as that plant, never being found in Africa, south of Atlas, nor in the East or West Indies. It is also easily affected by cold, but not more so than the orange.

Pruning. The object here is to have a regular distribution of wood of the former year, from the axils of the leaves of which, the flowers spring out. When shoots of three or more years are shortened for this purpose, they do not produce blossoms; but wood of the preceding or current year may be shortened, and the shoots proceeding from them will produce blossoms in due course. Ringing, to induce fruitfulness, was practiced on the olive so early as the seventeenth century. *Bosc. in N. Cours,* &c. art. *Olivier.*

SUBSECT. 4. The *Indian Fig,* or *Prickly Pear.* — *Cactus Opuntia,* L; (*Knor. Thes.* 1. t. *F. a.*) *Icos. Monog.* L.; and *Cacti* J. *Raquette,* Fr.

1519. The genus *cactus* consists of succulent plants, permanent in duration, singular and various in structure; generally without leaves, and having the stem or branches jointed, and for the most part armed with spines and bristles. The joints or branches of the C. *opuntia* are ovate, compressed, and have very small cadaverous leaves coming out in knots on their surface, and accompanied by four short bristly spines. The branches spread near to, or trail on the ground. The flowers come out on the upper edges of the branches in June and July. The fruit is in the form of a fig or pear, with clusters of small spines on the skin, which encloses a fleshy pulp of a red or purple color, and agreeable sub-acid flavor. It is a native of Virginia and Barbary, but is now naturalized in the south of Italy, being found on the rocks at Terracina and Gaeta. It was cultivated in England by Gerarde, in 1596, in the open air, but without bearing fruit. It was cultivated in the stove by Justice at Crickton near Edinburgh, in 1750, and ripened its fruit. Miller says, "it will live abroad in England in a warm situation and dry soil; but in severe winters will be destroyed if not protected from frost."

Use. The fruit is sent to the dessert in the West Indies; and might add to the variety of exotic fruits in this country. Braddock observes, (*Hort. Trans.* ii. 239.) that in countries where the fruit abounds, it is considered very wholesome, and though the taste of it is not agreeable to all persons till after they have eaten of it several times, yet they soon become very fond of it.

Sorts. There are several species of that division of the genus *cactus*, called prickly pears or figs, which produce edible fruit in their native countries, as the great Indian fig or upright prickly pear, *C. funa*, (*Plant. grass*, 138.); oblong Indian fig, *C. ficus Indica*, (*Reich*, ii. 470.); Barbadoes gooseberry, *C. pereskia*, (*Dill. elt.* t. 227. f. 294.); the *C. opuntia* is deemed the most hardy, and by consequence the easiest to fruit in Britain; but there can be no doubt that these sorts might also be brought to mature their fruit with very little expence or trouble. They are at present kept in dry-stoves for the sake of variety.

Propagation and Culture. All the above sorts may be propagated from seed or cuttings; the latter mode is most common. Cut off the branches at the joints, in July, or after the plants have done flowering, and let them dry for a fortnight, that the wounded part may be healed over; then plant in small pots, and plunge in the bark-bed, or in a moderate hot-bed, watering sparingly, giving air to avoid damps, and shading from the mid-day sun.

Soil. Miller recommends the following: one-third of light fresh earth from a pasture; a third part of sea-sand; and the other part, one-half rotten tan, and half lime rubbish. These are to be mixed and laid in a heap, three or four months before using, turning it over once a month; then pass it through a rough screen, but do not sift it fine; reserving some of the small stones and rubbish to lay at the bottom of the pots, in order to keep an open passage for the moisture to drain off. The Barbadoes gooseberry requires less lime-rubbish and more of vegetable earth.

Temperature. All the sorts, excepting the prickly-pear, require the temperature of a dry-stove in winter, and an increased degree of heat, say 80° or 90° in summer, when it is intended they should produce fruit. They may either be planted in large boxes, filled with the soil above described, with a portion of vegetable mould added; or in borders, to be trained on a wall or trellis near the light. In either case, by supplying them liberally in summer, whilst in a growing state, with heat at bottom and top, air, light, and some moisture, they will thrive abundantly, and produce fruit certainly not of exquisite flavor, but agreeable and singular, and worthy of being added to the British dessert.

Culture of the Prickly-Pear in the open Air. Braddick having eaten, with pleasure, of this fruit in Virginia, was desirous of cultivating it here. He recollected that the plant in its wild state delighted in a dry soil, amongst rocks, near the skirts of the sunny sides of the forests; and having heard that it would stand the open air in this country, he planted it in the compost described below, placed in a sheltered situation open to the sun. "The first plant that I turned out has lived in the open ground of this country for six or seven years, during which period it has endured one exceeding hard winter, and several trying springs; and in all, except the two first years, it has never failed to ripen its fruit and seeds, so that it may be now considered decidedly acclimated.

"The compost used by me for growing the *Cactus opuntia* is the following: one-half is carbonate of lime, for which lime-rubbish from old buildings will answer; the remaining half consists of equal portions of London clay and peat-earth, having the acid neutralized by barilla: these are intimately blended and sifted. One square yard of this compost I conceive to be sufficient for one plant, which must be placed in the middle of a small artificial hillock, raised eighteen inches above the surface of the ground, which ground should be rendered perfectly dry, if not naturally so, by under-draining. Neither the leaves, flowers, or fruit should ever be suffered to touch the ground, but they should, as constantly as they are produced, be kept from the earth by placing stones, pebbles, flints, or bricks under them, in imitation of artificial rock-work." (*Hort. Trans.* 238.)

The *Torch Thistle*, or *Upright Cereus*, of which there are four species which bear edible fruit; and the *Strawberry Pear*, *C. Triangularis*, the *Poire de Chardon* of the French; may also be cultivated as fruit-bearing stove plants, in the same way as recommended for the Indian fig.

Sect. III. *Exotic Fruits little known, some of which merit cultivation for their excellence or rarity.*

The introduction and cultivation of exotic fruits may be considered as a very rational and entertaining object, for such as have the means, the time, and a taste for gardening. It seems to deserve the particular attention of retired persons of solitary habits, aged, or inactive, by presenting an end to be attained; it may serve as a gentle stimulus to such as, from indolence or bilious complaints, are apt to sink into a state of torpid, unenjoyed existence. A few of the plants, which we shall here enumerate, have been cultivated so as to produce fruit in this country, as the granadilla, litchi, loquat, banana, &c.; most of the others have hitherto served only to increase the variety of our stove or green-house plants.

1520. The *Akee Tree* is the *Blighia Sapida*, H. K. (*Ann. Bot.* 2. t. 16, 17.) *Oct. Monog.* L.; and *Sapindi*, J. (*fig.* 375.) It is a tree rising from twenty to twenty-five feet in height, with numerous branches, and alternate pinnate leaves, like those of the common ash. The flowers are small, white, on axillary racemes. The fruit is a pome, reddish or yellow; about the size of a goose's egg, with a pulp of a grateful, sub-acid flavour; and in the West Indies esteemed very wholesome and nourishing. It is a native of Guinea, and was introduced in Jamaica in 1778, and from thence brought to this country in 1793.

Propagation and Culture. It may be propagated from seeds, cuttings, or layers; but as the former mode would prolong the period of culture for fruit, and the two latter produce but weak plants, the better plan would be to order a few trees to be inoculated in Jamaica, and then sent over in tubs; these might be treated as directed for orange trees (1513.), and then planted in a border of rich earth, submitted to a Jamaica climate, and flat-trained near the glass. By such treatment, there can be no doubt the akee tree would in a few years produce fruit as readily as the orange.

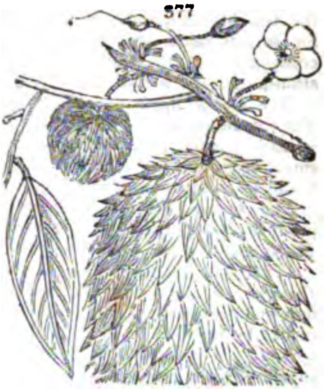
1521. The *Aligator*, or *Avocado Pear*, is the *Laurus Persea*, L.; (*Pluk. Alm.* t. 267. f. 1.) *Ennean. Monog.* L.; and *Laurinæ*, B. P. It is a stove tree, which, in the West Indies, grows to the height of thirty feet or upwards, with a trunk as large as that of our common apple tree. The leaves are like those of laurel, of a deep-green. The flowers are produced towards the extremities of the branches. The fruit is the size of one of our biggest pears, and is held in great esteem in the West Indies; the pulp is of a pretty firm consistence, and has a delicate rich flavour; it gains upon the palate of most persons, and becomes soon agreeable even to those who cannot like it at first; but it is so rich and mild, that most people make use of some spice or pungent substance, to give it a poignancy; and for this purpose some make use of wine, some of sugar, some of lime-juice, but most of pepper and salt. Miller, from whom the above account is extracted, cultivated it in 1739.

Propagation and Culture. Miller gives directions for raising the tree from seeds, which, he says, may be brought over in dry sand from the countries where it is cultivated. There is nothing uncommon in the process of raising, which is conducted in a hot-bed or pit; and when the plants have made their summer's shoots, they are removed to the stove during winter. But where it is intended to cultivate this tree for its fruit, a better way would be to send to the Botanic Garden of St. Vincent's, and request a few stocks to be inoculated from bearing-trees. These being properly cased and packed, would arrive as safe as orange trees usually do; might be treated like them when unpacked; and planted in a border of strong rich soil, to be trained on a trellis or wall near the glass. After the plants were established, horizontal training and ringing, accompanied by a Jamaica temperature, would soon produce fruit.

1522. The *Anchovy Pear* is the *Grias Cauliflora*, L.; (*Sloan Hist.* 2. t. 217. f. 1. 2.) *Poly. Monog.* L.; and *Guttiferæ*, J. (*fig.* 376.) It is a stove tree, frequently growing to the height of fifty feet in the West Indies, where it is a native. The leaves are oblong, and two or three feet long. The flowers numerous on short peduncles, large and whitish. The drupe is ovate, and crowned with a calyx like the pomegranate, about the size and shape of an alligator's egg: it is pickled, and eaten like the East-Indian mango, which it greatly resembles in taste. It grows generally in low, moist bottoms, or shallow waters, and has a most elegant appearance. Introduced here from Jamaica in 1768.

Propagation and Culture. It is very readily propagated from the stones, and the plants must be kept in a moist heat. To grow it for fruit, plant in a border, and train horizontally near the light, as directed for the avocado pear (1520.).

1523. **The Durion**, is the *Durio Zibethinus*, L. (*Rumph. Amb.* p. 99.); *Polyadelph. Polyan.* L.; and *Capparides*, J. (*fig.* 377.). This is a lofty East Indian tree, with leaves resembling those of the cherry, and large bunches of flowers coming out below the leaves, of a pale-yellow color. The fruit is the size of a man's head, of a roundish or oblong; resembling in some degree a rolled-up hedge-hog, with a hard bark or rind; the fleshy part of the fruit is of a creamy substance, and of a delicate taste; but of an unpleasant, heavy smell, somewhat resembling that of rotten onions; and the smell of the breath of those who eat it is infected also in a high degree; but when once a person has accustomed himself to eat this fruit, he generally considers it the most excellent of all others. Rumphius says, it is by much the most excellent fruit of India. The tree has not yet been introduced; but if a few fruit or plants were sent for from the Calcutta garden, and submitted to the general plan of culture for trees difficult to fruit, there can be no doubt of success.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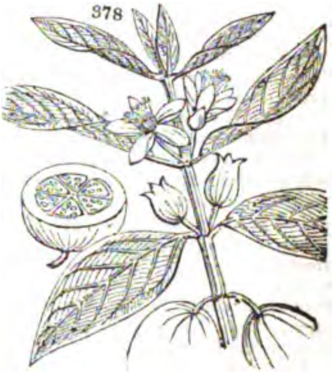
1524. The *White Guava* is the *Psidium pyriferum*, L. (*Rumph. amb.* l. t. 47.); *Icos. Monog.* L.; and *Myrti*, J. (*fig.* 378.). It is a West Indian tree, growing to the height of seven, eight, or twelve feet, with numerous branches, and blunt, entire, smooth leaves, two or three inches long; the flowers are in solitary peduncles and sweet smelling; fruit bigger than a hen's egg, roundish or oblong, smooth, yellow; the rind thin, brittle, and yellow; pulp firm, full of bony seeds, flesh-colored, sweet, aromatic, and pleasant. It is eaten with avidity both by West Indians and Europeans, raw in the dessert, and preserved with sugar. It has been grown here as a stove-plant since 1656; it is propagated by seeds from ripe fruits brought over; and to be fruited should be treated as directed for other similar fruit trees already mentioned.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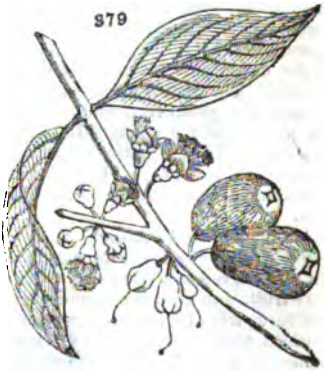
The *Red Guava*, *P. pomiferum*, has a beautiful fruit, crowned like a pomegranate; but is not so agreeable to eat as the other.

Cattley's Guava, *P. Cattleianum*. A new species introduced from China by Messrs. Barr and Brooks, nurserymen, and fruited by W. Cattley, F. H. S., in 1820. The plant resembles the other species in general habit and appearance; but the fruit is larger, nearly spherical, of a fine deep-claret color, growing in the axilla of the leaves; the skin has much the consistence of that of a ripe fig, but is thinner; the interior is a soft fleshy pulp, purplish-red next the skin, but becoming paler towards the middle, and at the centre it is quite white; it is juicy, and in consistence is much like a strawberry, to which it bears some resemblance in flavor. *Hort. Trans.* iv. pl. xi. 317.

1525. The *Jamrosade*, or *Rose Apple*, is the *Eugenia Jambos*, L. (*Bot. Mag.* 1696.); *Icos. Monog.* L.; and *Myrti*, J. (*fig.* 379.) It is a branchy tree, rising from twenty to thirty feet high, with long narrow leaves not unlike those of the peach. The flowers come out in terminal bunches in July, are of a greenish-yellow color, and succeeded by pear-shaped fruit, about the size of a medlar, two inches long, white, red, or rose-scented, and ripening from September to December. It is a native of the East Indies, and was cultivated here by Miller, in 1768.

There are several varieties of this tree differing in the size and color of the fruit. That with white fruit has been cultivated by Professor Thouin in the National Garden at Paris. This horticulturist endeavoured to harden the tree by exposing it annually to the open air during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the two hottest months of the year; but, after persisting in this mode of cultivation for several years, and finding the leaves and part of the shoots die off annually, in consequence of the cold while exposed, he at last had recourse to a hot and moist atmosphere, and was successful. *Hort. Trans.* i. *App.*

The *Malay Apple* is another species of *Eugenia* (*E. Malaccensis*, *Bot. Rep.* 458.) The tree resembles the former, but has broader leaves. The fruit is ovate, an inch and a half in diameter, fleshy, very sweet smelling, like the rose, agreeable to the taste, smell, and sight, and esteemed wholesome. It is common in most of the islands in the South sea, and was cultivated by Miller in 1768.

The *Bastard Guava, E. Pseudo-Psidium*; and the *Cayenne Cherry*, *E. cotenifolia*, produce edible fruits, held in considerable esteem in the West Indies, and with the Malay apple appear to deserve culture in this country. See *Miller's Dict.*

1526. The *Mammee Tree.* (*Mammea Americana*, L.); *Polyan. Monog.* L.; and *Guttiferæ*, J.; is a tall handsome tree, with oval, shining, leathery leaves, and one-flowered peduncles, producing sweet white flowers an inch and a-half in diameter, succeeded by roundish fruit, about the size of an egg, and in pulp and taste not unlike the apricot. It is eaten raw alone, or cut in slices with wine and sugar, or preserved in sugar. It is a native of the Caribbee islands, and was cultivated in 1739 by Miller.

Propagation and Culture. It may be raised from the stones or seeds, and treated like other stove fruit-trees. It has been cultivated by T. A. Knight, who found it rather impatient of a very high temperature. *Hort. Trans.* iii. 464.

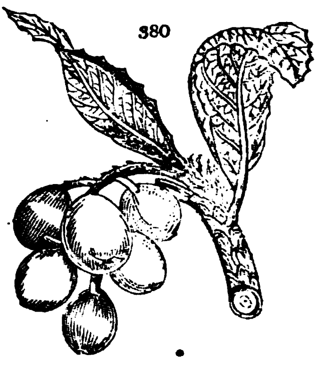
1527. The *Lee-chee*, and *Long-yen.*—The *Lee-chee* is the *Dimocarpus Litchi*, W. (*Lam. ill.* t. 306.); *Octan. Monog.* L.; and *Sapindi*, J. It is a stove-tree, with compound leaves, not unlike those of the common ash-tree; a native of China, and introduced in 1786. The fruit is a berry, of a red colour when ripe, except in one variety, which remains green: it is much esteemed by Europeans.

1528. The *Long-yen* is the *D. Longan*, H. K. (*Buch. ic.* t. 99.) The tree resembles the former, but the fruit is not so large, and is of a light-brown colour.

"In both species the pulp of the fruit is surrounded with a tough, thin, leathery coat; it is a colourless, semi-transparent substance; in the centre of which is a dark-brown seed, of different sizes in the different varieties. The flavor of the pulp is slightly sweet, sub-acid, and particularly pleasant to the taste in a warm climate. The fruit of the lee-chee, dried either in the sun or by fire-heat, is frequently brought to England from China. In this state the pulp is shrivelled and reduced within the coat, or shell, to half its usual size, and has a rich and sweet taste, if it has been well preserved. The fruit of the long-yen has been ripened by John Knight, Esq. of Lee Castle, in a lofty stove, erected for the purpose of growing tropical fruits; and a bunch was presented by him to the Hort. Soc. in September, 1816, supposed to be the only one ever produced in Europe, and which persons, well-acquainted with the long-yen in its native places of growth, pronounced quite as good as those grown within or near the tropics." *Hort. Trans.* ii. 403.

Propagation and Culture. Both species may be raised from seeds or layers, and the plants may be afterwards placed in a bed or area of rich soil, and trained or spread out near the glass. The temperature should never be under that of the pine-apple.

1529. The *Lo-quat* is the *Mespilus Japonica*, L.; (*Vent. Malm.* 19. and *Hort. Trans.* iii. *tab.* 11.) *Icos. Di-Pent.* L.; and *Rosaceæ*, J. (*fig.* 380.). In a wild state it is a lofty tree, with thick-knobbed branches, and tomentose spray or branchlets; the leaves are narrow, a span long, bright-green above, and cenereous tomentose below. The flowers come in spikes at the end of the shoots in October and November. The fruit is a five-celled pome, about the size of a gooseberry, and in taste approaching to that of the apple. It ripens in May and June. It is a native of Japan, and was introduced in 1787, to Kew-gardens, where, as well as in some other places, it has produced fruit.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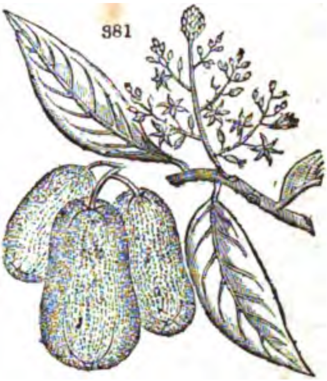
Propagation and Culture. It may be raised from seeds, or continued by cuttings or layers; but the best method, when it is intended to produce fruit, is to graft it on any other species of mespilus. It is considered as a frame or half-hardy tree; but, to ripen its fruit with flavor, should have the temperature of the stove, in which, planted in a border of rich soil, it will add to the variety of the dessert. Sir Joseph Banks (*Hort. Trans.* i.) considers the fruit as equally good with that of the mango. Lord

Bagot, who has fruited the plant in a very superior manner for several years at Blithfield, gives the following outline of his practice: "The plan I have usually followed has been to give it a winter (out of doors) during the months of July, August, and September, and about the middle of October, to replace it in a very warm situation in the tan. This summer, however, I was obliged to alter my mode; for, just at the moment when I was going to put it out for its winter, it became covered with at least twenty bunches of the finest flowers possible; I was therefore obliged to let it remain where it was. The present year's treatment, therefore, is an exception to the former practice; under that, it usually breaks into flower about the end of December, and the fruit becomes ripe in March or April. The last time my plant was in fruit, Sir William Coke, who had resided many years in Ceylon, where he is at present, was with me at Blithfield; he told me that he was in the constant habit of eating very large quantities of the fruit daily in that island, but that he had never tasted any so good, and with so much flavor, as those produced in my garden."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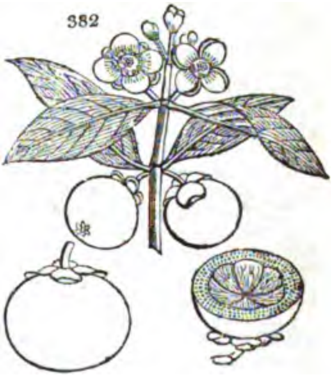
1530. The *Mango Tree*. — The *Mangifera indica*, L. (*Bot. Rep.* 425.); *Pent. Monog.* L.; and *Terebintaceæ*, J. (*fig.* 381.). It is a large spreading tree, with lanceolate shining green leaves, seven or eight inches long, having a sweet, resinous smell; the flowers are white, growing in bunches at the extremity of the branches. The fruit a drupe, large kidney-shaped, covered with a smooth, softish, resinous pale-green, yellow, or half-red skin, and containing an ovate, woody, fibrous, compressed nut or stone, within which is an ovate kernel, soft and pulpy, like a damascene plum. "When ripe, it is replete with a fine agreeable juice; it eats like an apple, but is more juicy, and some are as big as a man's fist. It is esteemed a very wholesome fruit, and excepting very fine pine-apples, is preferable to any fruit in India: gentlemen there eat little other fruit in the hot months. In Europe we have only the unripe fruit brought over in pickle." *Martyn in Miller's Dict.* It is a native of the Brazils, and was introduced in 1690; but has not yet been cultivated for its fruit.

Propagation and Culture. It may be increased by cuttings like the *Gardenia*, which it somewhat resembles in habit, or from nuts; but as the vegetative quality of these does not seem to admit of long preservation, they must be enveloped in wax, or otherwise managed (1045), to preserve it. Miller says, the tree will not thrive in the tan-pit; and he recommends the dry stove, a temperate heat, and light kitchen-garden earth. This tree seems particularly deserving culture for its fruit, both on account of its quality, and the plants not requiring so much heat as most of the other untried Indian fruits. T. A. Knight raised some mango plants from seeds in October, 1818, which, in the following March, shot very vigorously in a temperature of 60°; he is "much inclined to believe that the mango might be raised in great abundance, and considerable perfection, in the stove in this country; for it is a fruit which acquires maturity within a short period. It blossoms in Bengal in January, and ripens in the end of May." *Hort. Trans.* vol. iii. 463.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1531. The *Mangostan*, or *Mangosteen*. — *Garcinia Mangostana*, L. (*Lam. Ill.* t. 405.); *Dodec. Monog.* L.; and *Guttiferæ*, J. (*fig.* 382.) It is a tree rising near twenty feet high, with a taper stem, sending out many branches, not unlike a fir-tree; with oval leaves, seven or eight inches long. The flower is like that of a single rose; the fruit round, the size of a middling orange; the shell is like that of the pomegranate, the inside of a rose-color, divided by thin partitions as in oranges, in which the seeds are lodged, surrounded by a soft, juicy pulp, of a delicious flavor, partaking of the strawberry and the grape, and is esteemed one of the richest fruits in the world. It is a native of the Molucca islands, whence it has been transplanted to Java and Malacca. The head is in the form of a parabola, so fine and regular, and the leaves so beautiful, that it is looked upon in Batavia as the tree most proper for adorning a garden, and affording an agreeable shade. It was introduced to England in 1789.

According to Dr. Garcin (*Phil. Trans.*) "it is esteemed the most delicious of the East Indian fruits, and a great deal of it may be eaten without any inconvenience; it is the only fruit which sick people are allowed to eat without scruple. It is given with safety in almost every disorder; and we are told that Dr. Solander, in the last stage of a putrid fever in Batavia, found himself insensibly recovering by sucking this delicious and refreshing fruit. The pulp has a most happy mixture of the tart and sweet, and is no less salutary than pleasant."

Propagation and Culture. It may be raised from seed or cuttings; and in procuring the seeds from the East Indies, the same precautions must be taken as suggested for those of the mango. (1530.) Miller says, "the surest way to obtain the plants, is to sow the seeds in tubs of earth in their native country, and when the plants have obtained strength, they may be brought to Europe; but there should be great care taken to screen them from salt water in their passage, as also not to give them too much water when in a cool or temperate climate. When the plants arrive in Europe, they should be carefully transplanted each into a pot filled with light kitchen-garden earth, and plunged in the tan-bed, and shaded from the sun till they have taken new root. Then treat them as suggested for fruiting other stove plants."

1532. The *Pishamin*, or *European Date Plum.*—*Diospyros Lotus*, L. (*Mill. ic.* t. 116.) *Polyg. Diœc.* L.; and *Ebenaceæ*, B. P. It is a small tree, rising six feet high, with spreading branches, and large shining lanceolate leaves. The flowers are small, of a reddish white; the fruit is a berry half an inch in diameter, yellow when ripe, sweet, and somewhat astringent: it is used like the medlar, in a state of incipient decay. It is a native of Italy and some parts of France; was introduced to this country in Gerarde's time, and will grow in the open air, but not ripen its fruit freely.

Propagation and Culture. It may be raised from seeds sown in a hot-bed, and afterwards hardened, or from layers; but when it is intended to fruit the plant, it may be procured from Genoa of a good size; and planted in a temperate forcing-house, it will not fail to mature its fruit.

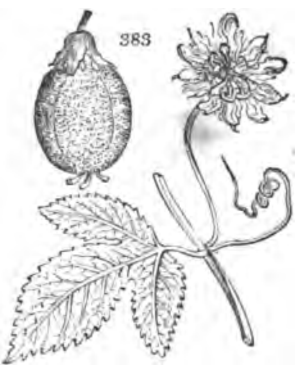
1533. The *Granadilla*, or *Little Pomegranate*. This name is applied to the edible fruit of five species of the *Passiflora* genus; *Monadel. Pentan.* L.; and *Passifloreæ*, J. The common character of which is that of climbing herbaceous plants, woody at bottom, generally with lobed leaves, and all natives of warm climates.

The *Granadilla*, or *Gronadilla Vine*, of the Fr. is the *P. quadrangularis*, L. (*Bot. Reg.* 14.) The leaves are oval and subcordate, five or six inches long and entire; the stem luxuriant and four-cornered. The flowers are odoriferous, red within and white on the outside, and appear in August and September, both fruit and flowers growing at the same time. The fruit, J. Sabine describes (*Hort. Trans.* iii. 100.) as "very large, of an oblong shape, about six inches in diameter, from the stalk to the eye, and fifteen inches in circumference. It is externally of a greenish-yellow when ripe, soft and leathery to the touch, and quite smooth; the rind is very thick, and contains a succulent pulp of a purple color, (which is the edible part), mixed with the seeds, in a sort of sack, from which it is readily separated. Wine and sugar are commonly added to it, when used. The flavor is sweet, and slightly acid, and it is very grateful to the taste, and cooling in a hot climate. It is a native of Jamaica, and other West India islands, where it grows in the woods, and was cultivated by Miller in 1768, as a stove-plant. It has since been successfully cultivated for its fruit in a few places, as at Lord Harewood's, (*Hort. Trans.* iv. 60.) Farnley Hall, &c.

The *Apple-fruited Granadilla*, or *Sweet Calabash*, is the *P. maliformis*, L.; (*Bot. Reg.* 95.) It has a thick triangular stem, with leaves oblong, cordate, six inches long, and four broad, in the middle of a lively green. The flowers are sweet-scented, large, of a pale red and blue: "the fruit round, smooth, about two inches in diameter, of a dingy yellow color when ripe; the coat is hard and stringy, nearly a quarter of an inch in thickness, full of a very agreeable gelatinous pale yellow pulp, in which many oblong black seeds are lodged," (*Hort. Trans.* iii. 101.) and is eaten like that of the former species It is a native of the West India islands, and was introduced here, and cultivated by Miller in 1731. It has borne fruit in the stove of the Bishop of Durham in Oxfordshire, and at J. Veres, Kensington Gore.

The *Laurel-leaved Granadilla*, or *Water Lemon*; the *Pomme de Liane* of the French, is the *P. laurifolia*, L.; (*Bot. Reg.* 13.) It has a suffrutescent stem, with divaricating, filiform branches, oval, smooth leaves, and very long tendrils. Flowers red and violet, sweet scented; the fruit about the size of a hen's egg, but rather more elongated, and tapering equally at both ends; when ripe, it is yellow and dotted over with white spots; it contains a whitish watery pulp, which, in the West Indies, is usually sucked through a small hole made in the rind; the rind is tough, soft, and thin; the juice has a peculiar aromatic flavor, is delicately acid, and allays thirst agreeably. It is a native of

Martinique and Surinam, and was introduced here in 1690. It is grown in the stove, but has not yet been cultivated for its fruit.



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The *Purple-fruited Granadilla* (*Hort. Trans.* vol. iii. pl. iii.) (*fig.* 383.) is by some botanists considered as a variety of *P. incarnata*, but by J. Sabine, who thus describes it (*Hort. Trans.* iii. 99.), as a distinct species. "The stem is thick and woody, the leaves three-lobed, and of considerable size; the flowers proceeding from the axilla of the leaves, fragrant, and of a white color, tinged with purple. The fruit when unripe, is green, but as it ripens changes to a dark livid purple, and much resembles the fruit of the purple egg-plant. The shape is eliptic, an inch and a half in diameter, and two inches from the stalk to the top; the pulp is orange-colored, and the seeds numerous; the taste acid, and the flavor somewhat like that of the orange. It is a native of the Brazils, was introduced from Portugal by E. Boehm, Esq. in 1810, and has produced fruit abundantly in the stoves at Walton on Thames, at the royal gardens at Windsor, and other places. Such is the rapid growth of this species, that a single plant will in one season extend in a line over upwards of forty feet of glass, on which space it will produce from 400 to 500 fruit."

The *Flesh-colored Granadilla*, or *May Apple*, is the *P. incarnata*, L.; (*Abb. in Geor.* t. 12.) The root is perennial, sending up annually a number of herbaceous shoots, with three-lobed leaves, and sweet scented flowers, variegated with purple, and appears from July to September. The fruit when ripe is about the size of an apple, orange-colored, with a sweetish yellow pulp. It is a native of Virginia, was cultivated in the open air by Parkinson in 1629, and afterwards by Miller in the stove, with whom it bore fruit.

Propagation and Culture. All the sorts may be propagated from seed-layers, and even cuttings; but layers come soonest into bearing. Having procured plants with good roots, plant such as are intended to fruit in a border in the stove, and train them to a trellis near the glass; they will in general produce fruit the second year. The seedlings of the purple-fruited sort will produce fruit the first year.

All the species will fruit even in large pots; but J. Sabine says, the "best method is, to plant them in an angle of the bark-bed, which has been parted off, either by boards, or nine-inch brick-work as low as the pit goes. At the bottom of the cavity, formed by this division, should be laid some brick-rubbish, over which may be thrown a little dead-tan, and the whole be then filled with equal parts of very old tan, and a compost of leaf-mould and rotten-dung. Herein the roots will strike freely, and will even spread through the partition into the pit, growing into the fresh tan. Such roots may be trimmed and reduced whenever the tan is changed; but should the plant have been some time in its station, it will be as well to leave part of the old tan in the bottom of the pit, in which the protruded roots may remain undisturbed. They do not require the full heat of the pine-stove, for they flourish best in a temperature of from 65 to 70 degrees; but they do not bring their fruit to perfection if kept in a common green-house or conservatory, though they will grow and flower in it. The shoots as they advance must be trained near to, and under, the inclined glass of the stove: the first flowers will appear in May, and the blooming will continue until September, the fruit setting the whole time; but if it does not set well, it will be advisable to impregnate the stigmas, by applying the pollen with a feather. As they grow, the very strong shoots should be cut out from their origin, for these do not bear fruit so abundantly as those which are less vigorous; but the fruiting branches must not be shortened on any account. The temperature must be kept up equally, during the time of flowering and fruiting; the crop will begin to come in in August, and will continue until January; but the earlier produce is the best."

"When the crop is all off, which will be early in January, the heat must be reduced to about 50°, so as to check or stop the growth; this being effected, the shoots must be well cut in. As little old wood as possible, besides the main stem, which rises from the pit to the glass, and a few pieces (about two or three feet of each) of the old branches should be retained: for all that is to be trained under the glass to bear in each year, ought to be the growth of the same season. It is found that the shoots break better, and in greater quantity, from the older wood than from that of two years' standing. In this dormant and reduced state it is to be kept during January and February, after which the necessary heat may be applied to cause it to resume its functions for the ensuing season."

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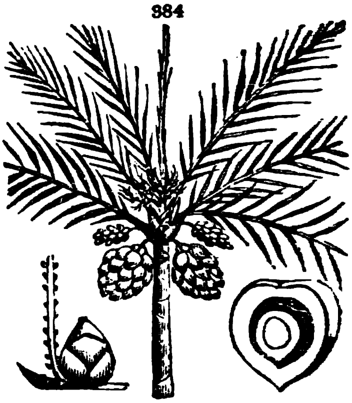

1534. The *Cocoa-nut Tree* is the *Cocos nucifera*, L.; (*Roxb. Cor.* 1. t. 73.) *Monæc. Hexan.* L.; and *Palmæ*, B. P. (*fig.* 384.) It is an East Indian palm; but cultivated in most places within the tropics. The trees grow to a great height, with leaves thirteen or fourteen feet long; the flowers come out round the top of the trunk of the tree in large clusters, inclosed in a spatha or sheath; and the nuts succeed them commonly ten or twelve together. Their form and use is familiar.

Propagation and Culture. The nuts are to be planted where they are designed to remain, as the tree will not bear transplanting unless when very young. In a moist heat they will push in six weeks or two months. To cultivate for fruit, plant in the centre of the area of a house, twenty-five feet wide, and either lofty, or with a moveable roof, which will admit of being raised as the tree advances in height. In this way, with a strong heat, there can be no doubt this tree would produce fruit in England; but even if it did not, or did not for a great many years, the magnificence of its appearance, under such a mode of treatment, would compensate a curious horticulturist for the labour and expence.

Though the cocoa-nuts to be obtained in the shops are supposed to be gathered before being ripe, yet they have been found to grow with no other care than planting in a large pot or box of rich earth, and plunging in a bark-bed. It may be observed here, that this is almost the only palm that could be cultivated in this country for perfecting its fruit; for the others being diœcious plants, unless a great number were grown together, there would be no means of impregnating the female blossoms.

1535. The *Plantain-Tree; Musa paradisiaca*, L.; *Hex. Monog.* L.; and *Musaceæ*, P. S., rises with a soft, herbaceous, conical stalk, fifteen or twenty feet high, with leaves issuing from the top, often more than six feet long, and near two feet broad; the spike of male and female flowers appear from the centre of the leaves, and is succeeded by pudding-shaped fruits, eight or nine inches long, above an inch in diameter; pale yellow when ripe, of a soft, sweet, luscious flavor; the spikes often so large as to weigh upwards of forty pounds. It is a native of the East Indies, and other parts of Asia, and probably of Africa, and was cultivated at Hampton-Court in 1690. Gerarde says, the pulp eats something like that of a musk melon; he calls the plant Adam's apple-tree, from a notion that it was the forbidden fruit of Eden; others suppose it to have been the grape brought out of the promised land to Moses. Dampier says, it is the king of all fruit, not excepting the cocoa itself. There are numerous varieties.

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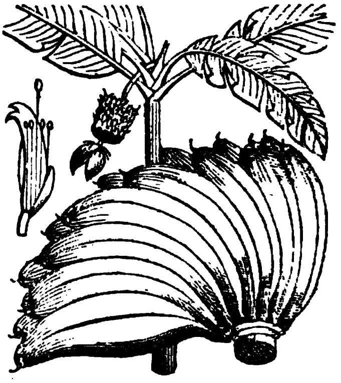
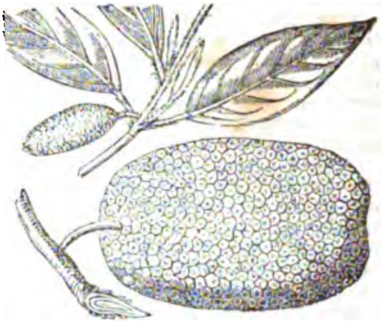


1536. The *Banana-Tree*, (*M. sapientum*, L.) (*fig.* 385.) differs from the plantain in having its stalks marked with dark purple stripes and spots, and the fruit is shorter and rounder. Some botanists, however, consider them as only one species. The fruit is mellower than the other, is eaten raw or roasted, in fritters, preserves, marmalades, and the fermented juice affords an excellent wine. It has been fruited for upwards of seven years, at Wynstay, the seat of Sir W. W. Wynne, in Denbighshire. Specimens were sent to the Horticultural Society in August 1819, which were between four and five inches long, and possessed an agreeable, luscious, and acid flavor, and the produce from a single plant is "so abundant, as to entitle the banana to be considered as an useful fruit for the table."

Propagation and Culture. Suckers rise from the root, which should be planted in light, rich earth, in pots, and afterwards, if the plant is cultivated for its fruit, planted in a bed or pit of earth, kept rather moist. The plant at Wynnstay was planted in the pit of a stove about 1811. "It was then about six feet high, with a single stem. In each succeeding year it has produced a bunch of fruit; but in the present year (1819) two bunches; the first was ripe in May, the other in August, having about four dozen fruit on each bunch. The plant is now sixteen feet high, and measures three feet round at the bottom." *Hort. Trans.* iv. 198.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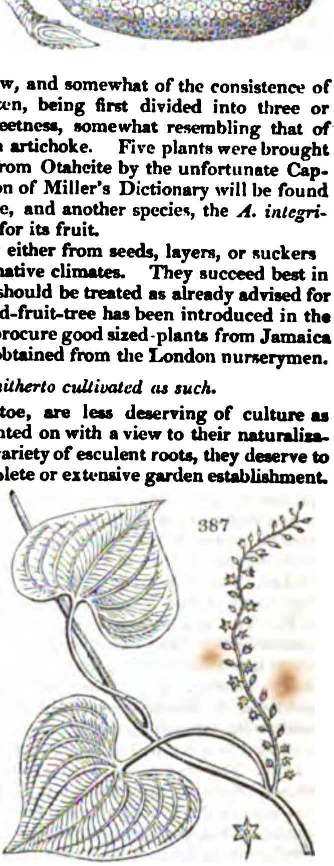
1537. The *Bread Fruit* is the *Artocarpus incisa*, L.; (*Rumph. Amb.* 3. t.33.) *Monæc. Monan.* L.; and *Urticeæ*, J.; the *Rima* or *Fruit-à-pain*, Fr.; and *Brodbaum*, Ger. (*fig.* 386.) It is a stove tree, growing in the South Sea Islands, to the height of a moderate sized oak, with alternate leaves, deeply gashed, glaucous, and two feet long. Aments on the outmost branches, violet-coloured, peduncled, male and female on the same twig. The whole tree and the fruit, before it is ripe, abounds in a very tenacious milky juice. The fruit is about the size and shape of a child's head, and the surface is reticulated, not much unlike a truffle; it is covered with a thin skin, and has a core about as big as the handle of a small knife; the eatable part lies between the skin and the core; it is as white as snow, and somewhat of the consistence of new bread. It must be roasted before it is eaten, being first divided into three or four parts; its taste is insipid, with a slight sweetness, somewhat resembling that of the crumb of wheaten bread mixed with Jerusalem artichoke. Five plants were brought to England, the remainder of the stock brought from Otaheite by the unfortunate Captain Bligh in 1793. In Professor Martyn's edition of Miller's Dictionary will be found a variety of interesting details relative to this tree, and another species, the *A. integrifolia* or *Jacca tree*, which also well merits culture for its fruit.

Propagation and Culture. This tree will grow either from seeds, layers, or suckers the latter the plants send up abundantly in their native climates. They succeed best in a rich soil; and to induce them to produce fruit, should be treated as already advised for other stove fruits not easily fruited. As the bread-fruit-tree has been introduced in the West India Islands, the shortest way would be to procure good sized-plants from Jamaica or St. Vincent's, though they may be occasionally obtained from the London nurserymen.

SECT. IV. *Exotic Esculents, not hitherto cultivated as such.*

If some of these as the yam and sweet potatoe, are less deserving of culture as exotic luxuries, they are worthy of being experimented on with a view to their naturalization as articles of food; but even as furnishing a variety of esculent roots, they deserve to be grown and sent to table, where there is a complete or extensive garden establishment.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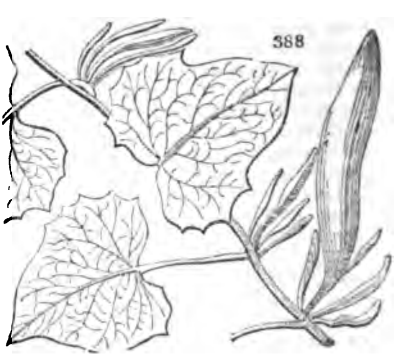
1538. The *West India Yam.* — The *Inhame* of the Portuguese, and *Igname* of the French, is the name applied to several species, with their numerous varieties of the genus *Dioscorea*, L.; *Diæc. Hexan.* L.; and *Dioscoreæ*, J. They are climbing, perennial, herbaceous plants, with tuberous roots, and axillary flowers in spikes or racemes. The name yam is more particularly applied to the *D. sativa*, (*Rheed. Mal.* 8. t. 51.) (*fig.* 387.) This plant has tender stalks, climbing to the height of eighteen or twenty feet, and furnished with smooth-nerved roundish leaves. From the base of the leaves arise spikes of small flowers of no beauty. The root is flat, brownish, a foot broad, and nearly palmated like those of some of the orchoideæ. It is a native of, and cultivated extensively in Africa and the East and West Indies, and was introduced here from the latter country in 1733. The roots are mealy, easy of digestion, palatable, and not inferior to any roots now in use, either for delicacy of flavor or nutriment. They are eaten instead of bread, either roasted on the cinders or boiled; the flower is also made into bread and puddings.

The *D. alata*, (*Rheed. mal.* 7 t. 38.) or *Winged yam*, is in equal, if not more universal cultivation than the former species. Its roots are frequently three feet long, and weigh thirty pounds. Of both these species there are numerous varieties, differing in the size and form of their roots.

Propagation and Culture. They may be propagated like the common potatoe, and cultivated in nearly the same manner as the forced potatoes. Brown (*Hist. of Jam.*)

affirms, "that the roots must be cut so as to leave a little of the skin to each piece, for by that alone they germinate; the roots having no apparent buds or eyes, but casting out their weakly stems from every part of the surface alike. They are planted commonly in August, and are ripe in November or December following."



1539. The *Spanish*, or *Sweet Potatoe*, is the *Convolvulus Batatas*, L. (*Rheed. mal.* 7. t. 50.); *Pent. Monog.* L.; and *Convolvulaceæ*, B. P. (*fig.* 388.). It is an herbaceous perennial, with a round stem, hispid, prostrate, creeping, of a whitish-green, putting out scattered, oblong, acuminated tubers, purple or pale on the outsides. The leaves are angular, on long petioles; the flowers purple, on upright peduncles. It is a native of both the Indies, and was introduced here, and cultivated by Gerarde in 1597. He calls the roots potatus, potades, or potatoes, and says, that they are by some named skirrets of Peru. They flourished in his garden till winter, when they perished and rotted. Batatas were then sold at the exchange in London, and are still annually imported into England from Spain and Portugal. They were, as already observed, (1315.) the common potatoes of our old English writers; the *Solanum tuberosum* being then little known.

The tubers of the batatas are sweet, sapid, and nourishing. They are very commonly cultivated in all the tropical climates, where they eat not only the roots but the young leaves and tender shoots boiled. There are several varieties, if not distinct species, differing in the size, figure, and taste of the roots.

Propagation and Culture. In warm climates this plant is cultivated in the same manner as our potatoe, but requires much more room, for the trailing stalks extend four or five feet every way, sending out large tubers, forty or fifty to a plant. In the national garden at Paris, the plants are raised in a hot-bed, and about the middle of May, transplanted in the open ground, where they are earthed-up, and otherwise treated like the potatoe. In warm seasons they produce a tolerable crop, and we have been informed by Professor Thouin, that he hopes, after several years, at least so far to acclimate the plant as to fit it for field-culture in the south of France. He considers it as much lighter food than the common potatoe, and equally nourishing. In England, Miller observes, the roots must be planted on a hot-bed in the spring, and if the plants are kept covered in bad weather with glasses, they will produce flowers and many small tubers from the joints; but if they are exposed to the open air, they seldom make much progress. This, however, ought not to discourage the curious or patriotic horticulturist, either in his attempts to raise the roots for the table, or to acclimate the plant.

1540. The *Salsilla* or *Edible Alstræmeria*, is the *Alstræmeria Salsilla*, B. M. (*Bot. Mag.* 1613.); and *S. edulis*, (*Hort. Trans.* vol. ii.) *Hex. Monog.* L., and *Asphodeleæ*, B. P. This is a herbaceous plant of great beauty a native of Peru, and introduced in 1806. It is cultivated in the West Indies, where its roots are eaten like the potatoe. It was flowered here in 1811, in the Count de Vande's garden at Bayswater. It requires the temperature of the stove, and may be cultivated in a hot-bed like early potatoes.

1541. The *Bread-root* is the *Psoralea esculenta*, (*Pursh. Amer.* t. 22.); *Diadelph. Decan.* L.; and *Leguminosæ*, J. It is a perennial herbaceous plant, a native of Missouri, and introduced here in 1811. It will grow in the open air, but requires the protection of a frame to produce abundant crops of roots, which are used like those of the potatoe in the countries where it is a native.

1542. The *Pi-tsi*, or *Water Chestnut* of the *Chinese*, is the *Scirpus tuberosus*, (*Rox.* iii. 26.) *Triand. Monog.* L.; and *Cyperaceæ*, B. P. (*fig.* 389.) It is a stoloniferous rush, without leaves, excepting a slender short sheath or two at the base of each culm. On the stolones grow tubers which are in high estimation among all ranks of the Chinese, not only as a pot-root, but as a medicine. It is eaten either boiled or raw.

Cultivation. "The Maa-tai, Pu-tsai, or Pi-tsi, of Abbé Grosier, grows in tanks; these are manured for its reception about the end of March. Thus a tank being drained of its water, small pits are dug in its bottom; these are filled with human manure, and exposed to the sun for a fortnight; their contents are next intimately blended with the slimy bottom of the tank, and the slips or roots of the plant deposited therein; the water is now returned to the tank, and the new crop of tubers comes to perfection by the first of September." *Rox. Corom.*

1543. The *Earth Almond*, or *Rush Nut*, (*Cyperus esculentus*, L.); *Trian. Monag.* L.; and *Cyperaceæ*, J.; *Souchet comestible*, Fr.; *Zizole di Terra*, Ital., is a fibrous-rooted grass, with small round tubers hanging from the fibres, about the size of pease, which taste, like schestnuts or almonds. It is a native of Italy and Montpelier, and is cultivated in some parts of the south of Europe and Germany for food. The tubers are planted in spring, and taken up in October, and preserved for winter use in the manner of potatoes. It might probably be cultivated in this country in dry warm situations, or in a frame. *Bon Jardinier.*

1544. The *Eatable Hibiscus*, (*Hibiscus esculentus*, L.); *Monodelph. Polyan.* L.; and *Malvaceæ*, J. *Gombaud* or *Gombo*, Fr. This is a stove annual, a native of the West Indies, and introduced in 1692. A soft, herbaceous stalk rises from three to five feet high, with crenate leaves, and axillary, pale sulphur-colored flowers, succeeded by capsules. These, in the West Indies and the south of France, are put green into soups, or eaten with butter. In the south of France it is cultivated in the open air for this purpose; and at Paris it is treated as we do the capsicum and love-apple. A similar treatment would, no doubt, succeed in this country.

1545. The *Arracacha*. *Umbelliferæ*, J., is a South American plant, said to resemble the *Apium* in habit; probably *Apium Americanum*, D. The main roots divide into four or five others, which grow to the size of cow's horns. These are used in the manner of potatoes by the inhabitants of Santa Fée and the Caraccas. They are light, starchy, and easy of digestion. The plant is said to thrive best in the elevated regions of mountains, where the medium heat does not exceed 58° or 60°. (*Annals of Bot.* i. 400.) This plant has not yet been determined, nor has it been introduced to Europe; but through the exertions of the Horticultural Society, specimens may soon be expected in England.

1546. The *Horned Tetragonia*, or *New Zealand Spinach*, *Tetragonia expansa*, W.; *Icos. Di.-Pentag.* L.; and *Ficoideæ*, J.; is a biennial, with numerous branches, elongated, round, and spreading. Leaves alternate, bluntish, quite entire, an inch and a half long. The flowers are yellow, and appear in August and September. The whole plant is studded with very minute chrystalline dots, as in some species of *Atriplex* and *Chenopodium*. It is a native of New Zealand, by the sides of woods in bushy sandy places, and though not used by the inhabitants, yet being considered by the naturalists who accompanied Captain Cook, as of the same nature as the chenopodium (*Foster escul.*), it was served to the sailors, boiled every day at breakfast and dinner. It was introduced here by Sir Joseph Banks in 1772, and treated as a green-house plant; but has lately been found to grow in the open garden as freely as the kidney-bean or nasturtium, and has been used as a spinach plant. In the Earl of Essex's family at Cashiobury, no other spinach was used during the whole summer of 1821. It grows so fast that three or four plants will suffice for a large family. *Hort. Trans.* vol. iv.

To the above we might add the *Trapa natans*, with which the ponds in Holland are covered, and the tubers used as chesnuts both by men and hogs; the *Dahlia*, recommended to be grown for its tubers by A. Thiébaut-de-Berneaud; and various others. To the former section also a number of fruits might be added by consulting the first book of *Rumphius*, which is devoted to the description of exotic trees cultivated in the East and West Indies for their fruit. See also Martyn's *Miller's Dictionary.*

Chap. XI.

Horticultural Productions which may be expected from a first rate Kitchen Garden managed in the best Style.

1547. The intention of this table is to point out in one view the numerous and varied sources of edible enjoyment afforded by a first-rate kitchen-garden, and consequently to inform a proprietor, who spares no expence on this department, what he has a right to expect, subject, however, to the drawbacks of bad situations, uncertain seasons, and unforeseen accidents. Many gardeners object to lists of this kind, as leading to unreasonable expectations, disappointments, and quarrels, and as, in short, enlightening too much their employers. On this we shall only observe, that the more a proprietor requires, the more he must conform to the conditions on which alone these products are to be expected. As to the subject of enlightening masters, much might be said in its favor, and nothing founded in right reason against it. It is only by a knowledge of gardening that a master can distinguish a bad gardener from a good one; and only from this appreciation that a good gardener can be properly valued and rewarded. Community of knowledge must be better than no community at all. A man who employs a gardener as he does a tailor, merely to supply his wants, may look on him as a very convenient machine, and useful to have about his premises; but where a knowledge and taste for gardening exists in the employer, one point of union is formed between him and his servant, which must be productive of a certain degree of humanity, if not of mutual respect and consideration. It is only bad gardeners therefore that have to fear the dissemination of knowledge among their masters.

In a work of this nature, however, in which the object is more to give the opinion of others than our own, we subjoin what M'Phail observes on the subject, which may be reckoned the opinion of most men of his order. The book called "'Every Man his own Gardener," he says, "gives a list of what fruits, &c. gentlemen may expect from their gardens in every month of the year; such a list not only of fruits, but of flowers and esculent vegetables, which nature, assisted by artificial means, is incompetent to produce in every month of the year in any country, in any degree of latitude under the sun: hence, from lists of this kind being given in books said to be written by practical gardeners, ariseth strife between masters and mistresses and their servant-gardeners." *Gard. Rem. Pref.* xxviii.

Sect. I. *January; the Productions arranged in the Order in which they have been treated in the preceding Chapters.*

1548. *Culinary Vegetables from the open Garden or Garden Stores.* Strasburg cabbage, savoys, borecoles, Brussels' sprouts. Kidney beans for haricots, and Prussian and other peas. Potatoes, Jerusalem artichokes, turnip, carrot, parsnip, red beet, skirret, scorzonera, and salsify, from the seed-room. Spinach in mild seasons; also sorrel and white beet. Onions, leeks, garlick, shallot, and rocambole. Sea-kale from the covered beds. Lettuce, endive, celery, American and winter-cress. Parsley, if protected, horse-radish, and dried fennel, dill, chervil, &c. Thyme, sage, rosemary, lavender, from the open garden, and dried marjoram, savory, mint, basil, &c. from the herb-room. Rhubarb-stalks from covered roots; anise, coriander and carraway-seeds, chamomile, elecampane, blessed thistle, &c. dried. Red cabbage and samphire. Wild rocket, wild spinach, sauce-alone, and sorrel, if a mild winter. Mushrooms from covered ridges. Sea-belt, or sweet fucus, dried.

Hardy Fruits from the Open Garden, Orchard, or Fruit-Room. Apples, pears, quinces, medlars, services from the fruit-room. Some plums and morello cherries, carefully preserved on the trees. Some thick-skinned gooseberries, currants, and grapes, preserved on the trees. Some dried fruits of the same sorts on branches hung up in the fruit-room. Almonds, walnuts, chestnuts, filberts from the fruit-room. Sloes from the bushes, wild services, hips, haws, and sometimes a few cloud-berries.

Culinary Vegetables and Fruits from the forcing Department. Kidney beans. Potatoes. Sea-kale. Small salads. Parsley, Fennel. Rhubarb. Mushrooms. Pines, winter melons, grapes, strawberries, cucumbers occasionally. Oranges, olives, and pomegranates. Malay apple, loquats, and lee-chees. Yams, and Spanish potatoes.

Sect. II. *February.*

1549. *Culinary Vegetables from the Open Garden or Garden Stores.* Scotch or Strasburgh cabbage, savoys, borecoles, Brussels' sprouts, and, if a mild winter, cabbage coleworts, brocolis. Haricots, beans, and soup-peas from the seed-room. Potatoes, Jerusalem, artichokes, turnip, carrot, parsnip, red-beet, skirret, scorzonera, and salsify. Spinach, if a mild winter. Onions, leeks, garlick, shallot, and rocambole. Sea-kale from covered beds. Lettuce, endive, celery. American and winter-cress. Parsley, if protected, horse-radish, and dried fennel, dill, chervil, &c. Thyme, sage, rosemary, and lavender, from the open garden; dried marjoram, basil, &c. from the herb-room. Rhubarb-stalks from covered roots, anise, coriander and carraway-seeds, from the seed-room; chamomile, &c. from the herb-room. Red cabbage, samphire. Nettle and thistle tops; towards the end, sorrel leaves, and if a mild winter, sauce-alone. Mushrooms from covered ridges. Sea-belt preserved, and occasionally badder-locks.

Hardy Fruits from the open Garden, Orchard, or Fruit-Room. Apples, pears, quinces, medlars, services from the fruit-room. Some plums from branches hung up in the fruit-room. Dried grapes and currants from branches hung up in the fruit-room. Almonds, walnuts, chestnuts, filberts from the fruit-room. Sloes from dried branches hung up in the fruit-room.

Culinary Productions and Fruits from the forcing Department. Kidney beans. Potatoes. Sea-kale, asparagus. Small salads. Parsley, mint, chervil. Rhubarb. Mushrooms. A pine occasionally; grapes, cucumbers, strawberries. Oranges, lemons, olives, pomegranates. Pishamin-nuts, lee chees. Yams, and Spanish potatoes.

Sect. III. *March.*

1550. *Culinary Vegetables from the open Garden, or Garden Stores.* Brussels' sprouts, borecoles of sorts, especially the early greens, and Breda cale, brocolis. Haricot beans and soup peas, from the seed-room. Potatoes, Jerusalem artichokes, turnip, carrot, red-beet, parsnip, skirret, scorzonera, and salsify. Spinach occasionally, if mild. Onions from the root-room; Welch onions, ciboules from the garden; garlick, shallot, and rocambole from the root-room. Sea-kale from covered beds. Lettuce, endive, celery, American and winter-cress; also water-cress, burnet and others. Parsley horse-radish, and dried fennel, dill, chervil, &c. Thyme, sage, rosemary from the open garden; and dried marjoram, basil, mint, savory, &c. from the herb-room. Rhubarb-stalks from covered roots; anise, coriander, carraway, and other seeds, chamomile, blessed thistle, and other dried herbs. Samphire. Nettle-tops, dandelion-leaves, bladder campion-tops, water-cresses, brook-lime, sauce-alone. Mushrooms from covered ridges. Common and red dulse, sea-belt, and pepper-dulse.

Hardy Fruits from the open Garden, Orchard, or Fruit-room. Apples, pears, quinces, medlars, services from the fruit-room. Some dried grapes. Almonds, walnuts, chestnuts, filberts from the fruit-room.

Culinary Productions and Fruits from the forcing Department. Kidney-beans. Potatoes, radishes. Sea-kale, asparagus. Small salads, onions. Parsley, mint, chervil, sweet marjoram. Rhubarb. Mushrooms. A pine occasionally; grapes, cucumbers, strawberries. Oranges, shaddocks, lemons, olives, preserved pomegranates. Loquats, pishamin-nuts, leeches, &c. yams, and Spanish potatoes.

Sect. IV. *April.*

1551. *Culinary Vegetables from the open Garden, or Garden Stores.* Brussels' sprouts, borecoles, brocoli, coleworts. Haricot beans, and soup-peas from the seed-room. Potatoes, Jerusalem artichoke, yellow turnip, carrot, red-beet, parsnip, skirret, scorzonera, and salsify. Spinach, orache, wild spinach, sorrel, fat-hen, herb-patience. Bulbed and young onions, ciboules, and Welch onions; garlick, shallots, rocambole, &c. from the stores. Sea-kale and asparagus at the end of the month; hop-tops, campion-tops, and thistle-tops throughout the month. Lettuce, endive, celery, American and winter-cress; burnet, water-cress, and other salads. Parsley, purslane, tarragon from the garden; horse-radish and dried herbs, from the herb-room. Thyme, sage, mint, rosemary, lavender, tansey, from the open garden. The others of this class from the herb-room. Rhubarb-stalks, from covered plants; angelica, elecampane, and thistle-stalks from the garden. The seeds and dried herbs of this class from the stores. Samphire and buds of marsh-marigold. Nettle, campion, thistle, bryony, burdock, ox-tongue, sauce-alone, and other tops; chickweed, wild-rocket, sea-belt, and other leaves. Mushrooms from covered ridges. Dulse, tangle, and other fuci, in a fresh state; sea-belt preserved; and floating fucus pickled.

Hardy Fruits from the open Garden, Orchard, or Fruit-Room. Apples, pears, services, from the fruit-cellar. Some dried grapes from the fruit-room. Almonds, walnuts, chesnuts, filberts, from the fruit-room or cellar.

Culinary Productions and Fruits from the forcing Department. Kidney beans, peas. Potatoes, carrots, radishes. Sea-cale, asparagus. Small salads, lettuce, onions. Parsley, purslane, mint, &c. Rhubarb. Mushrooms. A pine occasionally; grapes, cherries, peaches, cucumbers, melons, strawberries. Oranges, lemons, limes, pomegranates. Loquats, pishamin-nuts, and dried lee-chees, and long-yens. Yams and Spanish potatoes.

Sect. V. *May.*

1552. *Culinary Vegetables from the open Garden, or Garden Stores.* Early cabbages, cauliflowers, brocolis, and coleworts. Haricot-beans, and soup-peas from the seed-room, and sometimes, though rarely, young peas, towards the end of the month, from a warm border. Potatoes and Jerusalem artichokes from pits, or cold cellars; turnip, carrot, and red-beet from cellars or the open ground, if not destroyed by the frost; young radishes. Spinach, orache, wild spinach, sorrel, and herb-patience in perfection. Housed onions, and winter leeks; young onions, ciboules, and chives, garlick and shallot from cold rooms. Asparagus and sea-kale in perfection. Lettuce, endive, celery, succory, young radishes, and all the salads in perfection; winter-radish, lamb-lettuce. Parsley, purslane, horse-radish, tarragon, and all this class, either fresh or from the herb-room. Thyme, sage, mint, tansey, costmary, &c. from the open garden; the others from the herb-room. Rhubarb-stalks, blanched, or otherwise, from earthed-up or uncovered plants, angelica-stalks, anise, and other seeds, and the dried herbs, as before, from the herb-room. Samphire, and buds of marsh-marigold. Charlick, fat-hen, chickweed, so beautiful, that it is looked upon in Batavia as the tree most proper for adorning a garden, and affording an agreeable shade. It was introduced to England in 1789.

According to Dr. Garcin (*Phil. Trans.*) "it is esteemed the most delicious of the East Indian fruits, and a great deal of it may be eaten without any inconvenience; it is the only fruit which sick people are allowed to eat without scruple. It is given with safety in almost every disorder; and we are told that Dr. Solander, in the last stage of a putrid fever in Batavia, found himself insensibly recovering by sucking this delicious and refreshing fruit. The pulp has a most happy mixture of the tart and sweet, and is no less salutary than pleasant."

Propagation and Culture. It may be raised from seed or cuttings; and in procuring the seeds from the East Indies, the same precautions must be taken as suggested for those of the mango. (1530.) Miller says, "the surest way to obtain the plants, is to sow the seeds in tubs of earth in their native country, and when the plants have obtained strength, they may be brought to Europe; but there should be great care taken to screen them from salt water in their passage, as also not to give them too much water when in a cool or temperate climate. When the plants arrive in Europe, they should be carefully transplanted each into a pot filled with light kitchen-garden earth, and plunged in the tan-bed, and shaded from the sun till they have taken new root. Then treat them as suggested for fruiting other stove plants."

1532. The *Pishamin*, or *European Date Plum.* — *Diospyros Lotus*, L. (*Mill. ic.* t. 116.) *Polyg. Diœc.* L.; and *Ebenaceæ*, B. P. It is a small tree, rising six feet high, with spreading branches, and large shining lanceolate leaves. The flowers are small, of a reddish white; the fruit is a berry half an inch in diameter, yellow when ripe, sweet, and somewhat astringent: it is used like the medlar, in a state of incipient decay. It is a native of Italy and some parts of France; was introduced to this country in Gerarde's time, and will grow in the open air, but not ripen its fruit freely.

Propagation and Culture. It may be raised from seeds sown in a hot-bed, and afterwards hardened, or from layers; but when it is intended to fruit the plant, it may be procured from Genoa of a good size; and planted in a temperate forcing-house, it will not fail to mature its fruit.

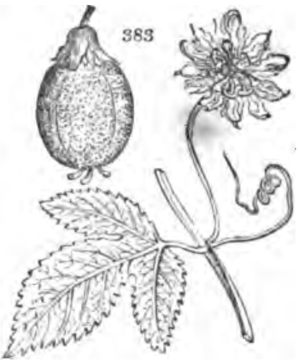
1533. The *Granadilla*, or *Little Pomegranate.* This name is applied to the edible fruit of five species of the *Passiflora* genus; *Monadel. Pentan.* L.; and *Passifloræ*, J. The common character of which is that of climbing herbaceous plants, woody at bottom, generally with lobed leaves, and all natives of warm climates.

The *Granadilla*, or *Gronadilla Vine*, of the Fr. is the *P. quadrangularis*, L. (*Bot. Reg.* 14.) The leaves are oval and subcordate, five or six inches long and entire; the stem luxuriant and four-cornered. The flowers are odoriferous, red within and white on the outside, and appear in August and September, both fruit and flowers growing at the same time. The fruit, J. Sabine describes (*Hort. Trans.* iii. 100.) as "very large, of an oblong shape, about six inches in diameter, from the stalk to the eye, and fifteen inches in circumference. It is externally of a greenish-yellow when ripe, soft and leathery to the touch, and quite smooth; the rind is very thick, and contains a succulent pulp of a purple color, (which is the edible part), mixed with the seeds, in a sort of sack, from which it is readily separated. Wine and sugar are commonly added to it, when used. The flavor is sweet, and slightly acid, and it is very grateful to the taste, and cooling in a hot climate. It is a native of Jamaica, and other West India islands, where it grows in the woods, and was cultivated by Miller in 1768, as a stove-plant. It has since been successfully cultivated for its fruit in a few places, as at Lord Harewood's, (*Hort. Trans.* iv. 60.) Farnley Hall, &c.

The *Apple-fruited Granadilla*, or *Sweet Calabash*, is the *P. maliformis*, L.; (*Bot. Reg.* 95.) It has a thick triangular stem, with leaves oblong, cordate, six inches long, and four broad, in the middle of a lively green. The flowers are sweet-scented, large, of a pale red and blue: "the fruit round, smooth, about two inches in diameter, of a dingy yellow color when ripe; the coat is hard and stringy, nearly a quarter of an inch in thickness, full of a very agreeable gelatinous pale yellow pulp, in which many oblong black seeds are lodged," (*Hort. Trans.* iii. 101.) and is eaten like that of the former species It is a native of the West India islands, and was introduced here, and cultivated by Miller in 1731. It has borne fruit in the stove of the Bishop of Durham in Oxfordshire, and at J. Veres, Kensington Gore.

The *Laurel-leaved Granadilla*, or *Water Lemon*; the *Pomme de Liane* of the French, is the *P. laurifolia*, L.; (*Bot. Reg.* 13.) It has a suffrutescent stem, with divaricating, filiform branches, oval, smooth leaves, and very long tendrils. Flowers red and violet, sweet scented; the fruit about the size of a hen's egg, but rather more elongated, and tapering equally at both ends; when ripe, it is yellow and dotted over with white spots; it contains a whitish watery pulp, which, in the West Indies, is usually sucked through a small hole made in the rind; the rind is tough, soft, and thin; the juice has a peculiar aromatic flavor, is delicately acid, and allays thirst agreeably. It is a native of

Martinique and Surinam, and was introduced here in 1690. It is grown in the stove, but has not yet been cultivated for its fruit.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The *Purple-fruited Granadilla* (*Hort. Trans.* vol. iii. pl. iii.) (*fig.* 383.) is by some botanists considered as a variety of *P. incarnata*, but by J. Sabine, who thus describes it (*Hort. Trans.* iii. 99.), as a distinct species. " The stem is thick and woody, the leaves three-lobed, and of considerable size; the flowers proceeding from the axilla of the leaves, fragrant, and of a white color, tinged with purple. The fruit when unripe, is green, but as it ripens changes to a dark livid purple, and much resembles the fruit of the purple egg-plant. The shape is eliptic, an inch and a half in diameter, and two inches from the stalk to the top; the pulp is orange-colored, and the seeds numerous; the taste acid, and the flavor somewhat like that of the orange. It is a native of the Brazils, was introduced from Portugal by E. Boehm, Esq. in 1810, and has produced fruit abundantly in the stoves at Walton on Thames, at the royal gardens at Windsor, and other places. Such is the rapid growth of this species, that a single plant will in one season extend in a line over upwards of forty feet of glass, on which space it will produce from 400 to 500 fruit."

The *Flesh-colored Granadilla*, or *May Apple*, is the *P. incarnata*, L.; (*Abb. in Geor.* t. 12.) The root is perennial, sending up annually a number of herbaceous shoots, with three-lobed leaves, and sweet scented flowers, variegated with purple, and appears from July to September. The fruit when ripe is about the size of an apple, orange-colored, with a sweetish yellow pulp. It is a native of Virginia, was cultivated in the open air by Parkinson in 1629, and afterwards by Miller in the stove, with whom it bore fruit.

Propagation and Culture. All the sorts may be propagated from seed-layers, and even cuttings; but layers come soonest into bearing. Having procured plants with good roots, plant such as are intended to fruit in a border in the stove, and train them to a trellis near the glass; they will in general produce fruit the second year. The seedlings of the purple-fruited sort will produce fruit the first year.

All the species will fruit even in large pots; but J. Sabine says, the " best method is, to plant them in an angle of the bark-bed, which has been parted off, either by boards, or nine-inch brick-work as low as the pit goes. At the bottom of the cavity, formed by this division, should be laid some brick-rubbish, over which may be thrown a little dead-tan, and the whole be then filled with equal parts of very old tan, and a compost of leaf-mould and rotten-dung. Herein the roots will strike freely, and will even spread through the partition into the pit, growing into the fresh tan. Such roots may be trimmed and reduced whenever the tan is changed; but should the plant have been some time in its station, it will be as well to leave part of the old tan in the bottom of the pit, in which the protruded roots may remain undisturbed. They do not require the full heat of the pine-stove, for they flourish best in a temperature of from 65 to 70 degrees; but they do not bring their fruit to perfection if kept in a common green-house or conservatory, though they will grow and flower in it. The shoots as they advance must be trained near to, and under, the inclined glass of the stove: the first flowers will appear in May, and the blooming will continue until September, the fruit setting the whole time; but if it does not set well, it will be advisable to impregnate the stigmas, by applying the pollen with a feather. As they grow, the very strong shoots should be cut out from their origin, for these do not bear fruit so abundantly as those which are less vigorous; but the fruiting branches must not be shortened on any account. The temperature must be kept up equally, during the time of flowering and fruiting; the crop will begin to come in in August, and will continue until January; but the earlier produce is the best."

" When the crop is all off, which will be early in January, the heat must be reduced to about 50°, so as to check or stop the growth; this being effected, the shoots must be well cut in. As little old wood as possible, besides the main stem, which rises from the pit to the glass, and a few pieces (about two or three feet of each) of the old branches should be retained: for all that is to be trained under the glass to bear in each year, ought to be the growth of the same season. It is found that the shoots break better, and in greater quantity, from the older wood than from that of two years' standing. In this dormant and reduced state it is to be kept during January and February, after which the necessary heat may be applied to cause it to resume its functions for the ensuing season."

Sect. XII. *December.*

1559. *Culinary Vegetables from the open Garden, or Garden Stores.* Strasburg cabbages, cauliflowers, where preserved or protected, brocolis, savoys, Brussels'-sprouts, borecole. Dried kidney-beans for haricots; and soup-peas from the seed-room. Potatoes, turnips, carrots, winter-radish, Jerusalem artichokes, red beet, skirret, salsify, and scorzonera, from the open garden or root-room. Beet-chard, where protected. Onions, leeks, garlic, shallots, and rocambole. Cardoons, celery. Endive, lettuce, winter and American-cress. Parsley, horse-radish, dried herbs. Thyme, sage, rosemary, lavender, &c. green, the other dried. The anise and other aromatic seeds from the seed-room; and the herbs of this class from the herb-room. Red cabbage. Edible roots from stores or pits. Preserved sea-belt, and when the weather admits of gathering other edible fuci; the floating fucus in pickle.

Hardy Fruits from the open Garden, Orchard, or Fruit-room. Apples, pears, quinces, medlars, services. Some protected plums and cherries from branches hung in the fruit-room. Grapes from the trees, or from branches hung in the fruit-room. Almonds, wallnuts, chestnuts, filberts, from the fruit-room. Sloes, from the bushes, wild services, hips, haws, cranberries, and cloudberries.

Culinary Productions and Fruits from the forcing Department Kidney beans. Potatoes. Sea-kale. Small salads. Chervil, fennel, &c. Rhubarb. Mushrooms. Pines, grapes, melons, &c. winter-melons, cucumbers, figs. Oranges, lemons, pomegranates, olives. Akees, guavas, durions, mangos, mangosteens, rose-apples, pishamins, lee chees, &c. Yams and sweet potatoes.

BOOK II.

Floriculture.

This branch of practical gardening we consider as comprehending whatever relates to the culture and arrangement of vegetables, grown chiefly on account of their flowers, or as objects of taste or curiosity. The culture of flowers was long carried on with that of culinary vegetables, in the borders of the kitchen-garden, or in parterres or groups of beds, which commonly connected the culinary compartments with the house. In places of moderate extent, this mixed style is still continued; but in residences which aim at any degree of distinction, the space within the walled garden is confined to the production of objects of domestic utility, while the culture of plants of ornament is displayed in the flower-garden and the shrubbery. These, under the general term of pleasure-ground, encircle the house in small seats, and on a larger scale embrace it in one or more sides; the remaining part being under the character of park-scenery.

Many of the most interesting plants belonging to this branch of culture are natives of warm climates, and require the protection of glass and artificial heat. On a limited scale, such plants are grown in the culinary-forcing-houses, or in green-houses, or botanic stoves, connected with the others in the kitchen garden. In complete residences, however, the culture of exotics forms a distinct department of ornamental horticulture, and the hot-houses requisite for this purpose are placed in the flower-garden, or variously arranged within the precincts of the pleasure-ground. In both departments, separation is attended with the usual advantages resulting from a division of skill, labor, and effect.

Floriculture is obviously of limited interest and utility, compared to horticulture; much less has accordingly been written on it, and our view of modern practice will, therefore, be proportionately brief. The order adopted, is the formation, planting, and general culture of the flower-garden. The formation, planting, and general culture of the shrubbery. The design and general culture of the hot-house. The catalogue of plants and trees used in ornamental horticulture: and, lastly, the monthly table of floricultural productions.

Chap. I.

Of the Formation of the Flower-Garden.

1560. It is essential to the flower-garden, as to every department of floriculture that its *situation* be near the house, for ready access at all times, and especially during winter and spring, when the beauties of this scene are felt with peculiar force. "The flower-garden," Neill observes, "should form an ornamental appendage to the mansion, and be easily accessible in all kinds of weather. There is no objection to its being seen from the windows of the house; on the contrary, this is sometimes considered as desirable." Nicol, as we have seen, (1074.), approves of "having the various gardens of a place combined, and placing them at no great distance from the house;" and Repton strongly recommends this practice.

Abercrombie, says, "While the kitchen-garden is concealed by buildings or plantations, the flower-garden and pleasure-ground should stand conspicuously attached to the family residence. When the horticultural establishment includes a conservatory, it is proper to have it in sight, and connected with the ornamented grounds; because the style of such a building, the plants within, and the scene without, under a tasteful arrangement, harmonize in character and effect. The botanic-garden, the range of stoves, and all the departments, a visit to which, renders a walk about the grounds pleasing and interesting, should be at hand."

The author of the *Florist's Manual* confines her observations to "the construction of that humble flower-garden," which she calls the "common or mingled flower-garden." "This," she says, "should be situated so as to form an ornamental appendage to the house, and where the plan of ground will admit, placed before windows exposed to a southern or south-east aspect; and although to this position there may appear the objection of the flowers turning their petals to the sun, and consequently from the windows, this predilection in the tribe of Flora for the rays of that bright luminary, will produce the same effect in whatever place our flowers may be situated, when in the vicinity of a building, as they invariably expose the front of their corols to the light, from which both the petals of flowers, and the leaves of plants are believed to derive some material essential to their existence." She adds, "when apart from the house, the mingled flower-garden may be introduced with great advantage, if situated so as form a portion of the pleasure-ground: in this case it should not be distinct from the house, but so contrived as to terminate one of the walks of the home-shrubberies." *Flor. Man.* p. 10. and 15.

It is in general a desirable circumstance to place the flower-garden south of the house, and between it and the kitchen-garden. In a design for a villa farm (*fig.* 390.) supposing the entrance front of the house (*a*), to face the north-west, then the farm offices (*b*), horse-pond (*c*), &c. may be placed to the north-east; the kitchen-yard (*d*), and livery-stable-yard (*e*), to the south-west: against these may be placed the exotic hot-houses, looking to the flower-garden (*f*), and beyond this the American garden (*g*), and lastly, the kitchen-garden (*h*), and walk through the farm (*i*). If concealed approaches to the farm and stable-offices (*c, n*,) and from the kitchen-garden to the kitchen (*h, e, d*,) be contrived, such an arrangement will be found to combine both elegance and economy, and to admit of bringing the wire fence (*m*), which separates the mown from the fed lawn, near the house, without being unsightly: a desirable object in farm villas, as it saves mowing, and increases pasturage.

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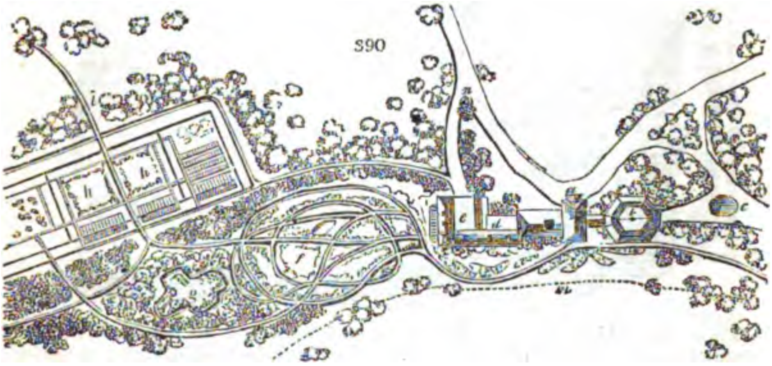

1561. *In Exposure and Aspect*, the flower-garden should be laid out as much as possible on the same principles as the kitchen-garden (1075), not only on account of the advantages to be derived from the full influence of the sun during winter on the hot-house department, but also for the better enjoyment of the open air scenes, in weather favourable for walking out of doors. It should not be naturally low in surface, nor of a wet retentive soil, nor rendered damp and gloomy by surrounding high trees, or lofty walls or buildings.

If it happen that a house be nearly surrounded by a flower-garden, the variety of aspect thence afforded will be favourable to the continuance of the bloom of our flowers, far beyond what can be obtained if confined to a southern exposure. South-south-east, and east, are the aspects most advantageous to the growth of flowers; and, possessing these varieties of exposure, the bloom of a garden may be protracted some weeks beyond the time it could be preserved under a single aspect.

1562. *The extent* of the flower-garden depends jointly on the general scale of the residence, and the particular taste of the owner. If any proportion may be mentioned, perhaps, a fifth part of the contents of the kitchen-garden will come near the general average; but there is no impropriety in having a large flower-garden to a small kitchen-garden or mansion, where the taste of the owner leads to such a deviation from common rules. As moderation, however, is generally found best in the end, we concur with the author of the Florist's Manual, when she states, that "the compass of ground appropriated to flowers must vary according to the size of the place of which that ground forms a part, and should in no case be of greater extent. If the form of ground, where a parterre is to be situated, is sloping, the size should be larger than when a flat surface, and the borders of various shapes, and on a bolder scale, and intermingled with grass; but such a flower-garden partakes more of the nature of pleasure-ground than of the common parterre, and will admit of a judicious introduction of flowering shrubs."

"To cover twenty acres with mere flowering plants," Abercrombie observes, "producing nothing esculent in the root, leaves, or fruit, would be puerile and ridiculous, as it would exceed the moderation with which nature scatters her ornaments." *Pract. Gard.* 338.

1563. *Shelter* is equally requisite for the flower as for the kitchen-garden, and where naturally wanting, is to be produced by the same means, viz. planting. The plantation on the side next the garden, should begin with the lowest shrubs, and rise in gradation to the trees, which, unless on the north, or very exposed points, should not be of the tallest kinds. A few elegant shrubs, and one or two trees may be scattered through the scene, either in the dug compartments or in the turf-glades, for the purposes of shelter and shade as well as ornament; but in general, much of either of the two former qualities are highly injurious both to the culture of flowers, and the thick closeness of turf; besides rendering the garden unfit to be resorted to in the winter and spring seasons.

Sometimes an evergreen-hedge will produce all the shelter requisite, as in small gardens, composed of earth and gravel only (*fig.* 392.); but where the scene is large, (*fig.* 391.), and composed of dug compartments (*a*), placed on lawn (*b*), the whole may be surrounded by an irregular border (*c*) of flowers, shrubbery, and trees.

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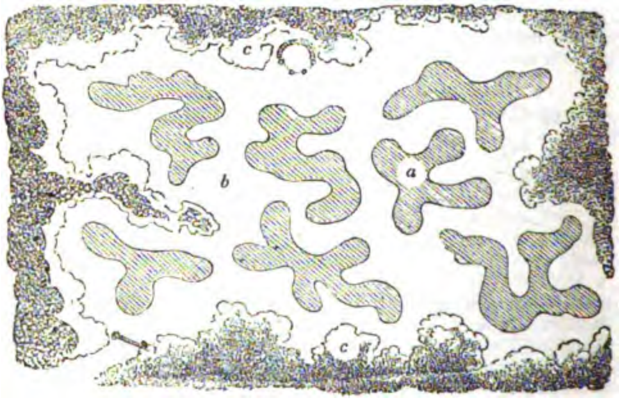

1564. *Soil.* Most of the hardy herbaceous flowers, and the deciduous and evergreen ornamental shrubs, will succeed in a soil of common good qualities, moderately light and mellow. Negatively, the ground should not be excessively strong and clayey; and mere gravel is very intractable. *Abercrombie.*

Nicol observes, that flowers in general "will thrive very well in common garden earth of a middling texture, if broke fine, to the depth of a foot. Some, no doubt, do better in light than in heavy soils; and the contrary: and others do best in rich, humid earth.

"Bulbous flowers, in general, do best in light, sandy earth; though some require a stronger and a richer soil. In general, the soil for these should be formed at least eighteen inches deep, and should be made very fine by the spade, or be put through a coarse screen."

In parterres where the finer flowers are cultivated, a variety of soils will be required according to the nature of the plants, as rich sandy loam for bulbs, loamy earth for the primula tribe, bog-earth for American plants; and hence it follows, that, provided the sub-soil be dry, the nature of the surface-stratum is of the less consequence.

1565. *Surface.* Where the extent is small, and the plants grown to be chiefly florists' flowers, or other select kinds, in beds separated by gravelled paths, a level or gentle and uniform slope will be found most suitable; but where the limits are more extensive, and turf and shrubs are introduced, a wavy surface, either naturally or rendered so by art, will have much the best effect. "In recluse scenes immediately under the eye, art may create a sort of miniature of beautiful ground. Man is but a puny object compared to those of inanimate nature. He may overlook a distant hill, separated by low ground; but a mound of less than three yards in height, placed near the eye, confines the view, and all other objects being shut out, acquires if apparently a work of nature, a degree of importance in his imagination: winding walks, four feet below the original surface, will supply earth for accompanying them by wavy hills or swells eight feet high. If these hills and swells are formed and contrived so as to produce a varied and natural-like whole, with every change of position, a very suitable basis will be raised for a picturesque shrubbery or flower-garden. It was to this sort of art that Pope's garden, at Twickenham, was indebted for so great a variety of beauties in a small space; and the flower-garden at Lord Harcourt's at Nuneham, was laid out under the eye of Mason the poet, on the same principle. *Ed. Ency.* art. *Landscape Gardening.*

1566. *Water.* This material, in some form or other, is as essential to the flower as to the kitchen-garden. Besides the use of the element in common culture, a pond or basin affords an opportunity of growing some of the more showy aquatics, while jets, drooping-fountains, and other forms of displaying water, serve to decorate and give interest to the scene. Besides choice aquatics, the ponds or basins of flower-gardens may be stocked with the gold fish (*Cyprinus auratus*), and will serve as a hybernaculum for that elegant and interesting animal the tree-frog (*Rana arborea*), so amusing in the gardens of the south of Germany.

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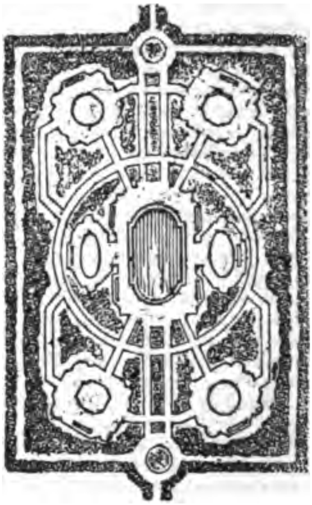

1567. The *Form* of a small garden, (*fig.* 392.) will be found most pleasing when some regular figure is adopted, as a circle, oval, octagon, crescent, &c.: but where the extent is so great as not readily to be caught by a single glance of the eye, an irregular shape is generally more convenient, and it may be thrown into agreeable figures, or component scenes, by the introduction of shrubs so as to subdivide the space. "Either a square or an oblong ground-plan," Abercrombie observes, "is eligible; and although the shape must be often adapted to local circumstances, yet, when a garden is so circumscribed that the eye at once embraces the whole, it is desirable that it should be of some regular figure."

Nicol says, "a variety of forms may be indulged in, without incurring censure; provided the figures be graceful, and not in any one place too complicated. An oval is a figure that generally pleases, on account of the continuity of its outline; next, if extensive, a circle. Next, perhaps, a segment in form of a half-moon, or the larger segment of an oval. But hearts, diamonds, triangles, or squares, if small, seldom please. A simple parallelogram, divided into beds running lengthwise, or the larger segment of an oval, with beds running parallel to its outer margin, will always please." Neill concurs in this opinion.

The author of *Hints on the Formation of Gardens,* &c. says, "a symmetrical form is best adapted to such parterres as are small and may be comprehended in one view; and an irregular shape to such as are of a considerable size, and contain trees, shrubs, statues, vases, seats, and buildings."

1568. *Boundary Fence, or Screen.* Parterres on a small scale may be enclosed by an evergreen hedge of holly, box, laurel, privet, juniper, lauristinus, or Irish whin (*Ulex europæus, var.* α.); but irregular figures, especially if of some extent, can only be surrounded by a shrubbery, such as we have already hinted at (1563.) as forming a proper shelter for flower-gardens.

Abercrombie says, "for the enclosure, a wall or close paling is, on two accounts, to be preferred on the north side; both to serve as a screen, and to afford a warm internal face for training rare trees. When one of those is not adopted, recourse may be had to a fence of white thorn and holly," &c. *Pract. Gard.* 339.

1569. *Laying out the Area.* This is the most difficult part of the business, and is not to be excelled in without a considerable degree of taste and experience. In laying out the area of the kitchen-garden, its destination being utility, affords in all cases a safe and fixed guide; but the flower-garden is a matter of fancy and taste, and where these are wavering and unsettled, the work will be found to go on at random. As flower-gardens are objects of pleasure, that principle which must serve as a guide in laying them out, must be taste. Now, in flower-gardens, as in other objects, there are different kinds of tastes; these embodied are called styles or characters, and the great art of the designer is, having fixed on a style, to follow it out unmixed with other styles, or with any deviation which would interfere with the kind of taste or impression which that style is calculated to produce. Style, therefore, is the leading principle in laying out flower-gardens, as utility is in laying out the culinary-garden.

As subjects of fancy and taste, the styles of flower-gardens are various. The modern style is a collection of irregular groups and masses, placed about the house as a medium, uniting it with the open lawn. The ancient geometric style, in place of irregular groups, employed symmetrical forms; in France, adding statues and fountains; in Holland, cut trees and grassy slopes; and in Italy, stone-walls, walled-terraces, and flights of steps. In some situations, these characteristics of parterres may with propriety be added to, or used instead of the modern sort, especially in flat situations, such as are enclosed by high walls in towns, or where the principal building or object is in a style of architecture which will not render these appendages incongruous. There are other characters of gardens, such as the Chinese, which are not widely different from the modern; the Indian, which consist chiefly of walks under shade, in squares of grass, &c.; the Turkish, which abounds in shady retreats, boudoirs of roses and aromatic herbs; and the Spanish, which is distinguished by trellis-work and fountains: but these gardens are not generally adapted to this climate, though from contemplating and selecting what is beautiful, or suitable in each, a style of decoration for the immediate vicinity of mansions might be composed, greatly preferable to any thing now in use.

Abercrombie, Nicol, and most practical gardeners, seem not to understand the subject of style, and their rules amount to little more than that of subdividing the area by paths in different directions. The former author says, "If a piece of ground be set apart for the cultivation of flowers, in what style should it be laid out? This may vary with the quantity of surface, and the object of the cultivator. In the first place, carry a border round the garden, nowhere narrower than three or four feet, unless it may be proper to contract its breadth under the windows of the house; or unless there be a green hedge, on any side, rooted in the level of the garden, which might be expected either to draw the earth, or to encroach on the small plants, in which case flowering shrubs in little slips of mould would do better than dwarf-stemmed flowers. In contact with the surrounding border, may be either a grass-plat or a gravel-walk. The latter is most convenient for approach at all seasons. If the ground be at all dilated, handsome walks, crossing or leading to the centre, will be also requisite: let the principal walks be five or six feet in breadth. The interior of the garden is usually laid out in oblong beds, three or four feet wide, with intervening alleys, two feet wide, or from that down to twelve inches, when it is intended to abstract as little space as possible from the cultivation of the flowers; or, the same end may be attained by circular or oval beds, with smaller compartments between, of such a form as will leave the alleys of one regular width." *Pract. Gard.* 340.

According to Nicol, the laying out of flower-gardens is a "matter very much of fancy." "Too many gravelled alleys offend the eye, especially if they be much twisted, or run cross; as it comprehends the whole at once. Their breadths should be proportioned to that of the beds; nor should they be much sunk; seldom more than an inch; otherwise they have a bad effect, and look rather like furrows than alleys. They may be edged with box, with daisies, with violets, gentianella, or thrift, according to fancy. But the edging, whatever it be, should be kept low, thin, and neat. It should seldom be allowed to rise two inches high, or spread two inches wide. A linear box-edging always pleases, if kept quite close and connected." *Kal.* 458.

The author of the *Florist's Manual*, though she confines her directions to one style, has much more correct ideas on the subject than our practical authors. "It is more difficult," she says, "than may at first appear, to plan, even upon a small scale, such a piece of ground, nor perhaps, would any but an experienced scientific eye be aware of the difficulties to be encountered in the disposal of a few shaped borders interspersed with turf; the nicety consists in arranging the different parts so as to form a connected glow of color, to effect which it will be necessary to place the borders in such a manner that when viewed from the windows of the house, or from the principal entrance into the garden, one border shall not intercept the beauties of another, nor in avoiding that error, produce one still greater, that of vacancies betwixt the borders forming small avenues, by which the whole is separated into broken parts, and the general effect lost. Another point to be attended to, is the just proportion of green turf, which, without nice observation, will be too much or too little for the color with which it is blended; and lastly, the breadth of the flower-borders should not be greater than what will place the roots within reach of the gardener's arm without the necessity of treading upon the soil, the mark of footsteps being a deformity wherever it appears amongst flowers." *Flor. Man.* 13.

In general, the materials which form the surface of flower-gardens (*figs.* 393. and 394.) are gravel (*a*), turf (*b*), and dug-borders (*c*), patches (*d*), or compartments (*e*), and water (*f*); but a variety of other objects and materials may be introduced as receptacles for plants, or the surface of walks; as grotesque roots, rocks, flints, spar, shells, scoriæ in conglomerated lumps, sand and gravel of different colors; besides works of art introduced as decorations, or tonsile performances, when the old French style (*fig.* 395.) is imitated.

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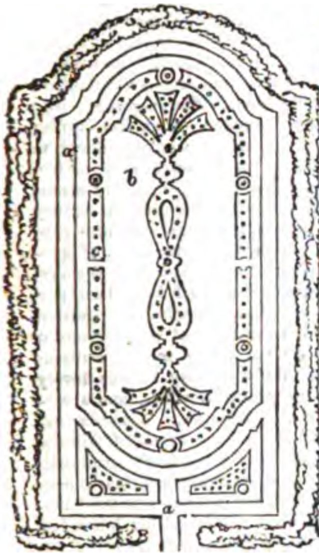

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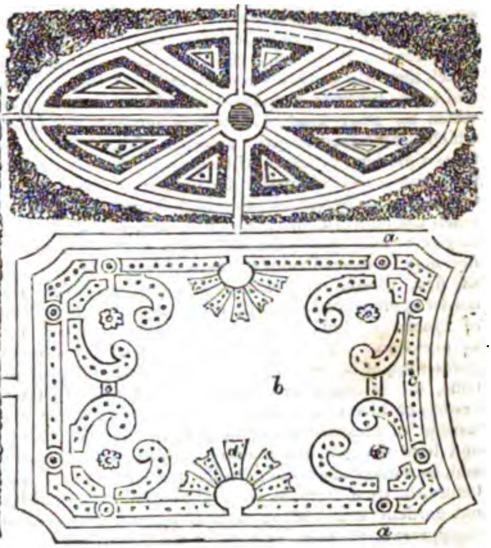

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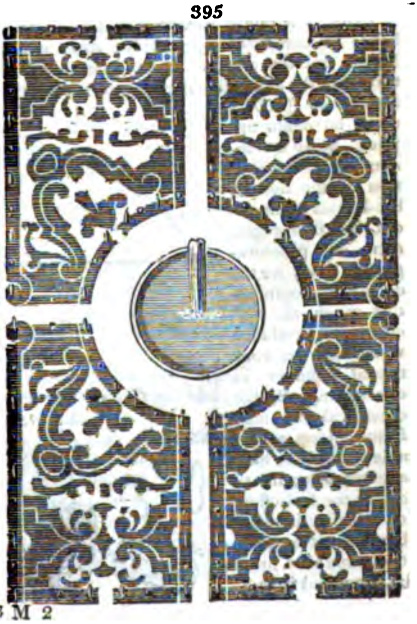

The author of the *Florist's Manual*, on the subject of *Rock-works*, observes, that "fragments of stone may be made use of, planted with such roots as flourish among rocks, and to which it might not be difficult to give a natural appearance, so far as by bringing forward to the view the utility of these stones in the culture of the vegetables growing thereon. The present fashion of introducing into flower-gardens this kind of rock-work requires the hand of taste to assimilate it to our flower-borders, the massive fabric of the rock being liable to render the lighter assemblage of the borders diminutive and meagre: on this point, caution only can be given, the execution must be left to the elegant eye of taste, which, thus warned, will quickly perceive such deformity. I must venture to disapprove the extended manner in which this vegetable rock-work is sometimes introduced, not having been able to reconcile my eye, even in gardens planned and cultivated with every advantage which elegant ingenuity can give them, to the unnatural appearance of artificial crags of rock and other stones interspersed with delicate plants, to the culture of which the fertile and sheltered border is evidently necessary, being decided that nothing of the kind should be admitted into the simple parterre that is not manifestly of use to the growth of some of the species therein exhibited. In pleasure-grounds or flower-gardens on an extensive scale, where we meet with fountains and statuary, the greater kinds of vegetable rock-work might probably be well introduced; but to such a magnificent display of art I feel my taste and knowledge wholly incompetent." *Flor. Man.* 15.

"Where neither expense nor trouble," the same author adds, "oppose their prohibitory barrier, many of the vegetable tribe may be cultivated to greater perfection, if we appropriate different gardens to the growth of different species, as, although it is essential to the completion of our garden to introduce, on account of their scent and beauty, some of the more hardy species of the flowers termed annuals, in that situation room cannot be afforded them sufficient to their production in that full luxuriancy which they will exhibit when not crowded and overshadowed by herbaceous vegetables; and hence becomes desirable that which may be called the annual flower-garden, into which no other kind of flower is admitted besides that fugacious order, and under which is contained so great a variety of beauty and elegance, as one well-calculated to form a garden, vying in brilliancy with the finest collection of hardy perennials. Also, the plants comprised under the bulbous division of vegetables, although equally essential to the perfection of the mingled flower-garden, lose much of their peculiar beauty when not cultivated by themselves, and will well repay the trouble of an assiduous care to give to each species the soil and aspect best suited to its nature. Two kinds of garden may be formed from the extensive and beautiful variety of bulbous-rooted flowers, the first, wherein they should be planted in distinct compartments, each kind having a border appropriated to itself, thus forming, in the Eastern taste, not only the 'garden of hyacinths,' but a garden of each species of bulb which is capable of being brought to perfection without the fostering shelter of a conservatory. The second bulbous garden might be formed from a collection of the almost infinite variety of this lovely tribe, the intermixture of which might produce the most beautiful effect, and a succession of bloom to continue throughout the early months of summer. A similar extension of pleasure might be derived from a similar division of all kinds of flowers, and here the taste for borders planted with distinct tribes may be properly exercised, and, as most of the kinds of bulbs best suited to this disposition have finished their bloom before the usual time at which annuals disclose their beauties, the annual and the bulbous gardens might be so united, that, at the period when the bloom of the latter has disappeared, the opening buds of the former might supply its place, and continue the gaiety of the borders.

1570. The flower-garden is seldom on so small a scale as not to admit of the green-house or conservatory, provided these structures are not appended to the house. In laying out the area, a fit situation must be allotted for this department of floriculture, and the principles of guidance laid down in treating of the situation of the culinary hot-houses (1092.) must be again applied. Some recommend the distribution of the botanic hot-houses throughout the flower-garden or pleasure-ground; but we are decidedly of opinion, that much the best effect is produced when they are connected together in one scene. By the other mode they may form objects agreeable enough to look at externally; but to derive the full effect of their internal beauties, it appears to us that they must be examined in suc-

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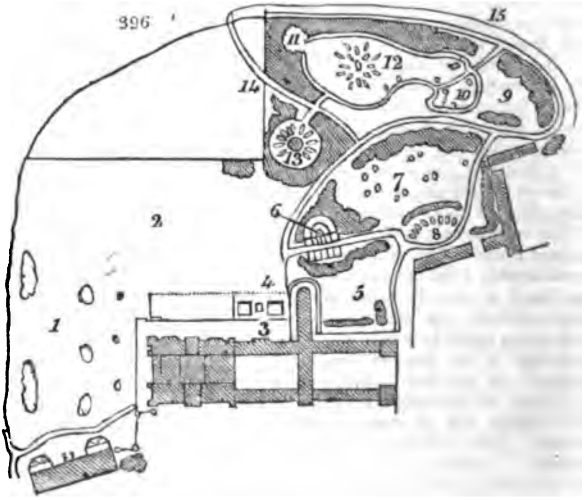

cession and without interruption. No arrangement can be better, in our opinion, than to connect the whole of the botanic hot-houses with the mansion as an introductory scene to the flower-garden. This was Repton's favorite mode, of which, among other examples, he has left that of Asbridge Park (*fig.* 396.). Here, to the original lawn and pleasure-ground (1), he made an addition (2), in the same style (2), combining by walks the following interesting scenes. The botanic stoves and paved terrace (3); broad-sanctuary and holy-well (4); pomarium and winter walk (5); the monk's garden (6); arboretum of exotic trees (7); magnolia and American garden (8); embroidered parterre (9); grotto and garden for rock plants (10): *cabinet de verdure* (11); mount garden (12); rosarium and fountain (13); connecting and exterior walks (14); open terrace and exterior walks (15).

In particular situations, as where the prospect and space are both confined, the plant hot-houses may embrace the house or the court-yard in two or more sides. In a case of this kind, which occurred in our practice, (*fig.* 397.) a large conservatory (*a*), and aquarium (*b*), was connected with the library (*k*): from the conservatory, a green-house (*c*), led to an aviary (*d*), and this was connected with a house for standard peach-trees, with vines as climbers (*g*), by two plant-stoves (*e* and *f*). The furnaces were placed in the court-yard (*l*), and attended from the stable-yard (*h*), without interfering with the house (*i*), or the flower-garden (*m*).

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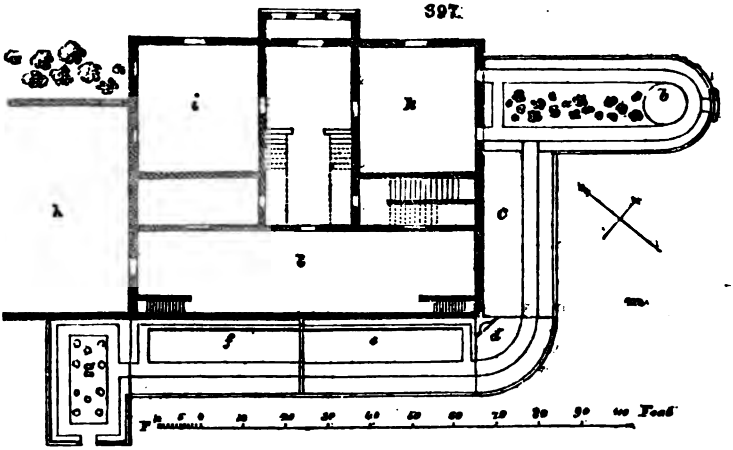
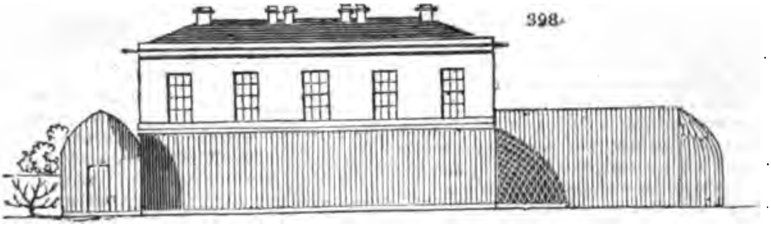


The elevation of such a range, (*fig.* 398.) does not pretend to architectural or picturesque beauty; but it is such as is best suited for the culture of plants; and from the peculiarity of the situation it is seen from no point beyond the limits of a very moderate-sized flower-garden.

398.



According to Neill, a green-house, conservatory, and stove, should form prominent objects in the different parts of the flower-garden. The author of the *Florist's Manual* recommends a spring-conservatory, annexed to the house, consisting of borders sheltered by glass, and heated only to the degree that will produce a temperature, under which all the flowers that would naturally bloom betwixt the months of February and May might be collected, and thence be enabled to expand their beauties with vigor. *Flor. Man.* p. 23.

"The most proper situation," according to Nicol, "for the green-house and conservatory, in an extensive and well laid out place, is certainly in the shrubbery or flower-garden; and not, as they are very generally to be found, in the kitchen-garden, combined with the forcing-houses. In smaller places, no doubt, they must be situated so as to suit other conveniences; and we often find them connected with the dwelling-house. In this latter way they may be very convenient, especially in the winter season, and may answer for keeping many of the hardy kinds of exotics; but it is seldom they can be so placed and constructed, on account of their connection with the building, as to suit the culture of the finer sorts, and bring them to a flowering state. Such may rather be termed green-rooms, as being connected with the house." *Kal.* 539.

Abercrombie says, "A green-house may be made a very ornamental object as a structure; its situation is, therefore, usually in a conspicuous part of the pleasure-ground, contiguous to the family residence. The front of the building should stand directly to the south, and the ends have an open aspect to the east and west. *Pract. Gard.* 557.

1571. *Flower Nursery, and Pits for forcing Flowers.* To every complete flower-garden and shrubbery, a piece of ground should be set apart in a convenient and concealed situation, as a reserve-ground, or nursery of flowering plants and shrubs. The situation should, if practicable, be behind and near to the range of hot-houses, and it may at the same time include the pits for forcing flowers, and the hot-bed department of the flower-garden. Here plants may be originated from seed, cuttings, pipings, and a proper stock kept up, partly in beds and partly in pots, for more easy removal, to supply blanks, and in the more select scenes, to replace such as have done flowering. No flower-garden can be kept in complete order without a nursery of this description; nor could the management of some sorts of florist's flowers, as the auricula, during the latter part of summer and winter, the carnation, &c. be well carried on without it. Here they may be grown, and, when in bloom exhibited in proper stages, in the main garden.

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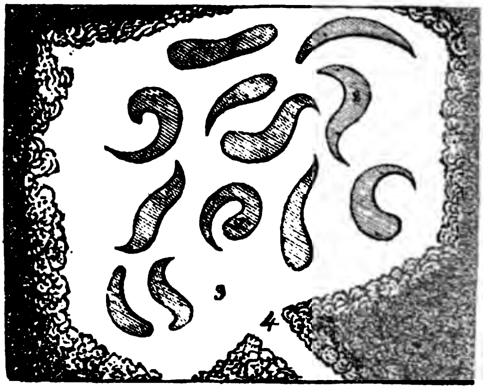

1572. *Walks.* In most styles of parterres these are formed of gravel; but in the modern sort (*fig.* 399.), which consist of turf, varied by wavy-dug beds (1 and 2.), and surrounded by shrubbery, they are sometimes dispensed with. Such a flower-garden is recommended by the author of the *Florist's Manual*, as suitable for the "midst of pleasure-ground," and the beds "peculiarly adapted to the advantageous exhibition of flowers." The general length of the beds she recommends to be from twenty-three to twenty-five feet, and the width in the broadest part, about four feet; the grass to be five or six feet wide between the beds, that it may be conveniently mown and rolled; all the beds a good deal raised, and a tree (3) placed at the entrance (4) of light and rather pendulous foliage, and pruned to form a high stem. "If the space of grass between the borders appear too great, it may be lessened by baskets of ever-blowing roses, carnations, or any other plants; and these baskets may be formed by circular beds, surrounded by cast-iron, made to resemble the open edges of a basket, and painted of a very dark-green color." *p.* 6.

In extensive and irregular parterres, one gravel-walk, accompanied by broad margins of turf, to serve as walks by such as prefer that material, should be so contrived as to form a tour for the display of the whole garden. There should also be other secondary interesting walks of the same width, of gravel, and smaller walks for displaying particular details. The main walk, however, ought to be easily distinguishable from the others by its broad margins of fine turf. In general the gravel is of uniform breadth throughout the whole length of the walk; but in that sort of French parterres which they call parterres of embroidery (*fig.* 400.), the breadth of the gravelled part (*a*) varies like that of the turf. Such figures, when correctly executed, carefully planted, judiciously intermixed with basket-work, shells, party-colored gravels, &c. and kept in perfect order, are highly ornamental; but very few gardeners enter into the spirit of this department of their art. The French and Dutch have long greatly excelled us in the formation of small gardens, and the display of flowers; and whoever wishes to succeed in this department ought to visit Amsterdam, Antwerp, Brussels, and Paris; and consult the old French works of Mallet, Boyceau, Le Blond, &c. To assist in the invention of figures, the simple but ingenious contrivance (*fig.* 401.) invented by Professor Bradley may be made use of. It consists of two plates of looking-glass, of any convenient size, furnished with wooden backs, so as to admit of their being hinged (*a*). One part of a circular figure being then drawn on paper (*b, c*), the frames are to be opened the width of the figure (*b, c, d*), and placed on edge so as to include it, when the form will then be so multiplied by the looking-glass as to complete the circle. The kaleidescope may also be resorted to, of which this instrument of Bradley's is supposed to be the origin or prototype.

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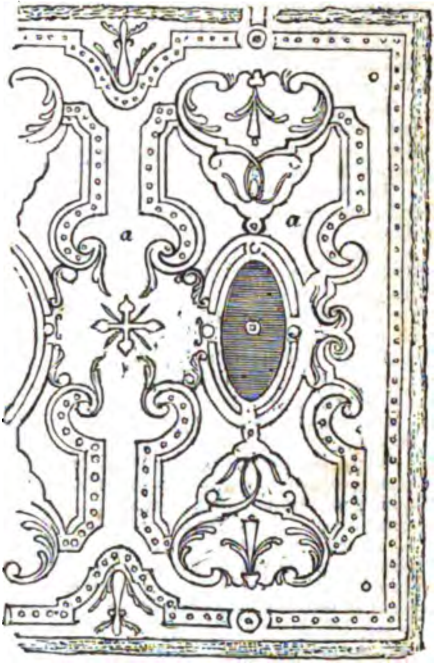

1573. *Edgings.* In parterres where turf is not used as a ground or basis out of which to cut the beds and walks, the gravel of the latter is disparted from the dug-ground of the former by edgings or rows of low growing plants, as in the kitchen-garden. Various plants have been used for this purpose; but, as Neill observes, the best for extensive use is the dwarfish Dutch box, kept low and free from blanks.

Abercrombie says, "Thrift is the neatest small evergreen next to box. In other parts, the daisy, pink, London-pride, primrose, violet, and periwinkle, may be employed as edgings. The strawberry, with the runners cut-in close during summer, will also have a good effect; the wood-strawberry is suitable under the spreading shade of trees. Lastly, the limits between the gravel-walks and the dug-work may sometimes be marked by running verges of grass kept close and neat. Whatever edgings are employed, they should be formed previous to laying the gravel."

1574. *Basket-Edgings.* Small groups near the eye, and whether on grass or gravel, may be very neatly enclosed by a worked-fence of basket-willows from six inches to a foot high. These wicker-work frames may be used with or without verdant edgings; they give a finished and enriched appearance to highly-polished scenery; enhance the value of what is within, and help to keep off small dogs, children, &c. Abercrombie scarcely approves of them. He says, "Where round or oval parterres stand on a ground of lawn, it is a prevailing fashion to surround them with what are termed baskets. These are commonly made either of wood or cast-iron; those of the latter material of course are durable; and the others, if painted, and removed under shelter in winter, will last ten or twelve years. Novelty is all-attractive; and when men have walked as far as they can in the path of nature for principles of embellishment, for the sake of novelty they will walk back again. A bed of flowers and shrubs within a basket looks very much like a large bouquet. What is artificial, should have some use. Where cattle are to be kept off, a basket is serviceable." *Pr. Gard.* 454.

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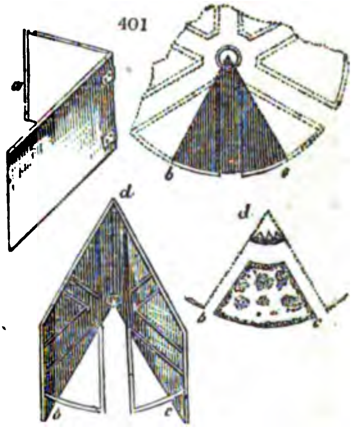

Chap. II.

Of Planting the Flower-Garden.

1575. The manner of planting both the herbaceous plants and shrubs in a flower-garden depends jointly on the style and extent of the scene. With a view to planting, they may be divided into three classes, which classes are independently altogether of the style in which they are laid out. The first class is the *general or mingled flower-garden*, in which is displayed a mixture of flowers with or without flowering-shrubs according to its size. The object in this class is so to mix the plants, as that every part of the garden may present a gay assemblage of flowers of different colors during the whole season.

The second class is the *select flower-garden*, in which the object is limited to the cultivation of particular kinds of plants: as, florists' flowers, American plants, annuals, bulbs, &c. Sometimes two or more classes are included in one garden, as bulbs and annuals; but, in general, the best effect is produced by limiting the object to one class only.

The third class is the *changeable flower-garden*, in which all the plants are kept in pots, and reared in a flower nursery or reserve ground. As soon as they begin to flower, they are plunged in the borders of the flower-garden, and, whenever they show symptoms of decay, removed, to be replaced by others from the same source. This is obviously the most complete mode of any for a display of flowers, as the beauties of both the *general* and *particular* gardens may be combined without presenting blanks, or losing the fine effect of assemblages of varieties of the same species; as of hyacinth, pink, dahlia, chrysanthemum, &c.

The fourth class is the *botanic flower-garden*, in which the plants are arranged with reference to botanical study, or at least not in any way that has for its main object a rich display of blossoms.

On each of these gardens, or manner of arranging plants grown for their beauty or curiosity, we shall offer some remarks.

1576. The *mingled flower-garden*, or *border*, is by far the most common; it is what every gardener attempts at in planting his flower-borders, and the aim of the greater number of such as form parterres, or separate scenes for the culture of flowers, seldom goes further. The object here is to display a gay assemblage of colors during the season of flowers, without much regard to variety of form or diversity of character in these flowers, or the plants that produce them. The great art, therefore, in this kind of flower-border is to employ such plants as produce large heads, or masses of flowers; to plant an equal number of every color, and such a variety in regard to time of flowering as may afford some of every color in flower from February to October. This object does not require a great variety so much as a judicious selection; for, supposing the number four to include all the colors of flowers, and one sort to continue in bloom a month, then for nine months of the year, viz. from February to October inclusive, only thirty-six sorts will be requisite to commence, as it were, the pattern of the border. Much more may be effected by a few sorts than by a great number, for the greater the number of sorts introduced in the pattern above thirty-six, supposing it correct that one sort continues in bloom a month, the greater the blank spaces that must remain between the plants in bloom. A moderate number of select sorts, or of what are called border-flowers, and that number selected equally from the different colors, and the sorts in bloom in the nine months of blooming season, is what demands the exclusive attention of whoever would plant a mingled border, or flower-garden. It has been frequently observed that flower-gardens have been on the decline for the last half-century; and the cause of this appears to have been the influx of new plants during that period, by which gardeners have been induced without due consideration to be more solicitous about rarity and variety, than well-disposed colors and quantity. The same error, and from the same cause, has prevailed, during the above period, in the planting of shrubberies and tree plantations.

Abercrombie, Nicol, and other practical gardeners seem to have no distinct ideas on the subject of arranging flowers in flower-gardens; but the authors of *Hints on laying-out Gardens*, and of the *Florist's Manual*, have viewed the subject in its proper light. Neill also has some judicious observations on the subject. He says, " the plants are arranged in mingled flower-borders, partly according to their size, and partly according to color. The tallest are planted in the back part, those of middling size occupy the centre, and those of humble growth are placed in front. The beauty of a flower-border, when in bloom, depends very much on the tasteful disposition of the plants in regard to color. By intermingling plants which flower in succession, the beauty of the border may be prolonged for some weeks. In a botanic garden the same plant cannot with propriety be repeated in the same border; but in the common flower-garden a plant, if deemed ornamental, may be often repeated with the best effect; nothing can be finer, for example, than to see many plants of double scarlet lychnis, double sweet-william, or double purple jacobea." *Ed. Encyc.* art. *Hort.*

The author of *Hints*, &c. remarks "that the beauty of parterres depends more on the materials with which they are planted than on their form; and that the prevailing error consists in crowding them with all sorts of trees and plants at random, or filling them entirely with rare species, which will ever want one principal source of beauty — health." In the *Florist's Manual* it is observed, that "the fashionable novice, who has stored her borders from the catalogue of some celebrated name with variety of rare species; who has procured innumerable rose-trees, chiefly consisting of old and common sorts, brought into notice by new nomenclature; who has set apart a portion of ground for American plants, and duly placed them in bog soil, with their names painted on large-headed pegs, becomes disappointed when, instead of the brilliant glow of her more humble neighbour's parterre, she finds her own distinguished only by paucity of color, and fruitless expenditure. Variety of species, bog borders, and largely-lettered pegs, are all good in their way, but they will not produce a *gay* flower-garden; and the simple cause of the general failure in this particular is the prevalent solicitude for rarity and variety, in preference to well-blended quantity; as, without the frequent repetition of the same plant, it will be in vain to attempt a brilliant flower-garden, and, as in the judicious mixture of every common color, the art of procuring it consists. Hence, the foundation thus laid, the solicitude of those who wish to complete the superstructure must not be for rare species, but for new color, so that the commonest primula which presents a fresh shade of red, blue, yellow, &c. ought to be esteemed more valuable than the most rare American plant which does not bring a similar advantage.

"In the formation of that assemblage of flowers, which may be distinguished by the the term of 'The Mingled Flower Garden,' it is essential that the separate parts should, in their appearance, constitute a WHOLE; and this appearance is not incompatible with any form into which the ground may be thrown, if attention be given to the manner of planting. In some gardens this appearance of a *whole* is entirely destroyed by the injudicious taste of setting apart distinct borders for pinks, hepaticas, primulas, or any other favorite kinds of flowers; also for different species of bulbs, as anemones, ranunculuses, hyacinths, &c.; these distinct borders, although beautiful in themselves, break that *whole* which should always be presented to the eye by the mingled flower-garden, as single beds, containing one species only, form a blank before that species produces its flowers, and a mass of decaying leaves when the glow of their petals is no more. The reverse of this mode of planting is essential to the perfection of the mingled flower-garden, in each border of which there should be, at least, two of every species; but the precise number must be regulated by the force of color displayed by the plant, and the size and the relative position of the borders. It will be only necessary to observe that, to whatever view the garden presents itself, the eye should not be checked by the failure, in any part of it, of the prevalent colors of the season." *p. 5.*

Hogg, who may be considered an unprejudiced observer of the different tastes in disposing of flowers, has the following remarks: "We are apt to ridicule the Dutchman, as well as the imitators of him here at home, who divide their gardens into small beds, or compartments, planting each with separate and distinct flowers: we ridicule the plan, because it exhibits too great a sameness and formality; like unto the nosegay that is composed of one sort of flowers only, however sweet and beautiful they may be, they lose the power to please, because they want variety. It must undoubtedly be acknowledged, that a parterre, no matter in what form, whether circular or square, elliptical or oblong, where all the shrubs, plants, and flowers in it, like the flowers of a tastefully-arranged bouquet, are variously disposed in neat and regulated order, according to their height and color, is a delightful spectacle, and worthy of general imitation. Yet still in some particular cases I am disposed to copy the Dutchman, and I would have my bed of hyacinths distinct, my tulips distinct, my anemonies, my ranunculuses, my pinks, my carnations distinct, and even my beds of holyhocks, double-blue violets, and dwarf-larkspurs distinct, to say nothing of hedge-rows of different sorts of roses: independent of the less trouble you have in cultivating them when kept separate, you have, as I said before, beauty in masses, and you have likewise their fragrance and perfume so concentrated, that they are not lost in air, but powerfully inhaled when you approach them.

"Mrs. Siddons, the celebrated tragic actress, is a great admirer of this mode of planting, and fond of contemplating 'this beauty in masses.' She adopted this style of gardening at her late residence on the Harrow-road. Her favorite flower was the viola amœna, the pansy, or common purple heart's-ease, and this she set with unsparing profusion all around her garden. Her garden was remarkable in another respect, and might with great propriety be styled a garden of evergreens, which, together with a few deciduous shrubs, were of the most sombre, sable, and gloomy cast, such as box-trees, fir, privet, phillyrea, arbor vitæ, holly, cypress, the red cedar, laurel, Irish ivy, bay-tree, arbutus, Daphne, or spurge-laurel.

"The only part of the year in which it could be viewed with any degree of satisfaction was the winter, as giving rise to a pleasing association of ideas in beholding these retain their green verdure and clothing, at a time when the rest of the surrounding trees were stript naked and bare." *Tr. on Flowers, 69.*

To give an example of the manner of planting a bed, or border, in the mingled style, suppose the various colors of flowers to be all included under the four common colors, red, white, blue, and yellow; that for the time of blowing, we allow February and March as one division, March and April as a second, May and June as a third, July as a fourth, August as a fifth, and September and October as the sixth and last. Then suppose the border, or bed, admits of four rows in width; the lowest plants to be placed next the walk, or the eye of the spectator, and the tallest at the back in regular gradation. Mark out the border in rows length-ways and across, so as each plant may stand in the angle of a square, whose side is, say eighteen inches. Then begin at the first row (*fig.* 402, *a.*), and fix on the order in which the plants are to be placed as respects their time of flowering. To distribute the plants in flower at one time as equally as possible over the border, the order of 1, 6, 3, 5, 2, 4, will, it is believed, be found the best. Next, fix as to the order of colors; and here it is of little consequence what order is fixed on, provided that order be maintained throughout the border: say that we adopt the order of red, white, blue, and yellow; then the first row to be of the lowest plants will stand thus: *1r, 6w, 3b, 5y, 2r, 4w*: that is, a red flower is to come into bloom in February and March; next to it, a white flower to come into bloom in September and October; next, a blue flower to come into bloom in May and June; then a yellow flower to come into bloom in August; then a red flower to come into bloom in April and May; and lastly, a white flower to come into bloom in July. The second, third, and fourth rows, (*b, c, d,*) are to be arranged in the same way, observing, however, not to begin with the same month and color for the sake of more effectually mingling the times of flowering and color of the flowers. Where roses or other shrubs are to be introduced, a plant must be omitted, which, however, should not be allowed to derange the order of the rest.

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a.............................. 1r 6w 3b 5y 2r 4w 1b 6y 3r 5w 2b 4y 1r 6w 3b 5y 2r 4w 1r 6w 3b
b........................ 1r 6w 3b 5y 2r 4w 1b 6y 3r 5w 2b 4y 1r 6w 3b 5y 2r 4w 1b 6y 3r 5w 2b
c................ 1r 6w 3b 5y 2r 4w 1b 6y 3r 5w 2b 4y 1r 6w 3b 5y 2r 4w 1b 6y 3r 5w 2b 4y 1r
d...... 1r 6w 3b 5y 2r 4w 1b 6y 3r 5w 2b 4y 1r 6w 3b 5y 2r 4w 1b 6y 3r 5w 2b 4y 1r 6w 3b
e...... 1r 6w 3b 5y 2r 4w 1b 6y 3r 5w 3b 4y 1r 6w 3b 5y 2r 4w 1b 6y 3r 5w 2b 4y
f................ 1r 6w 3b 5y 2r 4w 1b 6y 3r 5w 2b 4y 1r 6w 3b 5y 2r 4w 1b 6y 3r 5w
g........................ 1r 6w 3b 5y 2r 4w 1b 6y 3r 5w 2b 4y 1r 6w 3b 5y 2r 4w 1b 6y
h.............................. 1r 6w 3b 5y 2r 4w 1b 6y 3r 5w 2b 4y 1r 6w 3b 5y 2r 4w

If a double border, with a walk on each side (*fig.* 402, *a* to *h,*) a bed-group, or compartment on a lawn, to be viewed on all sides, is to be planted, then it is only necessary to fix on the number of rows, and to keep the lowest plants in the margin and the tallest in the centre, adhering, in the rows, to the order of time, and of colors given above, or to any order that may be fixed on, and inserting shrubs in lieu of plants where it may be deemed advisable.

It is to be observed, that flowers in borders should always be planted in rows, or in some regular form, and that this appearance should be assiduously kept up by trimming off all irregular side-shoots and straggling stalks, and reducing the bulk of plants which grow too fast. Every approach to irregularity and a wild, confused, crowded, or natural-like appearance, must be avoided in gardens avowedly artificial.

Admitting four colors, four rows or sizes, and six times of coming into flower, a mingled border may be commenced with ninety-six sorts; and the pattern may be repeated like the border of any work of art *ad infinitum;* but it is also evident, it may include any number of species, provided these havet he desired requisites of height, color, and time of flowering; the second and every successive repetition of the pattern being made up of different, and not before-introduced, species, but still of the heights, colors, and times of flowering required for the first example of the pattern. The safest way, however, as we have already observed, is to adopt but a moderate number of species, and those of the shewy sorts that have numerous varieties, and are of hardy vigorous growth. A suitable list for this purpose is given in the floricultural catalogue under the head of *Border Flowers,* and the reader may increase it at pleasure from the *Prodromus* of Page.

1577. The *Select Flower Garden* being limited to one kind, or class of plants, is comparatively simple as far as respects planting. It may be devoted to florists' flowers, as the hyacinth, tulip, pink, auricula, &c.; to select flowers, as the dahlia, peony, chrysanthemum, &c.; to annuals, hardy, half hardy, and tender; to American or bog-earth shrubs and plants; to any one natural order, as the bulbous-rooted tribe; or to spring, summer, or autumn flowers, &c.

Florists' Flowers, and *Select Flowers* are planted in beds or compartments of carefully-prepared soil, and the arrangement in the beds is generally conducted on the principle of mixing the colors and shades of color as much as possible. As the plants being of the same species generally grow of the same height, and come into flower at the same time, no particular attention is requisite in these respects. See *Hyacinth* and *Auricula*, in the catalogue.

A *Parterre of Annuals*, as the different sorts generally come into flower about the same time, may either be arranged according to their colors and heights jointly; or, as there are numerous varieties of some sorts, as of larkspur, chrysanthemum, lupin, &c., each species with its varieties, may be sown in groups, or beds, by itself; and the general principle by which to determine the sorts which are to join each other, may either be color and height, or natural character. If the latter, then the table exhibiting the genera, arranged according to the Jussieuean classification (278), will be found a convenient guide.

An *American Garden* combines shrubs and even low trees. These may be arranged in the mixed method, according to color, height, and time of flowering, the trees and shrubs alone, and the plants alone, or both combined: but the most suitable way is to follow the natural orders, attending, at the same time, to keep the higher sorts farthest from the walk or side from which the group, or border, is to be chiefly viewed. This arrangement has an excellent effect in an American shrubbery, where the low species of heaths and other bog under-shrubs which are introduced, supply the place of herbaceous plants.

A garden exclusively devoted to *bulbous-rooted flowers*, admits of being very perfectly arranged after the natural method. No orders run into other so naturally, and none present a more harmonious assemblage both of foliage and flowers than the Phanerogameæ (278.) The planting of such a garden would require very little nicety beyond introducing the proper genera and species in succession, taking care to keep the taller bulbs, as *lillium fritillaria*, &c. in the interior of the groups or beds.

Gardens of *spring, summer, or autumn flowers*, may be planted on any of the principles that have been mentioned.

The *Changeable Flower Garden*. The essential principle of this garden consists in the power of changing its productions at pleasure, so that whenever any plant, or group of plants, begin to decay, they can be removed, and their places supplied by others coming into bloom. To admit of this, a large reserve nursery is requisite, in which the plants must be kept in pots, and removed and plunged in the borders as wanted. The Chinese, Sir W. Chambers informs us (*Dissert. on Orient. Gard.* 96.), excel in this mode of gardening; and we have been informed by a traveller who has resided some time at Canton, that he has known a mandarin (or noble), have the whole furniture and style of his parterre changed in a single night, so as next morning to present not only a different description of flowers, shrubs, and dwarf-trees, but a different arrangement of the beds and compartments. Something of the same kind is practised in the gardens of the Thuilleries in Paris; in some of the Imperial gardens at Petersburg, and in the vice-royal gardens at Monza.

Gardens of this description admit of a very perfect arrangement of the flowers, whether in the mingled manner, in select groups, or according to the natural method. It is only with such resources that a flower-gardener can "paint his way," as Sir W. Chambers says the Chinese artists do, "not scattering their flowers indiscriminately about their borders, but disposing of them with great circumspection along the skirts of the plantations, or other places where flowers are to be introduced. They reject all that are of a straggling growth, of harsh colors, and poor foliage, choosing only such as are of some duration, grow either large, or in clusters, are of beautiful forms, well-leaved, and of tints that harmonize with the greens that surround them. They avoid all sudden transitions, both with regard to dimension and color, rising gradually from the smallest flowers to the hollyhocks, pæonies, sun-flowers, carnation-poppies, and others of the boldest growth; and varying their tints, by easy gradations, from white, straw-color, purple, and incarnate, to the deepest blues, and most brilliant crimsons and scarlets. They frequently blend several roots together, whose leaves and flowers unite, and compose one rich harmonious mass; such as the white and purple candituft, larkspurs, and mallows of various colors, double-poppies, lupins, primroses, pinks, and carnations; with many more of which the forms and colors accord with each other; and the same method they use with flowering shrubs, blending white, red, and variegated roses together, purple and white lilacs, yellow and white jessamine, altheas of various sorts, and as many others as they can with any propriety unite. By these mixtures they encrease considerably the variety and beauty of their compositions. In their large plantations the flowers generally grow in the natural ground; but in flower-gardens, and all other parts that are highly kept, they are in pots, buried in the ground, which, as fast as the bloom goes off, are removed, and others are brought to supply their places; so that there is a constant succession for almost every month in the year; and the flowers are never seen but in the height of their beauty." *Dis. on Orient. Gard.* 96.

1578. The *Botanic Flower-Garden* being intended to display something of the extent and variety of the vegetable kingdom, as well as its resemblances and differences, should obviously be arranged according to some system or method of study. In modern times, the choice is almost limited to the artificial system of Linnæus, and the natural method of Jussieu, though Adanson has given above fifty-six different methods by which plants may be arranged, (*Fam. des Plants.*) The latter has much the best effect in a garden, and corresponds better with culture. The former, though most convenient for the young student, yet by bringing plants together that have few or no obvious relations, it destroys that harmony which is so gratifying in viewing natural families. Whatever method is adopted, the plants may either be placed in regular rows, or each order may be grouped apart, and surrounded by turf or gravel. For a private botanic-garden, the mode of grouping on turf is much the most elegant, and it has this advantage, that as the species belonging to the group are increased, it can be enlarged by appropriating a part of the turf, and any group containing few species, may be filled up with repetitions for effect. The groups may be of the most irregular outlines, and those which are to contain trees may be raised or lowered in surface, according as the species may be natives of hills or valleys, and the trees and plants so dispersed, as that the former shall not conceal the latter, nor present a compact lumpish appearance at the edges, or in the outline against the sky. Rock-work may be introduced in groups where there are many Alpines to be grown; and bogs, ponds, and springs imitated in others, destined for aquatics, &c. as far as consistent with botanical purposes.

A gravel walk may be so contrived as to form a tour of all the groups, (*fig.* 403.).

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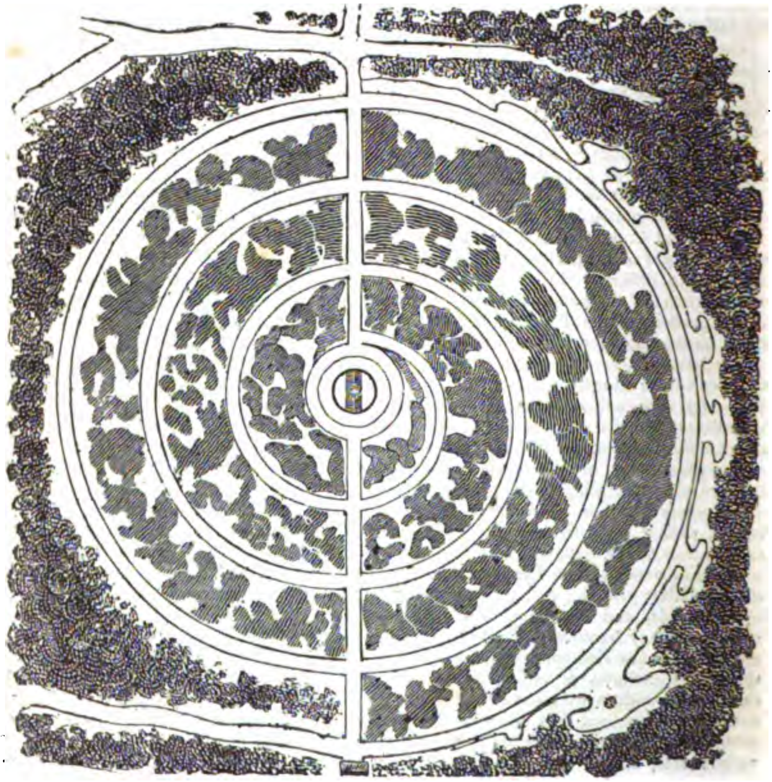

displaying them on both sides; in the centre, or in any fitting part of the scene, the botanic hot-houses may be placed, and the whole might be surrounded with a sloping phalanx of evergreen plants, shrubs, and trees. The plants in such a garden should generally be neatly, but inconspicuously named, or, at all events, numbered; but naming is greatly to be preferred, as saving trouble to the spectator, and more inviting to the novice desirous of knowledge.

It is hardly necessary to observe that the above modes of planting a flower-garden, or others that might have been mentioned, are alike applicable to every form or style of laying out the garden or partèrre, and that they interfere with any mode of enclosing or surrounding it, or of edging the walks.

1579. *Decorations.* It is usual to employ different objects of art as decorations to flower-gardens, and the practice is founded in reason, since the works of nature and of art lend force to each other by their contrast. We have, in a former part, (763 to 789.) enumerated the principal garden decorations. Those more especially applicable to the flower-garden are the fountain in various forms, the open and covered seat, the statue in all its varieties of therm, bust, single figure and group; and in the various materials of stone, metal, or verdure, the arbour, and a variety of others. Even the apiary and aviary, or, at least, here and there a bee-hive and cage suspended from a tree, will form very appropriate ornaments. Sometimes inoffensive birds, as the sea-gull, may be introduced; gold-fish are very appropriate in the aquarium; and an animal which affords great amusement by its cry and song in the flower-gardens of the south of Germany, the tree-frog, (*Rana arborea,*) would be an acquisition in this country. In some families there is a taste for minerals or antiquities; and here, besides larger specimens distributed in the garden, a building (*fig.* 404.) may be introduced, combining (*a*) a mineral cabinet, (*b*) an aviary, and (*c*) the botanic hot-houses.

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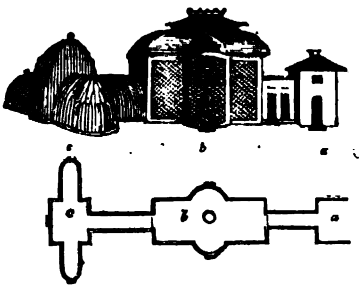

Where the old French style (*figs.* 395. 400.) is imitated, a profusion of marble and vegetable sculptures, verdant arcades, colonnades, arbours, &c. are in character; but in the more simple and modern forms (*figs.* 391. to 393.) a few stools, sofa-chairs, a pavilion-seat (*fig.* 227.), a sun-dial, fountain, some urns, and a few good statues, will, in most cases, be sufficient. In the distribution of even these few decorations much judgment is requisite to avoid exciting ridicule by falling into the vapid, flippant, or some other species of deformity.

Time of Planting Herbaceous Plants. This is, in general, autumn and spring; but any perennial plant may be safely removed after it has done flowering or produced seed. With respect to biennials and annuals, they may be planted at almost any season before they have begun to throw up flower-stems. Biennials, however, are generally sown early in autumn in the flower-garden nursery, and transplanted either late the same season or early in the following spring, to where they are to flower. Annuals are commonly sown in spring, where they are finally to remain. The culture of herbaceous flowers of the more valued sorts is exceedingly varied, and will be found under each species or class in the *Flower-garden Catalogue.* For the *preparation of the soil* and the manner of performing the operation, see these articles in (Chap. IV.) *Planting the shrubbery.*

CHAP. III.

Of Forming the Shrubbery.

1580. By a shrubbery, or shrub-garden, we understand a scene for the display of shrubs valued for their beauty or fragrance, combining such trees as are considered chiefly ornamental, and some herbaceous flowers. The form or plan of the *modern shrubbery* is generally a winding-border, or strip of irregular width, accompanied by a walk, near to which it commences with the herbaceous plants and lowest shrubs, and as it falls back, the shrubs rise in gradation and terminate in the ornamental trees, also similarly graduated. Sometimes a border of shrubbery accompanies the walk on both sides; at other times only on one side, while the other side is, in some cases, a border for culinary vegetables surrounding the kitchen-garden, but most generally it is an accompanying breadth of turf, varied by occasional groups of trees and plants, or decorations, and with the border, forms what is called pleasure-ground.

The sort of *shrubbery* formed under the *geometric style* of gardening (*fig.* 405.) was more compact; it was called a *bosque*, thicket or wood, and contained various compartments of turf or gravel branching from the walks, and very generally a labyrinth. The species of shrubs in those times being very limited, the object was more walks for recreation, shelter, shade, and verdure, than a display of flowering shrubs. What was wanting in natural beauty and variety, however, was made up by the art of the gardener in cutting such trees and shrubs as he had, into curious shapes.

Shrubberies are often made for the sake of obtaining an agreeable walk to some particular place or scene, as the kitchen-garden, farm, wood, &c.; and sometimes in order to lead the spectator to different points, where views or distant prospects may be obtained. The most desirable shrubbery is one where both these objects are combined; and the least so, where the walk leads to no particular object, is shut up on both sides, and has no beauties to depend on but those of the shrubs. Hence Sir W. Chambers complains of walks *en cul de sac*, and R. P. Knight of "the shrubbery's insipid scenes," &c. *Tr. on Country Res.* i. 352.

The shrubbery, however, judiciously laid out and planted, will always be a scene of considerable beauty and use about a country seat. It is one of the principal sources of a home-walk for exercise; and as H. Repton has observed, a tolerable walk, even round one's own field, is more interesting than a better one where we have no interest. "We are greatly indebted to shrubs," Nicol observes, "for much of the pleasure and delight we enjoy in our gardens. Though they produce no estable fruits, nor afford us any sort of nourishment, yet they are particularly conducive to our comfort. In winter, they shelter us in our walks; in summer, they shade us from the sun. They afford a great variety of flowers, a varied foliage, and are standard ornaments that give us no great trouble. They are particularly useful in the character of screens, whether against the weather, or to hide disagreeable objects, in which case they may be planted nearer to the house than forest-trees. When planted in masses at a distance, they become agreeable objects, and often improve the scenery of a place.

"The shrubbery is often a matter of utility as well as of ornament, in which case it gives the highest satisfaction. When formed for the purposes of shutting out the offices or the kitchen-garden from the view of the house; for sheltering the latter or the garden, or for connecting the house with the garden and the orchard, the shrubbery becomes useful and interesting."

1581. In respect to *situation*, it is essential that the shrubbery should commence either immediately at the house, or be joined to it by the flower-garden; a secondary requisite is, that however far, or in whatever direction it be continued, the walk be so contrived as to prevent the necessity of going to and returning from the principal points to which it leads over the same ground: but as this is a matter which must be arranged in the general disposition or laying out of the residence, it need not be here entered on.

The *extent* of the modern shrubbery must depend more on the extent of that place of which it is a part than on any other principle, and it is, or ought to be, so blended with the flower-garden lawn, as scarcely to admit of its quantity being estimated apart. Where the proportion of pleasure-ground, which may be judiciously apportioned to a residence, depends so much on the ground's surface, and on the character or style of the whole seat, nothing definite can be laid down in the way of rules. The walks in the pleasure-ground should generally exceed a mile or two for the sake of recreation; but what proportion of these should be in open lawn, and what in flower-garden, or along the margin of a shrubbery, is too vague a question to receive any useful answer. Local circumstances and the character to be created, must determine every thing. It may be mentioned as a characteristic distinction between the ancient and modern shrubbery, that the former was of limited extent, compact form, situated near the house, and that the length of walk was made up by repetition of parallel and cross walks. The whole of these had little distant prospect, and were generally more sheltered and shaded than is suitable for our climate; whereas, in the modern shrubbery, the length is made up by stretching out the walk to a distance; and air and ventilation, as well as views and prospects, are obtained by its being planted chiefly on one side. Such shelter and shade as is deemed requisite for the walk is obtained by the introduction of scattered trees along its open margin.

1582. *Soil.* "Shrubs, in general," Nicol observes, "thrive very well in ordinary garden-land, and better in light than in heavy soils. Most shrubs, likewise, do well in ground a foot in depth; but it is always advisable to trench to the full depth of the soil, previous to planting, if that were even two feet.

"Manure is seldom bestowed on shrubs, and if the soil be not far below mediocrity, it is seldom necessary, provided the ground be otherwise well prepared, and be meliorated by trenching or digging.

" In the case of planting screens, where it is desirable to have them effectual as soon as possible, or in planting favorite shrubs in particular situations, every justice should be done to the soil in preparing and enriching it, either with manure or by the addition of fresh earth.

" Those who are curious in collections of certain shrubs, prepare or choose certain soils for them. Evergreens, for the most part, thrive well in loam of a middling texture; but some kinds do better in mossy, humid earth, as the azalea and the rhododendron. Deciduous shrubs, in general, thrive well in light loams or sandy soils; but certain kinds flower better in rich mellow earth, as the moss-rose and the robinia."

1583. *Walks.* " The conducting of walks," Nicol says, " through the shrubbery is a matter both of conveniency and of taste: of conveniency, when the shrubbery is merely a passage from one place to another, or a narrow screen to the garden. In the former case, the walk should be simple and direct: in the latter case it may be circuitous; and if there be any variety in the ground, it ought to lead to particular points of view. The walks, however, should seldom cross one another; they should rather take off at oblique angles; nor should one run parallel to another within view. It is proper to show off the shrubs, but too many walks perplex.

" Their breadths may be various. If short, they should be narrow; if long, and if a considerable reach be caught at once, they should be broad. A medium may be taken at five feet, the extremes being three and eight. They may be of turf or of gravel; but the latter is always most wholesome, and most agreeable in winter."

In the ancient style, where the shrubbery or umbrageous scene (*fig.* 405, *a*), often inclosed the flower-garden (*b*), both being situated in front of the house (*c*), the walks (*d*) were laid out in arbitrary geometrical shapes, crowded and numerous, to afford sufficient space for recreation, and varied by nitches (*e*), boudoirs (*f*), salons (*g*), and other open parts to give variety.

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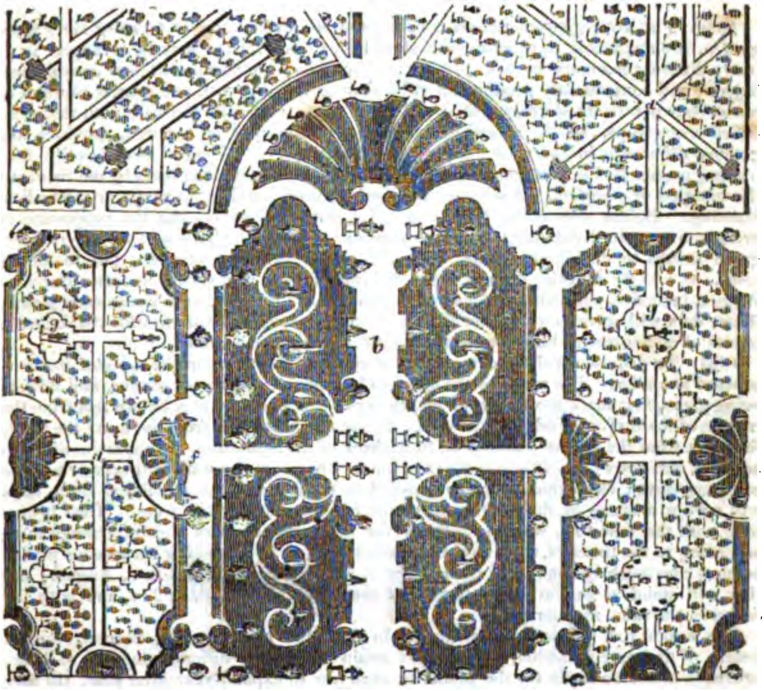

1584. *Fence.* Local circumstances must, in almost every case, determine the sort of exterior or *boundary-fence* most proper for the shrubbery or pleasure-ground; the interior, or that on the open side, should, in almost every case, be one of the inconspicuous kind; either light iron-railings, moveable hurdles of wood or iron, or the sunk-fence. Where the shrubbery is not a boundary plantation, a light fence may include it on both sides; but so much depends on locality and other arrangements, that the subject cannot be profitably discussed separately from that of laying out the entire residence. Under the geometric style, the business of fencing the shrubbery or woody scene, was very simple, the whole being generally surrounded by a high wall.

"Fences of all kinds," Abercrombie observes, "are rather necessary and useful as instruments of shelter and security than to be chosen as materials of ornament. Whether the view terminates on the fence, or is directed beyond it, the effect on the scene, at best, is negative: thus, a fence is sometimes made higher than its proper use requires, merely to shut out something more unsightly; and, in judiciously employing that capital invention, the sunk-fence or *ha-ha*, the advantage, though great, is purely negative; some prospect worth retaining at considerable cost is not obstructed."

1585. *Reserve Ground for the Shrubbery.* A plot of ground should be set apart for the propagation and culture of the more tender shrubs, to supply deaths or accidents in the front of the shrub-border. This reserve-nursery will be most conveniently situated when joined to that of the flower-garden; but it may also be taken from the interior of any wide part of the plantation where it will not be seen. Here roses, mezerions, American shrubs, honeysuckles, and a variety of the more ornamental and tender sorts should always be in readiness, partly in pots and partly in nursery lines, to remove to the principal scene, either to add to its usual beauty, or to compensate for accidental defects. To the same ground may be added a space for accumulating leaves, spray, and other refuse of the shrubbery, to ferment and produce manure for the nursery in the same way as is done in the compost-grounds of the kitchen and flower-garden.

Chap. IV.

Of Planting the Shrubbery.

1586. The same general remarks, submitted as introductory to *planting the flower-garden*, are applicable to planting the shrubbery; and shrubs may be arranged in as many different manners as flowers. Trees, however, are permanent and conspicuous objects, and consequently produce an effect during winter, when the greater number of herbaceous plants are scarcely visible. This is more especially the case with that class called evergreens, which, according as they are employed or omitted, produce the greatest difference in the winter aspect of the shrubbery. We shall here describe four leading modes for the arrangement of the shrubbery, distinguishing them by the names of the mingled or common, the select or grouped manner, and the systematic or methodical planting. Before proceeding farther it is requisite to observe, that the proportion of evergreen trees to deciduous trees in cultivation in this country, is as 1 to 12; of evergreen shrubs to deciduous shrubs, exclusive of climbers and creepers but including roses, as 4 to 8; that the time of the flowering of trees and shrubs is from March to August inclusive, and that the colors of the flowers are the same as in herbaceous plants. These data will serve as guides for the selection of species and varieties for the different modes of arrangement, but more especially for the mingled manner.

1587. To dispose shrubs and trees in a shrubbery plantation in the *mingled* manner, proceed as under. The width of the space to be covered with trees, shrubs, and flowers being given, first mark it out in rows lengthways. The first row may be two feet from the margin of the turf or the edge of the walk; the second, three feet from the first; the third, four feet from the second; and so on to the back of the plantation. Suppose the width to admit of ten rows (*fig.* 405. *a* to *k*), then the six rows next the walk will occupy a space of twenty-seven feet, which may be devoted to shrubs, and the remaining three rows will occupy a space of thirty-seven feet, and may be planted with trees. Then beginning with the first row, which is destined for the lowest class of shrubs, arrange them according to the times of their flowering, which will, as in arranging herbaceous plants, be most conveniently done at six times: viz. 1, March; 2, April, &c. to 6, August; and they will stand as in the flower-border in the order of 1, 6, 3, 5, 2, 4, and with the colors in the same manner (*a*).

The second row (*b*) is to be arranged in the same manner; and as trees, though nearly of the same size when planted, yet attain finally very different degrees of bulk, provision must be made for the plants in each row to expand year after year, till they attain their full growth. This we propose to do by planting two plants of a sort in the second row (*b*), three in the third, and so on, (as indicated in the figure), till in the last or tenth row (*k*), there will be ten plants of a sort in a line together. It is to be observed, that a deciduous and an evergreen sort, (marked *d*, *e*, in the figure) are to be planted alternately, in order to ensure an equal mixture in respect to verdure; and that the colors (denoted by *r*, *w*, *b*, *y*, in the figure) are mixed as in the mingled border, to ensure a general display of mixed blossoms. The second or third year such of the plants are to be thinned out as crowd the others, reserving, however, as final plants, one of each sort, (say E for the evergreens, and D for the deciduous sorts), so placed in respect to the plants in the other rows, as that the whole, when finally thinned out, may stand in quincunx. The largest trees will then occupy about 100 square feet each; and each of the shrubs in the front row about a square yard: there will be the same number of deciduous plants as evergreens; some shrubs of all the four colors in blow throughout the whole season, and a verdant aspect in summer as well as winter.

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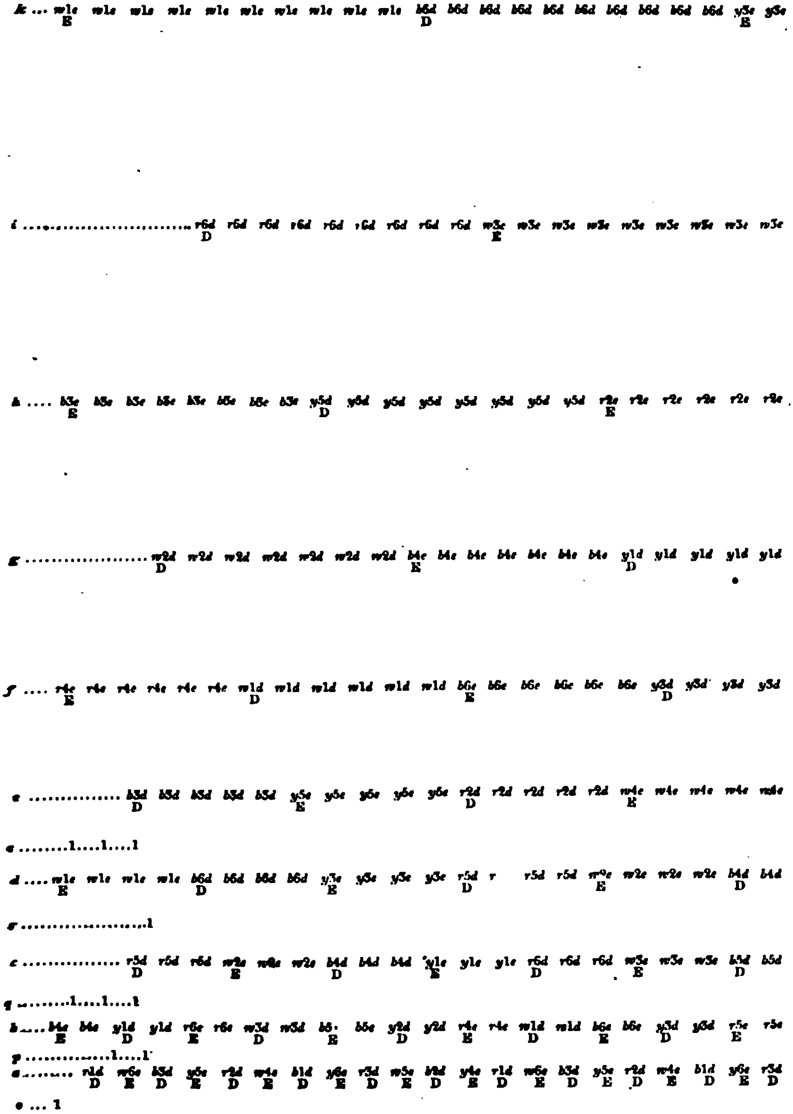
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In some cases, the distance between the rows of trees (ten feet) may be an objection for a year or two at first; but this, we consider, will be more than counterbalanced by the opportunity afforded of cultivating the ground between them, and by the air and light admitted to their side-shoots, which will the sooner fit them for producing blossoms. All formality of appearance will soon be done away by the irregular growth of the plants, and by the thinnings which must take place in, at the latest, three years after planting. If any, however, object to the appearance of rows, they may be obliterated, by introducing some plants in the intervals of the same sort as those in the lines adjoining; but in doing this, care must be taken never to lose sight of the shrub or tree which is finally to remain, as it is of importance to this plan, (which is not natural or picturesque planting,) that the regular disposition of the whole be preserved, as well with a view to the gradation of height as to the mixture of color in the flower, and of permanent and deciduous foliage.

The herbaceous plants only remain to be added. These are to be inserted one row in front of the first row of shrubs (*o*), and three or more rows (*p*, *q*, *r*, *s*,) in the intervening spaces between the next rows. The plants are to form a quincunx with the shrubs; and the same arrangement as to height, color, and time of flowering, adopted as in the mingled border.

Such a shrubbery may be commenced with (2 × 6) twelve sorts of evergreen, and the same number of deciduous trees; with (6 × 6) thirty-six sorts of shrubs, half the number deciduous, and half evergreen; and with (5 × 6) thirty sorts of herbaceous plants. It may then be continued either by repeating the pattern with the same sorts, or by other sorts; or principally by the same sorts, with some others occasionally. If a show of flowers is valued, the sorts employed must be comparatively few, as the flowers of the greater number of trees and shrubs are of dull colors, or little conspicuous. The evergreen trees, in a popular sense, can hardly be said to have any flower; but still a number of them must be introduced in the back rows, to blend with horse-chestnuts, limes, acacias, wild cherries, wild pears, &c. &c.

1588. *The Select or Grouped Manner* of planting a shrubbery (*fig.* 407.) is analagous to the select manner of planting a flower-garden. Here one genus, species, or even variety, is planted by itself in considerable numbers, so as to produce a powerful effect. Thus the pine tribe, as trees, may be alone planted in one part of the shrubbery, and the holly, in its numerous varieties, as shrubs. After an extent of several yards, or hundreds of yards, have been occupied with these two genera, a third and fourth, say the evergreen fir tribe and the yew, may succeed, being gradually blended with them, and so on. A similar grouping is observed in the herbaceous plants inserted in the front of the plantation; and the arrangement of the whole, as to height, is the same as in the mingled shrubbery.

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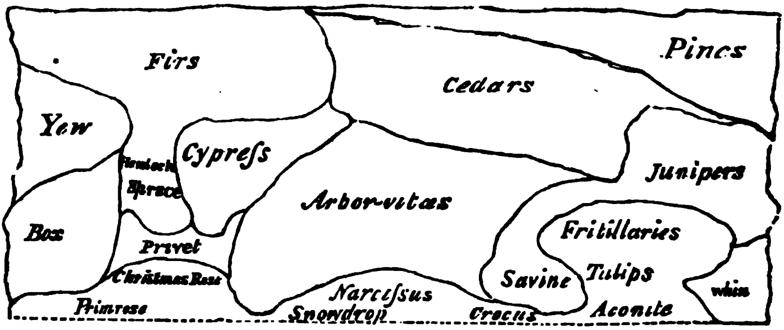

The chief difficulty in this manner of planting, is so to select the sorts that are to succeed each other; so to blend one group or kind with those adjoining, and at the same time maintaining the requisite gradation from the front to the back of the plantation, as to preserve to the spectator in walking along, the appearance of a *whole*. When this is successfully accomplished, and on a large scale, no kind of shrubbery can be more beautiful in summer; but in winter it will present parts wholly without evergreens, and it will only be rich in flowers in some parts; as for example, where the roses, spireæ, mespilcæ, &c. are introduced. By proper contrivance, however, the evergreens, the showy flowering deciduous kinds, and the less showy deciduous sorts may form three divisions, and the two former can be kept nearest the mansion.

The best guides as to the sorts proper to adjoin each other, are the general form and mode of growth; and next, the color and foliation. In these particulars the transition should always be gradual. Thus, among the trees, the pines, cedars, firs, and yew, form a regular gradation, and the shrubs which may be placed near them are the arbor-vitæ, juniper, whin, &c. To place groups of weeping-willow or elm adjoining the pines, and to select roses and lilacs as shrubs, would produce a harsh and incongruous effect. There is obviously much less natural affinity between herbaceous plants and shrubs than between shrubs and trees; but the groups of the herbaceous plants must harmonize among themselves on the same general principles as the trees; thus pink-looking plants (*caryophylleæ*), should not be succeeded by coarse broad-leaved sorts, (*boragineæ*), but rather by more delicate kinds, as grasses or primulæ, &c. There may sometimes also be a certain species of relation between the herbaceous plants and shrubs; thus the bulbous-rooted kinds, and small early flowers, as violets, primulæ, will be more fitly planted among evergreens and early-flowering deciduous shrubs than among late deciduous kinds.

Various other modes of select planting may be adopted in shrubberies; such as collecting together all such shrubs, trees, and flowers as flower at the same time, or have the same color of flower, or foliage, or the same odours, or the same general shape, or the same natural habitation, as of marshes, mountains, &c., or the same country, as America, Switzerland, Sweden, &c. But the intelligent gardener who has attended to what has been already advanced, can hardly require farther instructions to form such plantations. We would suggest, as worth trial, where there was ample space, the mode of arranging by odours; the ancients are said to have paid particular attention to this in mixing their trees, (*Falconer*, &c. and see 12.) Every one must have experienced a difference in this respect between walking in a pine forest, a plantation of balsam poplars, a birch copse, and beside sweet-briar and juniper hedges. An arrangement of this kind, depending on the smell of the buds and leaves, rather than of the flower, would have its effect the greater part of the year, especially after showers.

1589. *Systematic or Methodical Planting in Shrubberies*, consists, as in flower-planting, in adopting the Linnean or Jussieuean arrangement as a foundation, and combining at the same time a due attention to gradation of heights. This mode, executed on a grand scale, would unquestionably be the most interesting of all, even to general observers; but on a small scale it could not be so universally pleasing as the mingled manner, or the mode by select grouping. The uninstructed mind might be surprised and puzzled by such an assemblage; but not perceiving the relations which constitute its excellence, they would be less pleased than by a profusion of ordinary beauties; by a great show of gay flowers and foliage.

Dr. Darwin is said to have blended picturesque beauty with scientific arrangement in a dingle at Litchfield, where he disposed of a large collection of trees and plants in the Linnean manner. The same thing may be attempted on any description of surface, and with any form of ground-plan, provided turf be introduced, and care be taken to elongate the groups containing trees in such a way as to preserve a sufficient degree of wooddiness throughout, both for shelter, shade, and picturesque effect. In this way we have arranged a spot (*fig.* 408.) of little more than an acre and a half, so, as to ordinary observers to be nothing more than a house surrounded by pleasure-ground, but to the botanist and painter, to be a scientific and picturesque scene. This spot combines a villa and offices (*a*), a kitchen-garden (*b*), reserve-garden and melon-ground (*c*), botanic ground for herbaceous plants (*d*), rock-work (*e*), rosarium (*f*), aquarium (*g*), American ground (*h*); besides a variety of other subordinate scenes, a scattered orchard

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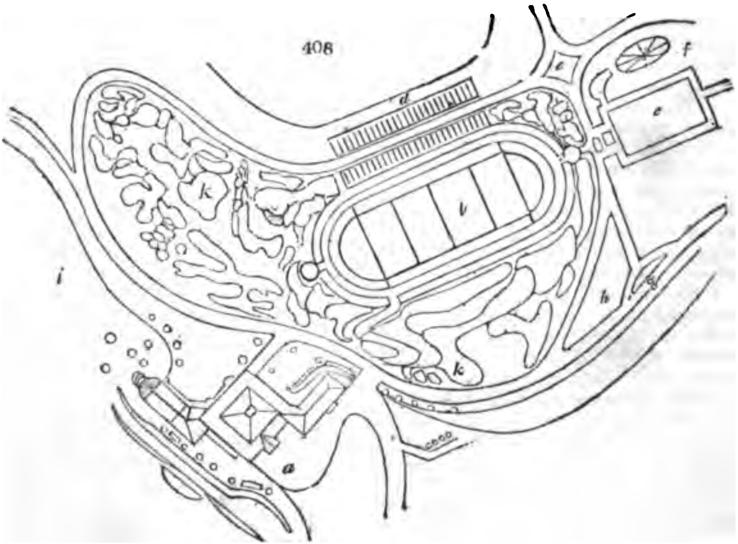


(*i*), and the shrubbery (*k*), arranged in irregular, elongated groups on lawn, in the manner mentioned.

But much the most interesting mode of arrangement would be that of Jussieu, by which a small villa of two or three acres might be raised, as far as gardening is concerned, to the *ne plus ultra* of interest and beauty. To aid in the formation of such scenes the tables (277. 278. & 525. 526.) exhibiting the genera contained in each Linnean or Jussieuean order, and also the number of species distributed according to their place in the garden, will be found of the greatest use.

1590. *General Practice.* It is only since the great influx of trees and shrubs from America, during the latter half of the last century, that the idea of arranging shrubs found a place in the writings on gardening. Sir W. Chambers seems to have been the first who suggested it in his account (whether correct or not, is of little consequence to our present purpose,) of the practice of the Chinese gardeners. "The Chinese," he says, "in their plantations, do not, as is the practice of some European gardeners, plant indiscriminately every thing that comes in their way; nor do they ignorantly imagine, that the whole perfection of plantations consists in the variety of the trees and shrubs of which they are composed: on the contrary, their practice is guided by many rules, founded on reason and long observation, from which they seldom or ever deviate. Many trees, shrubs, and flowers, they say, thrive best in low, moist situations; many on hills and mountains: some require a rich soil; but others will grow on clay, in sand, or even upon rocks; and in the water: to some a sunny exposition is necessary; but for others, the shade is preferable. There are plants which thrive best in exposed situations; but, in general, shelter is requisite. The skilful gardener, to whom study and experience have taught these qualities, carefully attends to them in his operations; knowing that thereon depend the health and growth of his plants; and consequently the beauty of his plantations.

"The perfection of trees for ornamental gardening, consists in their size; in the beauty and variety of their forms, the color and smoothness of their bark, the quantity, shape, and rich verdure of their foliage; with its early appearance in the spring, and long duration in the autumn; likewise in the quickness of their growth, and their hardiness to endure the extremities of heat, cold, drought, or moisture; in their making no litter, during the spring or summer, by the fall of the blossom; and in the strength of their branches, to resist, unhurt, the violence of tempests.

"The perfection of shrubs consists not only in most of the above-mentioned particulars, but also in the beauty, durability, or long succession of their blossom; and in their fair appearance before the bloom, and after it is gone.

"We are sensible, say they, that no plant is possessed of all good qualities; but choose such as have the fewest faults; and avoid all the exotics that vegetate with difficulty in our climate; for though they may be rare, they cannot be beautiful, being always in a sickly state.

"The excessive variety of which some European gardeners are so fond in their plantations, the Chinese artists blame; observing, that a great diversity of colors, foliage, and direction of branches, must create confusion, and destroy all the masses upon which effect and grandeur depend: they observe too, that it is unnatural; for, as in nature most plants sow their own seeds, whole forests are generally composed of the same sort of trees. They admit, however, of a moderate variety; but are by no means promiscuous in the choice of their plants: attending, with great care, to the color, form, and foliage of each; and only mixing together such as harmonize and assemble agreeably.

"They observe, that some trees are only proper for thickets; others, only fit to be employed singly: and others, equally adapted to both these situations. The mountain cedar, the spruce, and silver firs, and all others whose branches have a horizontal direction, they hold improper for thickets: because they indent into each other; and likewise cut disagreeably upon the plants which back them. They never mix these horizontal branched trees with the cypress, the oriental arbor vitæ, the bamboo, or other upright ones; nor with the larch, the weeping willow, the birch, the laburnum, or any of a pendant nature; observing, that the intersection of their branches forms a very unpicturesque kind of net-work: neither do they employ together the catalpa and the acacia, the yew and the willow, the plane and the sumach, nor any of such heterogeneous sorts; but, on the contrary, they assemble in their large woods, the oak, the elm, the beech, the tupelo, the sycamore, maple, and plane, the chestnut, the walnut, the arbele, the lime, and all those whose luxuriant foliage hide the direction of their branches; and growing in globular masses, assemble well together; forming, by the harmonious combination of their tints, one grand group of rich verdure.

"In their smaller plantations, they employ trees of a smaller growth, but of the same concordant sorts; bordering them with Persian lilacs, gelder-roses, seringas, coronillas of various sorts, flowering raspberries, yellow jessamine, hypericum, the spiræa frutex, altheas, roses, and other flowering shrubs peculiar to China: and wherever the ground is bare, they cover it with white, blue, purple, and variegated periwinkle, the convolvulus minor, dwarf stocks, violets, primroses, and different kinds of creeping flowers; and with strawberries, tutsan, and ivy which climbs up and covers the stems of the trees.

"In their shrubberies they follow, as much as possible, the same rules; observing farther, to plant in some of them, all such shrubs as flourish at one time; and in some, such as succeed each other: of which different methods the first is much the most brilliant; but its duration is short; and the appearance of the shrubbery is generally shabby, as soon as the bloom is off: they therefore seldom use it, but for scenes that are to be enjoyed at certain periods; preferring the last, on other occasions, as being of long duration, and less unpleasing after the flowers are gone." *Dissert. on Orient. Gard.*

About the same time Wheatley introduced some excellent remarks on the subject (*Obs. on Gard.* sect. 12, 13, and 14.) and subsequently Uvedale Price, (*Essays on the Picturesque*, vol. i.) In 1804 we endeavoured to enforce the principle, not only in planting trees, but in arranging herbaceous plants, and the plants in botanic hothouses. (*Obs. on Planting and Landscape Gard.* 8vo.) All these efforts were at first treated as visionary by Marshal, Nicol, and other planters and gardeners. But Nicol, in the last editions of his works, allows there may be some merit in grouping; and Sang, his editor, highly approves of following nature in the arrangement of trees. (*Planter's Kalend.*)

Nicol says, "the proper disposition of shrubs, where many are to be planted, is a matter of considerable importance to the future welfare of the whole, and that whether they be mixed, or be grouped; that is to say, whether deciduous or evergreen shrubs be indiscriminately mixed, as is often done, or the evergreens be planted distinctly by themselves.

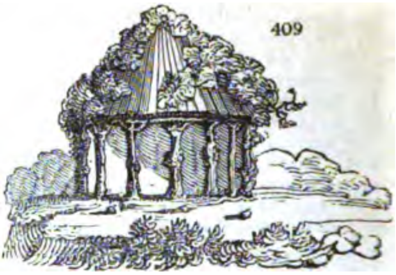
"The arrangement of shrubs is a matter, no doubt, very much of fancy. In some parts they may be mixed; in others grouped; but in general, there ought to be plenty of evergreens planted, in order that the whole may be the more cheerful in winter. Generally speaking, however, the method of mixing all kinds of shrubs indiscriminately, prevails too much in modern shrubberies. Much more character and distinctness may be given, by judiciously grouping them, than by following the common methods of planting."

Abercrombie, or rather his posthumous editor, seems rather undecided in his observations on this subject. In one place he says, "in the distribution of plants over grounds dedicated to elegance, there are two rival systems, each of which has its practical followers and theoretical vindicators. One proposes the indiscriminate mixture of many different species; the other deliberately groups those only which have some marks of affinity. It is still a question, which order of planting is countenanced by the practice of nature in self-sown vegetables; and which will confer on a garden the stronger claims to character and beauty?" He elsewhere observes, that "the different natures of herbaceous flowers, shrubs, and trees stand in the way of every attempt to govern their distribution or assemblage, by a common principle." In planting trees, however, he subjoins, "the principle of unity may be consulted, without losing sight of the advantage of variety," &c. *Pr Gard.* 477.

1591. *Fruit Trees in Shrubberies.* "In shrubberies of considerable extent, fruit-trees may be interspersed at fifteen or twenty yards' distance, by which means a good deal of fruit may be obtained, and very much beauty added to the shrubbery. In spring the blossoms of apples, cherries, and pears are beautiful; in autumn their fruits and the foliage of cherries in particular, give a lustre and variety that highly brightens the appearance of other plants, especially of evergreens." *Villa Gard. Direct.* 16.

This practice, Sir W. Chambers tells us, is practised by the Chinese *when the patron is poor*, (*Or. Gard.* 101.); that is, their shrubbery is composed of fruit-trees, and shrubs, and forms a sort of ornamental orchard. This we consider an advisable mode for an economical farm residence; but the general introduction of fruit-trees, in even mingled shrubberies, unless of the species in their wild state, as crabs, wildings of pears, cherries, quinces, raspberries, &c. we consider as likely to destroy the character of the scene. It must be recollected too, that grafted trees, especially the apple and cherry, seldom grow so freely, and produce such vigorous and natural like heads, as plants raised from seed; they are, therefore, soon overtopped by the others, or where they are placed among trees that do not grow higher than themselves, they seldom fail of producing deformed stinted heads.

Forsyth, Abercrombie, and others, recommend their introduction, as it appears to us, without due regard to any other object than the fruit they will produce, and the fugacious beauty of their blossoms; but their unaccommodating form, and their influence as to character in ornamental plantations, we consider as sufficient arguments against the practice in general cases.



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1592. *Decorations in Shrubberies.* Those of the shrubbery should in general be of a more useful and imposing character than such as are adopted in the flower-garden. The green-house and aviary are sometimes introduced, but not, as we think, with propriety, owing to the unsuitableness of the scene for the requisite culture and attention. Open and covered seats are necessary, or, at least, useful decorations, and may occur here and there in the course of the walk, in various styles of decoration, from the rough bench to the rustic hut (*fig.* 409.), and Grecian temple (*fig.* 410.) Great care, however, must be taken not to crowd these nor any other species of decorations.

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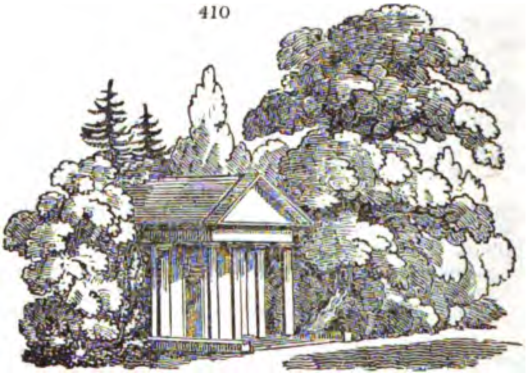

Buildings being more conspicuous than either statues, urns, or inscriptions, require to be introduced more sparingly, and with greater caution. In garden or ornamented scenery, they should seldom obtrude themselves by their magnitude or glaring color; and rarely be erected but for some obvious purpose of utility.

Covered seats are introduced of many forms, and under a great variety of names, such as root-houses, heath-houses, moss-houses, huts, bowers, caverns, caves, grottos, temples, mosques, &c. besides plain covered seats either of wood or stone. The imitation of temples or mosques, as they must be on a small scale, is generally quite ridiculous. The propriety of introducing the others depends entirely upon the character of the scene. Light bowers formed of lattice-work, and covered with climbers, are in general most suitable to parterres; plain covered seats suit the general walks of the shrubbery. Most of the others may be introduced in romantic, singular, wild, or melancholy places.

Statues, urns, inscriptions, busts, monuments, &c. are materials which should be introduced with caution. None of the others require so much taste and judgment to manage them with propriety. The introduction of statues, except among works of the most artificial kind, such as fine architecture, is seldom or never allowable; for when they obtrude themselves among natural beauties, they always disturb the train of ideas which ought to be excited in the mind, and generally counteract the character of the scenery. In the same way, busts, urns, monuments, &c. in flower gardens, are most generally misplaced. The obvious intention of these appendages is, to recal to mind the virtues, qualities, or actions of those for whom they were erected: now this requires time, seclusion, and undisturbed attention, which must either render all the flowers and other decorations of the ornamental garden of no effect; or, if they have effect, it can only be to interrupt the train of ideas excited by the other. As the garden, and the productions of nature, are what are intended to interest the spectator, it is plain that the others should not be introduced. This reasoning, while on the one hand it shews the absurdity of such a practice, on the other, directs that urns, monuments, &c. should only be placed in solitary, unfrequented places, where the mind is naturally led to contemplate, and where the remembrance of the virtues of great men, or the worth of relations now no more, afford proper subjects for contemplation. But even in places apparently solitary, or secluded, these have been introduced in so affected or improper a manner, as to furnish reason for the greatest caution in future. *Tr. on Count. Res.*

When the walk of a shrubbery is of great extent, it may sometimes be desirable to introduce a cottage (*fig.* 411.) in a distant part of it, with an occupant, for the purpose of keeping one apartment in order, as a place of repose. Such a cottage may be designed in any style, according to the taste of the owner, and may serve a variety of useful purposes. In the gardens laid out under the direction of the Queen of Geo. III. at Frogmore, and in the walks of what are called *the slopes* at Windsor, are some good examples of rustic seats and ornamented shrubbery cottages.

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1593. *On the subject of Planting both Flower Gardens and Shrubberies*, we may remark, with the author of the *Florist's Manual*, that it is considered in much too unimportant a light, both by gardeners and their employers. The business is almost every where performed at random, instead of being conducted with a specific object in view. To remedy this evil, gardeners should first make a correct plan of the border, parterre, or plot, of whatever kind it may be that is to be planted; and then having determined the mode of arrangement most proper, and selected the names of plants to effect it, from the proper catalogues, the situation of every plant and its name should be determined on the plan. This done, all these points should be correctly transferred to the ground, and a pin or stake inserted at each, numbered in correspondence with a list of the sorts. The plants being procured, should then be distributed and planted according to these stakes and numbers; and the stakes should be allowed to remain for a year or two, to make certain as to the sort to be replaced there, in the case of death or accident. If ever this branch of gardening should attain a high degree of perfection in Britain, it will probably be deemed as necessary to call in a professor to direct the arrangement of flowers and shrubs in parterres and shrubberies, as it is now to require his aid in arranging the ground-plan.

Chap. V.

Of the Hot-Houses used in Ornamental Horticulture.

These are the frame, glass-case, green-house, orangery, conservatory, dry-stove, the bark or moist stove, in the pleasure-ground, and the pit and hot-bed in the reserve nursery. In the construction of all of these the great object is, or ought to be, the admission of light and the power of applying artificial heat with the least labour and expence. In culinary forcing-houses, it is highly requisite to attend to the angle of the glass roof, so as to obtain most of the sun's influence at the time the fruit within is to be ripened; but in the hot-houses of the flower-garden or gleasure-ground, the construction ought to be such as to admit as much light as possible in winter; for then in the stoves a heat is kept up by art, which is not to be found in any climate connected with so little light as is then afforded in our latitude. Hence, as a general principle it may be affirmed, that the roofs of all plant or botanic hot-houses should be steep rather than flat, and, perhaps, the angle of 45° may be fixed on as the fittest average. It was adopted by Miller, both in culinary and ornamental hot-houses, and is fitter for general purposes than any other.

1594. The *Frame* used in ornamental horticulture, is generally of the same form as those of the kitchen-garden. For alpine plants this form succeeds perfectly, but for frame shrubs, the ends and front should be deeper than usual, and glazed half their depth, to admit the sun to the surface of the adjoining pots. Frames for the taller bulbous-rooted flowers, should either be glazed in front and at both ends, or if opaque in those parts, should be placed on a steep surface for the same general object. Frames of every description should have a gutter or spout in front, to carry off the rain-water which falls on the sashes.

The *Glass-case* may be variously constructed from detached sashes; it is used to protect standard trees or shrubs, and sometimes to place against walls or espaliers, (see *fig.* 134.).

1595. The *Green-House* may be designed in any form, and placed in almost any situation as far as respects aspect. Even a house looking due north, if glazed on three sides of the roof, will preserve plants in a healthy vigorous state. A detached green-house, even in the old style, may be rendered an agreeable object in a pleasure-ground, of which, as an example, we may refer to one (*fig.* 412.) erected by G. Todd, for

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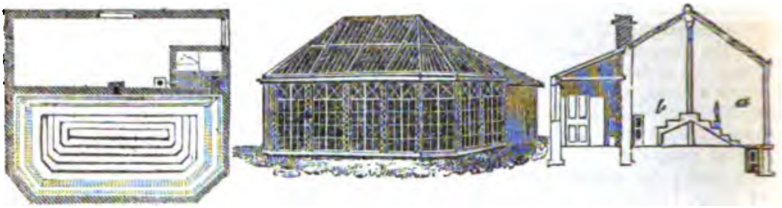

E. Liebenrood, Esq. near Reading; but the curvilinear principle applied to this class of structures, admits of every combination of form, and without militating against the admission of light and air. But though we are decidedly of opinion, that as iron roofs on the curvilinear principle become known, the clumsy shed-like wooden or mixed roofs now in use will be erected only in nursery and market gardens: yet we are not to be understood as exclusively recommending our own plans, and we, therefore, describe that of G. Todd, whose book contains a number of examples, erected in different parts of the country, and in the best manner of the old style. "This house (*fig.* 412.) has a span roof, and the centre lights, which are balanced by weights, made in imitation of acorns, suspended from the ridge of the roof, are made to slide, to admit air from the roof. The front and ends are formed with folding casements, hung so as to be taken away at pleasure; and between each is a pilaster of treillage work. A cast-iron column at each extremity of the upper part of the roof, is placed for the purpose of keeping it from spreading, as such roofs generally do, unless held together by a transverse tie, which has a less pleasant appearance than a column. A single fire heats this house; the flue goes under the floor round the front and ends, rises and continues above the floor along the back-wall, and terminates in a chimney in the centre. Over the stock-hole is placed a cistern, which is supplied from the roof, and occasionally from a pump adjoining, with water, which is conveyed into the green-house by a lead pipe." *Plans for Green-houses*, &c. p. 11.

In the interior of the green-house the principal object demanding attention is the stage, or platform for the plants. In a double roofed house, surrounded by a path, the stage generally consists of shelves, rising from the path to the middle of the house (*fig.* 412, *a* and *b*); but in a house with a single roof (*fig.* 413.) it generally rises from the front path to the back, and in both cases the slope of the stage is generally the same or somewhat less than the slope of the roof. In green-houses destined for very large or tall-growing plants, as camellias and many of the New Holland plants, no stage is requisite; and in such as are destined for small plants, as heaths and geraniums, the first step of the stage, when there is a path between it and the front glass, should be raised at least two feet and a half high, and it may then be continued parallel to the roof. The object of this arrangement is to bring the plants near the glass, so as they may obtain the benefit of the light in a state as little decomposed as possible. Flues in green-houses are frequently carried above ground, which is inelegant and too much in the style of the common forcing-house. They may in almost every case be conducted under the paths or stage, and by keeping them detached so as air may circulate round them, as much heat will be given out as by the common mode. In general one fire will be sufficient to warm from 4000 to 5000 cubic feet of air, of the temperature requisite for green-house plants (*see* 679.) In some cases trellis-rods are placed at regular distances under the roofs of green-houses, for the purpose of training vines; but this practice is incompatible with a high degree of culture and beauty in the green-house plants, on account of the light it excludes; besides, it interferes with character. If any creepers or climbers are to be trained under the roofs they should be of the ornamental kind; but it is generally best to train them to upright rods at the back part of the house, or rods forming intersecting arches over the back paths, or against the back wall; for by either of these modes they exclude less light, better display their foliage and flowers, and less recal the idea of the forcing-house.

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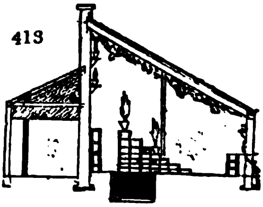

Abercrombie and Nicol give descriptions of green-houses, such as they approve; the former is rather indefinite in his remarks; but the latter has given the best instructions that have yet appeared, as far as respects the old forms and mode of treating and ventilating.

According to Abercrombie, "the green-house may be made a very ornamental object as a structure. The front of the building should stand directly to the south, and the ends have an open aspect to the east and west.

"The extent of the green-house may vary, according to the largeness of the collection to be cultivated: when most contracted it should considerably exceed the breadth and height, in order to have handsome proportions. As to the breadth: were it more than twenty feet, those plants most remote from the windows would be troublesome to manage, as they must stand on very high stages to be reached by the sun; between twelve and twenty feet will be found the most commodious latitude. The front, including a low parapet wall and a row of windows, or upright glasses, may be eight or ten feet high, measured from the interior floor. It will be proper to lay the floor at least twelve inches above the level of the ground, and in damp situations two feet. The back is the only part at which an entire wall should be carried up to the roof; the precise height of this wall depends upon that of the glass front and the breadth of the house; the proportions of these three must be so accommodated as to give the proper slope to the roof." *Pract. Gard.*

"In the construction of green-houses, fancy may be indulged, and a greater scope may be allowed to taste, than in the construction of forcing-houses. These are generally confined to one object, the production of certain fruits in perfection; which renders the observance of forms and dimensions in their construction more necessary than in that of the green-house, where a variety of plants of different habits are to be cultivated.

"Nevertheless, in order that these plants may generally thrive, there are certain rules to be observed, and errors to be guarded against, which I shall briefly point out.

"Green-houses with upright fronts, and with perpendicular lights only, whether the columns that separate them be of wood or of masonry, are the most objectionable; as the plants in such are always drawn up weak, and are distorted by continually stretching towards the light. Neither do they enjoy the genial effects of the sun, except in the winter months, when his rays, though feeble, strike horizontally on the windows, and for a few hours in the middle of the day perhaps, shine on the low plants, and those placed most forward. If such houses be very wide, they are the most objectionable on that account; as, in that case, the plants placed near to the back of the stage are never visited by the rays of the sun, and enjoy but little light to what they may require.

"But such green-houses may be, and indeed have been much improved, by taking off their leaden or slated roofs, and by substituting roofs consisting of wooden framing and glass, for the admission of sunshine and perpendicular light. But still they are so far defective, as that, by their great height, the plants are much more drawn than they ought to be, or would be, in a lower and better constructed house.

"Houses that are open on the front only, although they have sloping lights on the roof, are next to be objected to; as the plants in such are necessarily more drawn and distorted than as if the ends were also glazed. If such be not placed among other buildings, so as that they cannot be altered, they might be very much improved by pulling down the close ends, and by substituting glazed lights; which, if they be of a moderate height, would render them next best to such houses as are described below.

"But a complete green-house, being quite detached from other buildings, should be glazed on all sides. It may be circular, oval, hexagonal, octagonal; or with two straight sides, and circular ends, which I think the best form of any: the next best, an octagon, whose sides are not equal, but with two opposite longer sides, and six shorter sides; three and three opposite, forming, as one might say, an angular oval; the ends being angular, instead of round. In either of these last-mentioned forms, the stages and plants may, at least, in my mind, be more tastefully arranged, than in any other. Granting either of these cases,

"The house should be about thirty-six or forty feet long, eighteen or twenty feet wide, and ten, or at most twelve feet high, above a given level line for its floor. The parapet all round to be a foot or fifteen inches high, and the upright glasses placed on it, four, or four and a half feet at most. For it is of importance, for the sake of the finer kinds of plants, and in order to have all kinds grow bushy, and flower while young and small, (in which state they are certainly most attractive and pleasing), to keep the roof glasses as low as possible; just allowing sufficient head-room to the tallest person when walking in the alleys.

"The furnace and stock-hole may be placed at either end, or at either side, as may be most convenient; and they should be sunk under ground, and be concealed. The flue to be constructed, to run parallel to, and be separated from the parapet by a three-inch cavity; its surface being level with the top of the parapet, and being crib-trellised for heaths, Botany Bay, and other rare plants. A walk thirty, or thirty-six inches broad, to be conducted all round within the flue; within which to be placed the stages for the more common, and the taller plants; being raised in the middle, and falling to either side and end; corresponding with the glasses, though of course not so steep.

" A row of columns should be placed in the centre, in order to support the ridge of the roof; to which climbing plants might be trained in various forms, and might be hung in festoons from column to column at top, or otherwise, as may be dictated by fancy. The front of the stage all round, should be raised about eighteen or twenty inches above the walk, in order to raise the whole of the plants placed on it sufficiently near to the glass; thus forming the walk into a deep alley; the person walking in it having a narrow border of the finer and smaller plants on the one hand, and a bank of the more common and larger kinds on the other; than which, when the plants are healthy and thriving, few scenes can be more pleasing.

" The aspect of such a house should be towards the south; that is to say, it should stretch from east to west, or as nearly so as circumstances will permit. It may have an entrance on the south side, or one at either end, as shall be most convenient and suitable to its connection with the walks of the shrubbery or parterre in which it is placed.

" If a green-house must necessarily be attached to a wall or other building, it might be constructed very much as above; with this difference, having one of the ends as it were cut off; in which case, it should be placed with its circular end south, or towards that point, and the sides pointing east and west. This I should consider as the second best constructed green-house, and in which, excepting in the above described house, the plants would enjoy the fullest share of sun and light.

" In either of these houses, and in plant hot-houses of every description, a sufficient number of the upright and sloping sashes should be made moveable, for the admission and regular circulation of air in the better seasons of the year; and ventilators (1165.) should be placed at regular distances all round, for the purpose of airing and ventilating them in the winter months, or at times when it may not be safe to open the lights.

" Such a house as either of these, would form a very complete receptacle for a handsome and pretty extensive collection." *Kalendar*.

1596. The *Orangery* is the green-house of the last century, the object of which was to preserve large plants of exotic evergreens during winter, such as the orange-tribe, myrtles, sweetbays, pomegranates, and a few others. Geraniums, heaths, fuschias, and other delicate plants requiring much light, were then unknown. The orangery was generally placed near to or adjoining the house, and its elevation corresponded in architectural design with that of the mansion. From this last circumstance has arisen a prejudice highly unfavorable to the culture of ornamental exotics, namely, that every plant habitation attached to a mansion should be an architectural object, and consist of windows between stone piers or columns, with a regular cornice and entablature. By this mode of design, these buildings are rendered so gloomy as never to present a vigorous vegetation, and vivid glowing colors within; and as they are thus unfit for the purpose for which they are intended, it does not appear to us, as we have already observed at length (629.), that they can possibly be in good taste. Perhaps the only way of reconciling the adoption of such apartments with good sense, is to consider them as lounges or promenade scenes for recreation in unfavorable weather, or for use during fêtes, in either of which cases they may be decorated with a few scattered tubs of orange-trees, camellias, or other evergreen correaceous-leaved plants from a proper green-house, and which will not be much injured by a temporary residence in such places, which, as Nicol has observed, " often look more like tombs, or places of worship, than compartments for the reception of plants; and, we may add, that the more modern sort look like a combination of shop-fronts, of which that at Claremont is a notable example."

Sometimes structures of this sort are erected to conceal some local deformity, of which, as an instance, we may refer to that (*fig.* 414.) erected by G. Tod, for J. Elliot, Esq., at Pimlico. " This building was constructed for the purpose of preventing the prospect of some offices from the dwelling-house. The architectural ornaments, and the roof, not being of glass, are points in the construction not generally to be recommended; but, as it was built for the purpose above-mentioned, the objections were overruled. There are three circular stages to this house, which are made to take out at pleasure. The ceiling forms part of a circle, and the floor is paved with Yorkshire stone. It is fifty feet long, and thirteen feet six inches wide, and heated by one fire, the flue from which makes the circuit of the house under the floor." *Plans of Green-houses*, &c. p. 10.

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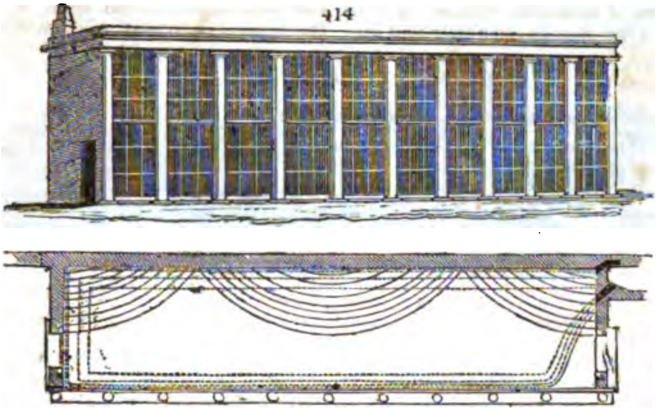
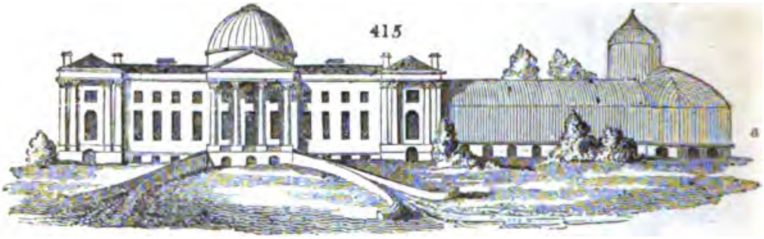


Of the orangery, considered as a house for growing the orange tribe as a dessert fruit, we have already treated (1510).

1597. A recent and very considerable improvement in the construction of green-houses and orangeries consists in forming the shelves and stages of thin plates of stone, instead of boards; and very frequently the stones are hollowed out, so as to leave a raised margin of half an inch or more, for the purpose of retaining moisture, preventing dripping, and raising, when the air of the house is warm, a general steam or dew. This may be considered, on the whole, as a real improvement, a proof of which is the readiness with which it has been adopted by nurserymen and practical gardeners. A substitute consists in raising marginal slips of boards to wooden shelves, and covering the board with a thin layer of gravel or scoria.

1598. The *Conservatory* is a term generally applied by gardeners to plant-houses, in which the plants are grown in a bed or border without the use of pots. They are sometimes placed in the pleasure-ground along with the other hot-houses; but more frequently attached to the mansion. The principles of their construction is in all respects the same as for the green-house, with the single difference of a pit or bed of earth being substituted for the stage, and a narrow border instead of surrounding flues. The power of admitting abundance of air, both by the sides and roof, is highly requisite both for the green-house and conservatory; but for the latter, it is desirable, in almost every case, that the roof, and even the glazed sides should be removable in summer. When the construction of the conservatory does not admit of this, the plants in a few years become etiolated, and naked below, and are no longer objects of beauty; but when the whole superstructure, excepting the north side, is removed during summer, the influence of the rains, winds, dews, and the direct rays of the sun, produce a bushiness of form, closeness of foliage, and a vividness of color, not attainable by any other means. We are decidedly of opinion, therefore, that a conservatory of any of the common forms, unless it were one devoted entirely to palms, ferns, scitamineæ, or other similarly growing plants, should always be so constructed as to admit of taking off the sashes of the roof and the front; and if it were a detached structure in the flower-garden, we should prefer a plan that would admit of the removal of every thing excepting the flues and the plants. There is an old conservatory of this sort in the flower-garden at Nuneham Courtenay, planted with orange-trees; and when the roof is removed, the flues, border, and bed are covered with turf, so that the trees appear as if planted in the open garden. The trees have stood there for upwards of half a century, are vigorous, and bear annually abundance of fruit. On the other hand, there are two conservatories at Knowle, with roofs fixed, or partially opening, which have not been erected more than four years, and in which the plants are already etiolated, and the lower branches dying off. When a conservatory is glazed on all sides, it should, if possible, be placed south and north, in order that the plants on both sides of the pit should equally benefit from the sun; when placed against a wall, the glazed side may front any quarter except the north.

But as the removal and replacing of the roof of such immense conservatories, as are sometimes attached to mansions (*fig.* 415.), is attended with considerable expence, risk of breakage, and what is of still more consequence, of risk to the plants, if they happen to be uncovered too soon in spring, or left too long uncovered in autumn, we would recommend the polyprosopic roof (641. and *fig.* 169.) as by far the most perfect description of a hot-house roof that has yet been devised. With such a roof, the plants within may at any time, in a few minutes, be as completely exposed to air, rain, dew, and sun, if these exist without, as if the roof were removed; and again, in a few minutes they may be completely shut up. The improver who shall erect an extensive conservatory of this kind (*fig.* 415, *a.*), and apply to it the regulating apparatus of Kewley (*fig.* 129), will find himself in possession of the most unique and complete plant-structure in the world.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In comparatively humble and economical residences (*fig.* 416.), the conservatory may consist of a number of rectangular sashes, connected and supported by means of light iron rafters. In the beginning of summer, the sashes may be removed and applied to the ripening of peaches, vines, or figs against walls, or laid over excavations in the form of pits, containing melons, cucumbers, &c. The light iron frame-work may either be removed, or remain and be disguised by annual creepers, or by vines of the narrow-leaved sorts (1484).

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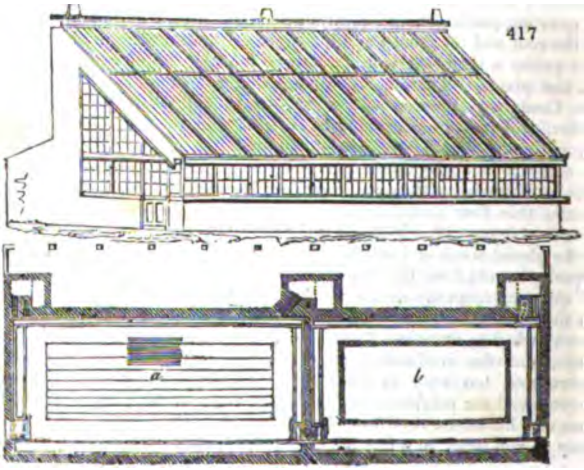
Sometimes a cistern is placed in the conservatory for growing aquatics, and containing a few gold-fish; but as there are very few exotic aquatics which will thrive in the temperature of the green-house, this is seldom requisite, unless as a decoration, and for the use of the water in culture, and the appearance of the fishes.

The temperature of conservatories being the same as of green-houses, the same proportion may exist between the flues and volume of air to be heated (134.)

1599. The *Dry-Stove* is chiefly devoted to the culture of succulents. In design it need not differ from the green-house, unless, perhaps, in the stage (*fig.* 417. *a*) being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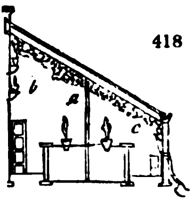
placed somewhat nearer to the roof. The name and character of this structure is derived from the higher degree of heat generally kept in it, and from the air being less moist than in the bark-stove, where more water is used, and consequently more vapor generated. The volume of air to be heated by one fire in the dry-stove, should not exceed two-thirds of that to be heated in a green-house or conservatory, similarly constructed and situated.

1600. The *Bark* or *Moist Stove* differs from the last only in having a pit (*fig.* 417. *b*) for bark or other fermenting matter instead of a stage. This pit may be from two and a half to four feet deep, according as bark or leaves are to be used, the latter material requiring the greatest depth. It is commonly surrounded by a thin brick wall, but, in elegant structures, planks of stone, or plates of slate, or cast-iron are to be preferred, as a higher finish, and occupying less space. The roof, when necessary, may be supported from the iron columns from the middle of the pit (*fig.* 418. *a*). Shelves may be placed against the back wall (*b*), and occasionally a narrow-leaved creeper run up the roof (*c*). Such is the common interior arrangement of a botanic stove, as may be exemplified in that designed by W. T. Aiton, and erected by G. Tod, in the royal garden at Frogmore. (*fig.* 417.) We may add, that houses of this description are generally placed east and west against walls, on account of the shelter thereby obtained during winter, when a high degree of heat is kept up within, while the cold is excessive without. There are exceptions, however, in the plant-stoves of the more recent public botanic-gardens, especially those of Dublin and Liverpool, which are placed with their ends to the south, and in the immense palm-house erected by Messrs. Loddiges, which stands east and west, and is glazed on all sides.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In private flower-gardens the hot-houses frequently consist of a range (*fig.* 419.),

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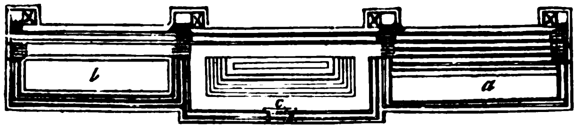
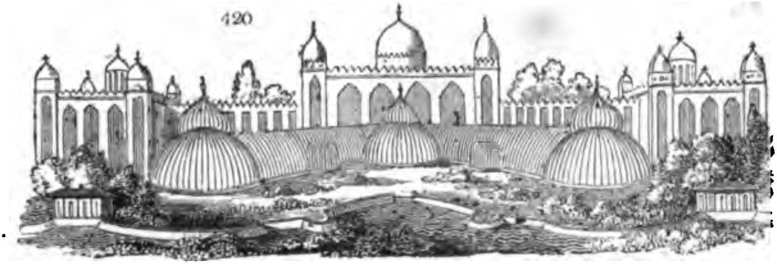


containing a green-house (*a*) at one end, a dry-stove (*b*) at the other, and a stove (*c*) in the centre. By this disposition the stove is easier kept up to the required temperature, though it loses the full influence of the light at the ends. In general, a stove requires double the number of fires required to a green-house of the same size.

There is one peculiarity in the construction of a plant-stove which deserves particularly to be noticed; namely, that fewer openings for the admission of air are requisite than in any other hot-house, excepting the pine-stove. One reason of this is, that the degree of heat which must at all times be kept up in the enclosed atmosphere, is so much greater than that of the open air, that the different specific gravity of the two fluids, when permitted to mingle by opening two or three sashes, produces a more active circulation, and sooner approaches to an equilibrium of temperature: another is, that however numerous the openings in the hot-house roof may be, they could seldom be made use of without reducing the house to too low a temperature; and a third and last is, that the plants being mostly kept in pots, and many of them, as the palms, being of slow growth, they are not so apt to etiolate as those of the green-house and conservatory. Hence it is, that the roof of a botanic-stove may generally be erected at less cost than that of a green-house or conservatory; but particularly where iron is employed, and the curvilinear principle adopted. Houses of magnificent forms, and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almost as light within as in the open day, might thus be constructed for the growth of palms, scitamineæ, bamboos, and other tropical trees to be planted in the ground, as in the conservatory. These might also be detached in the flower-garden (as *figs*. 10, and 20. in *Sketches for Curvilinear Hot-houses*), or they might form an appropriate appendage to a palace in the oriental style (*fig*. 420.). Indeed, there is hardly any limit to the extent to which this sort of light roof might not be carried; several acres, even a whole country residence, where the extent was moderate, might be covered in this way, by the use of hollow cast-iron columns as props, which might serve also as conduits for the water which fell on the roof. Internal showers might be produced in Loddiges' manner; or the roof might be of the polyprosopic kind, and opened at pleasure to admit the natural rain. Any required temperature might be kept up by the use of concealed tubes of steam, and regulated by the apparatus of Kewley. Ventilation also would be effected by the same machine. The plan of such a roof might either be flat ridges running north and south (*fig*. 421. *a*), or octagon or hexagon cones (*b*), with a supporting column at each angle, raised to the height of a hundred or a hundred and fifty feet from the ground, to admit of the tallest oriental trees, and the undisturbed flight of appropriate birds among their branches. A variety of oriental birds and monkeys, and other animals, might be introduced; and in ponds, a stream made to run by machinery, and also in salt lakes, — fishes, polypi, corals, and other productions of fresh or sea-water might be cultivated or kept.

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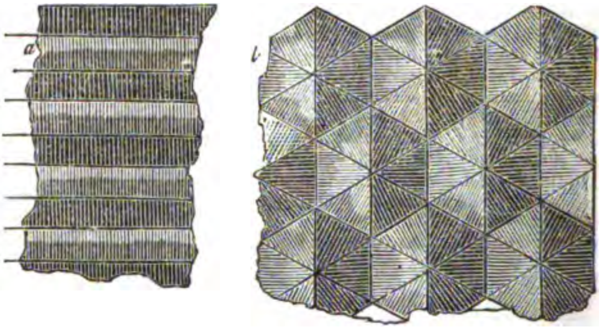

The great majority of readers will no doubt consider these ideas as sufficiently extravagant; but there is no limit to human improvement, and few things afford a greater proof of it than the comforts and luxuries man receives from the use of glass, a material, as Cuvier observes, (*Magazin Encyclopedique*, 1816,) manufactured from seemingly the most useless *debris* of our globe, and an insignificant plant (*salicornea*) found on sea shores. In northern countries civilized man could not exist without glass: and if coal is not discovered in these countries, say, in Russia, it may at some future period become a question whether, instead of separate fires and stoves, double windows, &c. the most economical mode of procuring a proper temperature will not be by at once covering whole towns with immense teguments of glass, and heating by steam or otherwise, the enclosed air common to all the inhabitants; or where glass was considered too expensive, whole villages might be covered with a roof of boards, and lighted night and day in the winter season by gas previously obtained from the fuel used to produce the steam: or the gas might be employed for heating, either by the generation of steam, or passing the air heated by the flame through metallic tubes.

1601. *The Aquarium.* The greater number of exotic aquatics being stove-plants, a cistern of water for their culture is commonly placed in the bark-stove, generally at one end of the pit, and so as to be as near the light as possible. The Duke of Marlborough, however, and some others, have erected houses on purpose for this beautiful class of plants, substituting a large cistern for the bark-pit. The aquarium, at White-Knights, (*fig*. 422.) built by G. Tod, " is constructed with a span roof of glass; the sides and ends are also of glass, as low down as the top of the flue. A cistern occupies the interior of the house, having a walk round it; it is lined with lead, and filled with a mixture of mud and water, proper for the reception and growth of such plants as require aqueous nourishment. A flue goes round, directly under the bottom of the cistern, for the purpose of keeping the water

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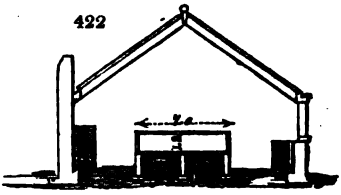

of a certain temperature. Another flue goes round the house above ground, and terminates in a chimney at the north-west corner. The bottom of the cistern, to receive the lead, is formed with slates, supported by transverse bars of cast-iron; a bottom of wood would have been more convenient for laying the lead upon, but as the flues are so near the bottom of the cistern, danger of fire was apprehended. The cistern is supplied with water by means of a pump placed at a convenient distance for that purpose." *Plans for Green-Houses,* &c. p. 17.

This aquarium suits very well for such aquatics as grow to some height above the water; but for those whose leaves float on its surface, as is the case with the most numerous and beautiful genus of this class (*Nymphæa,*) it is too far from the light. A more perfect plan would be, to have the cistern close under the front glass, and to have that glass rather flat, say at an angle of 15°; or two cisterns might be formed, one in the back part of the house for tall plants, and the other in front, for floating foliage, with a broad path between. But the most elegant plan would be, to have a circular house, glass on all sides, (*fig.* 423.). to have a cistern in the centre for river plants, and a surrounding cistern for those which grow in stagnant water. To imitate the effect of the motion of water in the central cistern, the mould or pots in which the plants grow might be placed on a bottom (*a*), apart from that of the cistern (*b*), and this bottom being on the end of an upright shaft, might, by the aid of proper machinery in a vault below (*c*), be kept in perpetual circular motion. These plants, which grow naturally in rapid streams, might be planted or placed on the circumference of the bottom (*d*), and those requiring less agitation, towards its centre (*e*). If reversed motion was required to imitate tides (where marine aquatics were cultivated), nothing could be easier than by the sort of wheel used in the patent mangle to produce it to any extent; or by another still more simple plan known to every engineer, it might be changed seldomer, say only once or twice in twenty-four hours. If a rapid and tortuous motion was required, then let the bottom on which the plants are placed, be furnished with small circular wheels (*f*) placed on its margin, working on pivots, and furnished on their edges with teeth like a spur wheel. Then let there be a corresponding row of teeth fixed to the inside of the wall or side of the cistern, into which they are to work like a wheel, and pinion. By this means, pots of plants set on the small wheels, will have a compound motion, one round the centre of the small wheels, and another round that of the large bottom, something of the nature of planetary motion, but more like that of the waltz dance. It is almost needless to add, that exotic aquatic fowls and fishes might be kept in such an aquarium, and either of the sea or fresh water rivers, according as salt water or fresh was used.

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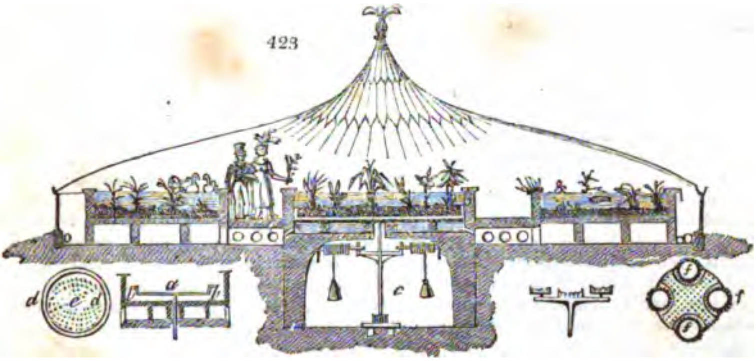


It may be thought by some that the machinery would be intricate and troublesome; but the power requisite is so very small, that it might easily be obtained by machinery on the principle of the wind-up-jack, such as was used by Deacon in his ventilating Eolians (*Rem. on Hot-h.* 68.) This kind of mechanism very seldom goes out of order, or requires repairs, and would require no other attention than being wound up twice in twenty-four hours, and oiled occasionally. The same vault that contained it might serve for the furnace or boiler for heating the house.

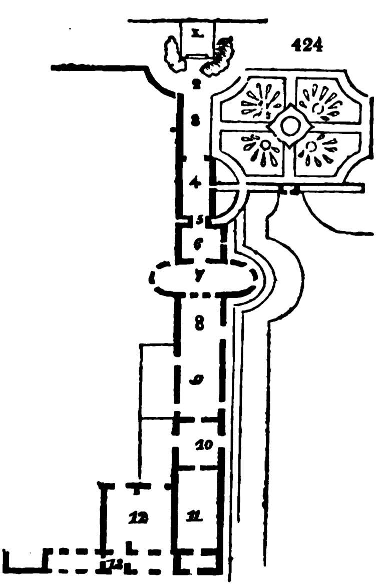
1602. ***Wind.*** If instead of water in a circular cistern with its bottom so constructed, we suppose air, then the same arrangement would serve for producing artificial wind to plants, the beneficial effects of which in producing bushiness and strength of stem are well known. The motion thus given would probably be extremely useful for young plants in close damp weather in winter, by preventing some sorts from getting mouldy and damping off, and by moderating the growth, and preventing the etiolation of others. For this purpose the machine might be considered as a kind of hospital, and the plants being in pots, might be set on either the large or small wheels, and kept there in motion for a longer or shorter period, according to circumstances.

1603. A recent innovation in the construction of plant-stoves, consists in the *substitution of fire-heat for that produced by the fermentation of vegetable substances*. This has been done by heating the air of a vault or chamber below the pit, with smoke or steam, either by circulating these fluids in flues or tubes in the chamber; or, by simply filling the vault with them. In some cases also, flues or steam-pipes have been conducted through the tan with a view to prolong its heat. The mode by heating an air-chamber below the pit, was carried into execution by us so long ago as 1804, at Glenfuir (*Tr. on Hot-h.* p. 249.); and more recently upon a larger scale, for the purpose of growing pines at Underley Park (*Tr. on Country Res.* p. 295. pl. 11. *fig.* 3.) A plan very similar to the last has been adopted by W. Kent (*Hort. Trans.* ii. 389, and iii. 287.) who at first plunged the pots in a bed of sawdust over the vault, thinking thereby to avoid the worms and insects that generate in decaying tan. He found, however, that when the sawdust became rotten, worms generated in it as freely as in any thing else, and has therefore given up the practice of plunging altogether, setting the pots on a thin layer of coarse sand placed over the pavement, which forms the roof of the hot-air chamber. Thus situated, the plants are not apt to run through the bottoms, and over the tops of the pots, as is the case when they are plunged, which always occasions a serious check to the plants, whenever they are removed or require to be shifted. After above a year's trial, he says, " I think I can with certainty pronounce that plunging is not only unnecessary, but really worse than useless to plants, except where they have been injured and require to be drawn."

A very obvious extension of this principle was the disuse of bottom-heat altogether, and the substitution of a platform of brick or pavement, or merely a bed of scoria or gravel for the bark-pit. This has been done extensively by Messrs. Loddiges, W. Kent, the Compte de Vande, and various others, with perfect success as far as respects large plants; but most stove-plants require to be originated and brought forward till they are one or two feet high in bottom-heat. By keeping up a considerable atmospheric temperature, and by frequent waterings over the leaves, that sort of moist heat is produced which seems most congenial to vegetation, and it may, we think, be assumed as experimentally proved, that where such heat is produced in plant-stoves the bark-pit is unnecessary for all general purposes. " If we reflect for a moment," says W. Kent, " that in tropical countries, the stem, branches, and leaves receive a greater degree of heat from the atmosphere than the roots can possibly do; it appears extraordinary that a system of management so directly opposite to nature, should have ever been adopted, or that it should have been so long practised. If a quantity of earth was to be raised from the root of any tropical shrub, growing in its native situation, there is no doubt its heat would be below the temperature of the air, therefore the roots of the plants in a stove ought not, at any rate, to receive more warmth than their other parts." *Hort. Trans.* iii. 288.

1604. *A Propagation-House* is a requisite appendage wherever a general collection of exotic plants are maintained; and the proper situation for it is in the reserve-garden. Such a house, like the houses used by nurserymen, does not require to be so light as fruiting or flowering-houses; it may be little more than a large pit with the roof very flat (say from 12° to 15°), in order that all the plants may be near the glass; it should contain a bark-pit, raised to within eighteen inches of the glass in front, and 2½ feet behind, a broad stone shelf in front, and two or more shelves in the back of the house, close under the roof, that is, over the path and flue. All shelves in hot-houses, it may be observed, whether of stone or timber, ought to have narrow ledgments along their edges, not less than an inch deep, by which the water which escapes through the bottoms of the pots is not only prevented from dropping, but retained to generate a salutary coolness and moisture. The fire-place should be formed at one end of the front, (say the south-east corner,) and the flue conducted along the front from about nine inches or a foot from the parapet, and so along the opposite end and back wall, till it terminates at the extremity of the latter, or the north-east corner. The door may be formed in the back part of the end in which the furnace is placed, and the path which surrounds the pit, should be made sufficiently low to admit of head room. This plan may in some cases be doubled; that is, a similar arrangement of flues, &c. may be erected alongside the other, that is, the north side, with a moveable boarded partition between them. The house fronting the north may be used for striking cuttings, or raising seedlings, and that fronting the south, for nursing the plants so raised, till they are fit for removal to the principal green-houses and stoves. The partition is made to remove, in order to exclude or admit the sun's rays to the back house in spring or autumn at pleasure.

1605. We have already stated that we consider *steam the best vehicle for heating hot-houses* of every kind, especially where there are several connected together. Thus where all the hot-houses of a residence are connected with the mansion, both the latter and the former, with drying rooms, hot water or vapour-baths, steaming apparatus for horse-food, poultry-houses (under particular circumstances), and various other appendages might be heated as well as the hot-houses. The spare steam might be employed as the first power to machinery, to raise water, to drive a mangle, &c. and a gas apparatus might be added, to admit of lighting up the whole. H. Repton has given a plan well adapted for this purpose (*fig.* 424.). At one end of this design an aviary (1) is surrounded by a conservatory (2), and joined to a glass passage for flowers (3), which leads successively through an orangery (4), lobby (5), music-room (6), library (7), print and picture-room (8), breakfast-room (9), anti-room (10), dining-room (11), hall (12), and peach and green-house (13). The whole length of this range is three hundred feet.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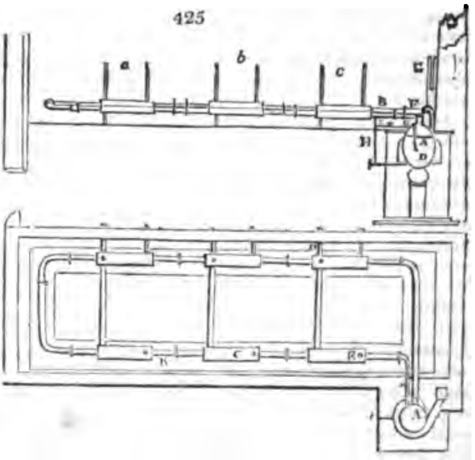
Even single stoves or green-houses may be more agreeably heated in this way than by smoke-flues, which are very generally attended by a bad smell, and vapours of carbonic acid and hydrogen. A very neat example of this kind (*fig.* 425.) is given by J. Hayward, (*Hort. Trans.* iv. 434.) " It is erected in a small conservatory, the boiler (A) contains about thirty gallons, and the pipes (B, B,) are three inches in diameter, and so laid as to have thick planks resting on props (*a*, *b*, *c*,) placed over them, to form the path-way round the house. Chambers are formed round the pipes, communicating with the external air, by surrounding them with larger pipes (C, C,); and by means of small pipes (D, D,) as much heated fresh air can be admitted into the house through different apertures (E, E,) as can be wished." By laying the pipes with a declination of a few inches from their departure from the boiler till their return to it, the water of condensation is returned through a valve (D), which is a very considerable advantage; but this valve is much better placed in a close box outside the boiler, (an improvement made by W. and D. Bailey), as it thereby admits of examining it with ease when out of repair. The air-cock (F), safety-valve (G), steam-gage (H), and water-gage in Hayward's boiler, do not differ from the usual construction.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The mode here described of admitting heated air, we would observe, must be used with very great caution, for we know experimentally, that no mode is more liable to overheat the atmosphere of the house when the fire or steam is brisk in the beginning of the night, and overcool it when the fire declines towards the morning. We have the same objection to " *Walker's Improved Construction of Hot-house Flues,*" as described (*Hort. Trans.* iv. 237.) by A. Seton, Esq. Here a cast-iron flue is enclosed in one of masonry, and the vacuity between them communicates with the open air at the stock-hole, and with the air of the house at certain distances, by means of apertures in the top of the flue. The argument in favor of this arrangement, is that usually given for vacuities around furnaces connected with flues, as adopted by Stewart, Gould, and various others, (*Tr.on Hot-houses*, p. 132.) viz. that "the current of external air, by commencing, when cold, at that part of the flue which is hottest, takes up the heat there where it is least wanted, and carries it to those parts at a distance from the furnace where it is most needed; and as the valves are to be chiefly opened in the latter situations, to permit its escape, it diffuses a nearly equal warmth over the whole house." Every thing in this plan evidently depends on the management of these valves; if they are left open during the night, the risk above stated is incurred; if during day, less heat being wanted, little advantage is obtained. In stoves, however, this plan, under judicious management, might be useful; but it must never be forgotten, that air can be rendered much hotter by a fire-flue than by a steam-pipe, and hence the danger to the plants. No one was ever more sanguine as to the advantages to be derived from furnace vacuities and air-flues than ourselves, (see *Tr. on Hot.-houses*); but after nearly twenty years' experience, we must acknowledge that they are soliable to produce accidents, either by admitting smoke or *burning up the plants* (as the phrase is), that we now seldom recommend their adoption.

Various Pits and Hot-Beds will be required in the reserve-department of the flower-garden, for forcing shrubs and flowers, raising annuals, &c.; the construction of which having nothing peculiar, need not be here detailed. (See 626.)

1606. The idea of *Cold-Houses* seems to have been first suggested by Sir W. Chambers, (*Dissert. on Orn. Gard.* p. 90.) and it may be worth while to submit some ideas on their construction for such amateurs in this country as may be curious in the cultivation of *musci, jungermanniæ*, and other cryptogamous vegetables which grow in the lowest temperatures; and for botanists in warm climates, who may wish to cultivate not only mosses, but the more perfect plants of elevated regions or northern climates; as for example, of the British or Swedish alpines in Spain, or in the south of Italy.

The simplest form of a *cold-house* may be a vault of rustic masonry, along the floor of which a rill of water may pass, and from every part of the ceiling water may drop on the floor or bed, and descend to the rill in the centre. This is an obvious imitation of the dripping caves sometimes found in tracts of country abounding with calcareous rocks, of which, as an example, we may cite the dripping rock at Knaresborough, and the dripping cave near Rousseau's walk at Lyons; in which last on the 19th day of June 1819, we found the thermometer at 48°, whilst in the open air, under the shade of an adjoining mulberry-tree, it stood at 72°. Various mosses and jungermanniæ were in luxuriant vegetation in the interior of the cave; and some sorts of ferns near its mouth.

Another imitation of such caves might consist of an open grove of elms or oaks, among the lower branches of which lead pipes pierced with small holes, in Loddige's manner (701.), might be fixed horizontally at regular distances, and these being supplied, during the warmer months, with water from a proper reservoir, would furnish a continual shower, which, with the assistance of the small rills furnished by the collected rain thus produced, would lower the temperature of the atmosphere sufficiently for the growth of such mosses and ferns as do not require much light; and the margin of the grove might be devoted to plants of a more perfect kind, requiring a low temperature and moist atmosphere.

But a more perfect plan would be to form a house like a large pit, with a double glass roof, fronting the north. Over the outer roof should be a system of pierced pipes to keep it cool by a continual shower during sunset, and at the top of the back wall an arrangement whereby two or more separate and concentric coverings of canvass could be let down to exclude the sun during the day. Instead of flues of masonry, large tubes of lead or cast-iron should surround the house, to be kept cool by a continual stream of water passing through them. The pit might contain a large covered metallic cistern, filled with ice, to be renewed when thawed, &c. It would be advancing too far into the regions of speculation to particularise other minor details that would be requisite to render such a house complete; let it suffice to say, that such houses might be erected either in Britain or the south of Europe, so as to produce a temperature of 32 degrees throughout the year. This would admit the cultivation, in pots and on pieces of rock, of lichens, mosses, and of all the more perfect plants which grow in the regions of perpetual snow.

CHAP. VI.

Of the general Culture and Management of the Flower-Garden and Shrubbery.

1607. The cultivation of the flower-garden is simple compared with that of the kitchen-garden, both from its limited extent and the general sameness of its products;

but to manage it to perfection requires a degree of nicety and constant attention beyond any other open-air department of gardening. As the stalks of flowering plants shoot up, they generally require thinning, and props for support; and the blossom, both of plants and shrubs, no sooner expands than it begins to wither, and must be cut off, unless, as in some of the ornamental shrubs, they are left for the sake of the beauty of their fruit. Weeding, watering, stirring the soil, cutting off stems which have done flowering, attending to grass and gravel, must go hand-in-hand with these operations.

1608. With respect to the general culture and manuring of the *soil*, it should be subjected, as far as practicable, to the same process of trenching to different depths as that of the kitchen-garden. In the shrubbery this cannot be done, but it, and also the earth compartments of the flower-garden, should be turned over a spit in depth, and some vegetable mould, or very rotten cow-dung, added occasionally. Every two or three years the plants in the flower-garden should be taken up and reduced in size, and the beds or borders trenched, say one time at two spits deep, another at three, and so on, (see 1115.), adding enriching compost or manure completely rotted, according to circumstances. If, instead of trenching, the old earth were entirely removed and replaced by good loam from a dry upland parterre, the improvement would be still greater. Most herbaceous plants flower well in such loam, and for the more cultivated sorts, as border pinks, auriculas, &c. that require a rich soil, a portion of enriching matter could be added to each plant as planted, and a corresponding attention paid to such as required peat-earth, sand, clay, or lime. In the shrubbery, a similar renewal of soil, and attention to the soils, required by particular shrub plants, is also required, at least in front, where the more delicate shrubs naturally rank, and where the herbaceous plants are chiefly arranged.

1609. With respect to the *times of planting, or sowing, and manner of cropping* the flower-garden and shrubbery, the greater part of the surface being covered with shrubs or plants of perennial duration, very little cropping is required, and as a substitute for a rotation, recourse must be had to the renewal of the soil as recommended above. Annuals are sown at various periods from February to June; but for the principal shew, generally in March; the half-hardy sorts are raised in hot-beds in the reserve department, and transplanted when they are to flower in April and May, and later sowings and transplantings are made to procure a protracted display. Biennials and perennials of the fibrous or ramose rooted kinds are transplanted from the reserve-department in September or in March; and such bulbous roots as are annually taken up, are generally replanted in November or February. When bulbs and other florists' flowers are cultivated in beds, a rotation may be adopted as far as respects them: thus the hyacinth, tulip, &c. may be succeeded by annuals, and those by the dianthus tribe, or dahlias, &c.; but in borders and compartments planted in the mingled manner, as well as in shrubberies, a rotation is out of the question.

Particular care is requisite to remove weak, ill-conditioned, or ill-flowering plants, and to replace them by others of the same height and color. This may be done at all seasons of the year by the use of the transplanter; but the better mode is to have always an ample stock in the reserve-garden, of all the colors and heights, both of herbaceous plants and low shrubs, (of all the sorts is unnecessary,) in pots, and whenever, when any plant is in flower, a defect appears, it can be remedied at once by turning the plant out of the pot into its situation in the border. Independently of disease or accident, fine shewy species, answering in general color and height, may thus at pleasure be substituted for such as are less shewy, or less to the taste of the master.

1610. Ornamental plants, whether shrubby or herbaceous, require to be *pruned, trained, thinned*, and *dressed*, according to the sort of beauty or effect expected from them. If they are grown chiefly on account of their blossoms, then they must be pruned on the same general principles as fruit-trees; but little more than thinning out weak and crowded shoots will be required where they are grown chiefly on account of the beauty of their foliage; and still less where the tree or bush is planted for the sake of its natural shape. It is customary in some places to apply the hedge-shears to shrubs; but this is a barbarous practice, destructive of all these beauties, which ought to be exploded, unless in cases where, in imitation of the antient style, trees are to be trained in artificial shapes.

Herbaceous plants require little pruning, but nevertheless something in this way may be occasionally required on the same general principles applied to trees. Where very large flowers are wanted, it is obviously advantageous to prevent the plant from expending its vigor in too great a number of them, or in mere shoots and leaves. Top-heavy plants, as some thistles, solidagos, &c. may require to be lightened, and almost all are benefited by thinning out a part of their shoots. In some annuals, thinning is effected both by eradication and pruning, and in the more delicate sorts by pinching off the young shoot, when an inch or two high.

Creepers, climbers, and shrubs planted against walls or trellises, either on account of their rarity, delicacy, or to conceal the object against which they are placed, require different degrees of training; those which attach themselves naturally, as the ivy, merely require to be occasionally guided so as to induce a regular distribution of their shoots; the others must be treated like fruit-trees, training thinly, if blossoms are the object; and rather thicker, if a mass of foliage be what is chiefly wanting.

Hedges and edgings require to be cut and otherwise kept in order by the obvious means. "Edgings of all sorts," Marshall observes, "should be kept in good order, as having a singularly neat effect in the appearance of a garden. The dead edgings will sometimes, and the live edgings often want putting to rights; either cutting, clipping, or making up complete. Where there are no edgings, or but weak ones, let the earth bordering on the walks be kept firm, and now and then worked up by a line in moist weather, beating it smooth with a spade." *Introd. 57.*

1611. Grass-plats require to be regularly mown at least once a fortnight, and where extraneous plants, of broad-leaved kinds, make their appearance, as plantagos, crowfoots, &c. they must be carefully removed. Worms should be gathered by hand before sunrise, and their casts swept off with the wire-besom (616.) Rolling and watering must be applied according to circumstances, and nothing neglected to ensure that deep green color and velvet texture which is, or ought to be, the characteristic of the British lawn, and which indeed is the pride of our island.

1612. Various tender sorts of plants and shrubs require *protection* by one or other of the different utensils, structures, or contrivances (620. and 625.) destined for that purpose. Alpine plants require protection from cold, by covering with snow, or by hand-glasses or frames during winter, and from heat, by screens to produce shade during summer. The roots of many sorts require to be protected by ashes, rotten tan, or litter, from frost, and the tops of others, both shrubs and plants, to be guarded by fronds of fern, fir-branches, mats, or portable glass-cases, from rain, hail, and cutting winds. Great care must be taken to protect pots of plants from frost, by always keeping them plunged in earth or some non-conductor; for no state in which a plant can be placed is so obnoxious to the baneful influence of congelation as that of being grown in a pot. Climbing plants require to be supported by poles or rods, as some sorts of honeysuckle, bignonia, aristolochia, &c.; by props, as pyramidal bell-flower, lobelia fulgens, &c. or by branches or spray, as the nasturtium and pea tribe. Much of the beauty of the flower-garden depends on the manner in which these operations are performed. The prevalent error consists in over-doing the thing, in employing too stout and too long rods or props, and too many thick tufty branches, instead of such as are free grown and open. Watering must be liberally applied to almost every part of the flower-garden during summer, and in the evening; it increases the progress, and enlarges the parts of all vegetables; gives a fresh appearance to the soil as well as the plants, disperses their odours in the surrounding atmosphere, and tends to subdue various kinds of insects.

1613. *Water*, whether as an ornamental feature, or as an aquarium, should be kept clear both of weeds and insects. Of aquatic weeds the most troublesome in small aquariums are the confervæ and byssi, which can only be removed by hand, or by entangling them with a rake or broom. The larvæ of numerous land-insects are deposited in water or in the muddy sides of ponds and ditches, as the elephant-hawk-moth, *Sphinx Elpenor*, L. (*fig.* 426.), the dragon-fly (*Libellula*, L.), and many others. Of the aquatic kinds are the well known tipulæ, of which some species, *T. oleracea*, (*fig.* 427.) glide over the water, and are by many considered rather ornamental than otherwise, and others live entirely under it, and feed on the roots of plants. To destroy, or at least greatly to keep under all aquatic insects, an effectual mode is to dry the pond for a day or two; but in the case of an aquarium it cannot be done; fish and frogs, their natural enemies, must therefore be encouraged, in order that they may attack them.

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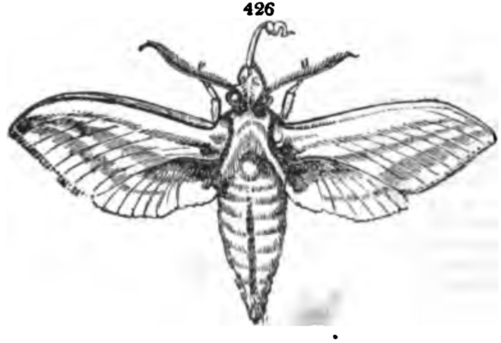
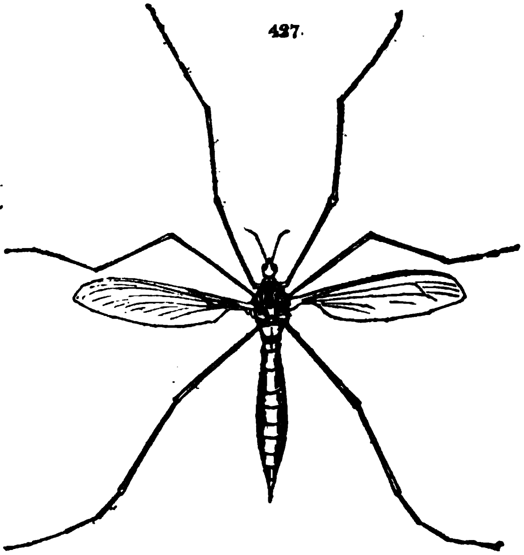


1614. *Insects and Vermin*. These must be kept under in every part of the flower-garden and shrubbery, and we perfectly agree with the author of the *Florist's Manual*, that "the simple and laborious mode of picking away the animal, is the only one to which



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recourse can be had with permanent advantage. To give full efficacy to this method of rescuing plants from caterpillars, snails, &c. our attacks must be made upon them at particular seasons, which can only be done from such a knowledge of their history, as shall enable us to have swarms of them destroyed, in the destruction of an individual of the species. Without, however, much research into their natural history we may, from common observation, understand that in the winged insect we may free our plants from an innumerable tribe of those which crawl, and which, in that reptile state, have the capacity of devouring the whole product of a garden. The two periods of change of form in the caterpillar species seem to afford the most advantageous times to put an end to their existence. Thus, the ephemeral butterfly; if timely attended to, we may destroy the animal before it has acquired the power of disseminating its young progeny; and, in the intermediate and voracious state of caterpillar, every single one which is prevented attaining the winged form, preserves our flowers from a host of enemies. The green-caterpillar is the most common foe to our flower borders, and in autumn attacks the branches of mignonette in such numbers as to afford an easy opportunity of their destruction. A more persevering enemy, and more difficult to exterminate from gardens, is the snail, (*Helix*), and slug, (*Limax*), which, forming their habitations under the soil, attack the roots of flowers, and frequently destroy them before the gardener can be aware of the mischief, that too often becomes visible only when past reparation. Under a vigilant eye, however, plants will not twice suffer, from the enemy not being ostensible; as the symptoms of his vicinity may be marked by flowers perishing as they first emerge from their buds or bulbs, by leaves or petals being pierced in small holes, or having the appearance of being gnawed in growth, or from almost any failure in vigor which cannot be accounted for by external causes.

" In cold and dry weather the snail rarely appears, but after warm showers it may generally be found; early in the morning, and about the close of evening, are the usual times of their coming abroad, when they may be picked up in large quantities. They will, however, frequently molest a plant for a length of time without being visible, in which case, when there is reason to suspect their hidden attacks, the only method to entrap them is to place a common garden-pot over the infested root, and it will rarely occur that the enemy is not discovered, as snails fasten themselves to the sides or tops of pots, boards, or mats, or cabbage leaves, so placed, and thence are easily taken. In droughty seasons it will be of use to water the plant before it is covered, as the moisture of the earth will be an additional motive of attraction to draw the animal from his hiding-place.

" The smaller insects which infest rose-trees, and some herbaceous plants, can only be kept within moderate bounds by sweeping them from the branches, or by cutting off those whereon they are found in most profusion. In carrying off these diminutive enemies, birds are peculiarly serviceable.

" Insects generally attack those plants which are least vigorous, and the reason of their selection of such leaves as are beginning to decay may be, that in their declining state they have usually a peculiar sweetness, probably perhaps owing to some saccharine juices which are preparing for the nutriment of the bulb or bud which is forming in their bosoms, for the nascent vegetable derives its sustenance from the recrements of the one from which it takes its birth." *Hor. Man. 25. et seq.*

The cultivated bee is an insect which the gardener will of course take care not to destroy on account of its use; and it may be a question whether some species of the butterfly, moth, dragon fly, &c. should be destroyed on account of their beauty.

1615. Some species of these genera are highly beautiful, as the four-blotched dragon-fly (*Libellula quadrimaculata*, L.), and the swallow-tailed butterfly, (*Papilio Machaon*, L., *fig.* 428.), which is reckoned the most superb of the British species. It is very local, but occurs near Bristol, Beverley, and in the New Forest. The larvæ feed on umbelliferous plants; the caterpillar is green, banded with black, marked by a row of red spots. It changes into the chrysalis state in July; and the perfect insect is found in August. There are two broods, the first appears in May, having been in the pupa state all the winter, and the other in August from the pupa of July. *Samouelle.*

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1616. *The Cutting off flower-stalks, decaying flowers, leaves,* &c. is to be done in most cases immediately after the flowers are faded; but there are exceptions where the leaves on the lower part of flower-stems may be requisite to strengthen the root, and where, as in the case of stipa, some convallarias, eringos, &c. the parts of the flower are persisting, or the fruit, or seed pods, are objects of beauty. The leaves of bulbous-rooted plants, and such others as are not prolific in foliage, should be carefully preserved till they have begun to decay; and, indeed, the base or root-leaves of no plant whatever should be cut off till this is the case, unless for some particular object. Every single flower, as soon as the petals begin to droop, should be pinched off, and especially every flower of the double kind. Every rose, when it begins to droop, should be clipt off near to the footstalk of the one which is about to succeed it; and when the last of the corymb has done flowering, then the common footstalk should be cut off back to the first strong leaf-bud: nothing is more unsightly in a flower-garden than rose-bushes where this has not been attended to. By employing women or apprentices to go over the whole pleasure-ground every morning during the four summer months, to attend to this business, it may be completely accomplished at very little expense. These and other points of management, we know, are considered needless niceties by many gardeners: but what is a flower-garden unless it is kept with the utmost nicety? Others will tell you, they have not time for such things; but where there is a real taste for neatness, time will be found. "No gentleman," Sir G. Mackenzie observes, (*Caled. Hort. Mem.* iv. 194.) "ought to keep a gardener who does not understand that there is time enough for every thing, provided that time is not wasted, but properly regulated, and nothing too long delayed."

1617. *Gathering Flowers.* Gather, if possible, only from the reserve-garden; for if the main borders and compartments are managed as they ought to be, much gathering will disfigure the plants. Always use the knife, and prefer such as are coming into flower, rather than such as are fully expanded. If possible, gather from crowded plants, or parts of plants, so that every gathering may operate at the same time, as a judicious pruning and thinning. Flowers may be preserved when gathered, by inserting their ends in water, moist earth, or moss; and may be freshened, when withered, by sprinkling with water, and putting them in a close vessel, as under a bell-glass, hand-glass, flower-pot, or in a botanic box; if this will not do, sprinkle them with warm water, and if this fails, insert their ends in water heated to 80° or 90°, and cover them with a glass.

Grafting, Budding, Laying, &c. Operations of this sort require to be performed in the flower-garden and shrubbery, for enlarging, renovating, and otherwise improving shrubs and plants, or introducing new sorts; they are also required for the common purposes of propagation.

Ordering Seeds, Bulbs, and Plants. This business is much simpler, in the flower, than in the kitchen garden. For flower-seeds of most sorts, an order is simply given for *a paper* of a sort; mignonette, lupins, sweetpeas, and a few others, may be ordered by the ounce; bulbous roots are generally ordered by number, either of mixtures or single sorts; and herbaceous plants, shrubs, &c. by name and number, or by the hundred or dozen in mixture. See the priced catalogue of any nursery-man.

1618. *Neatness* has been already a good deal insisted on in different parts of this work. We repeat, it is the dress and visage of gardening, and if necessary anywhere, is more especially so in the flower-garden. A gardener who pretends to manage a flower-garden without the most vigilant attention to this point, at all times is, unworthy the charge. The first thing is to have a quick intelligent eye, so as instantly to perceive what is wanting, and the second is to be possessed of that principle of activity which immediately sets about supplying the want. Many gardeners have certain times for *cleaning up*, &c. and will go fifty times past a weed, stone, dead leaf, or some such article, which disfigures or injures a scene, without removing it, merely because the time for cleaning, &c. has not come. This is most abominably formal conduct, deserving the severest reprobation. A gardener ought to have his eye, his head, his heart, his hand, his knife, and apron, ready for action at all times, places, and seasons, when within the precincts of his charge. Let him drown this incessant care in his own way when he is without his scene of business, or in the hours of rest and refreshment; and let him not undertake it without adequate terms of remuneration. (See 1071 & 1139.)

Chap. VII.

General Culture and Management of the Ornamental or Botanic Hot-houses.

1619. We shall first offer some remarks common to all the structures of this class, and next quote some directions applicable to the management of the frames, green-house, and stove.

Soil for Beds or Borders. The first operation of the gardener, after a conservatory or stove is finished, is to fill up the beds and borders with prepared earth. These being narrow, should seldom be less than three feet in depth, the bottom should generally be paved, and sloping to a drain or drains; and in cases of very dry soils, provision may be made for the roots extending themselves beyond the area of the house.

In general, however, this is not desirable in stoves, as the roots might be chilled during severe frosts; but provision may be made for their extension under the paths, and every other part of the area of the house. When a variety of plants and trees are to be grown in such pits, no soil can be fixed on that will suit them all; but if the main body be a sandy loam, then, as each particular tree is planted, a few cubic feet of this loam may be removed, and replaced by the soil best suited to the plant. The plant once established, be it what species it may, will not languish in a sandy loam, other circumstances being favorable.

1620. *Choice of Species and Planting.* The species of stove or green-house plants must depend on the sort of house, and a variety of circumstances which need not be entered into. For common purposes choose the showy flowering, easily cultivated, and vigorous growing genera, as geranium, camellia, fuchsia, jasminum, &c.; or evergreens, as the myrtæ, proteaceæ, &c. choosing (from the tables in chap. x.) some plants of the principal colors to flower in every month. In planting broad central beds in a house, glass on all sides, the highest-growing kinds will be placed along the middle of the bed; but where there is a wall to the north, the highest kinds will be placed next it. With respect to arrangement, the limited space admits of very little; in general, it will produce the most showy and immediate effect to adopt the common mingled and shrubbery arrangement, which we have recommended (1587.); but as the spectator lingers longer on the pavement of the conservatory or stove, than in the walk of the shrubbery, more prolonged interest will be produced by assembling such plants as belong to one genus, or natural order, by themselves; because this will be to unite what used to be considered the desideratum of taste — *unity and variety;* that is, a general harmony of character in the genus, tribe, or family, and yet, when examined in detail, a distinctive character belonging to each of the individuals which compose it.

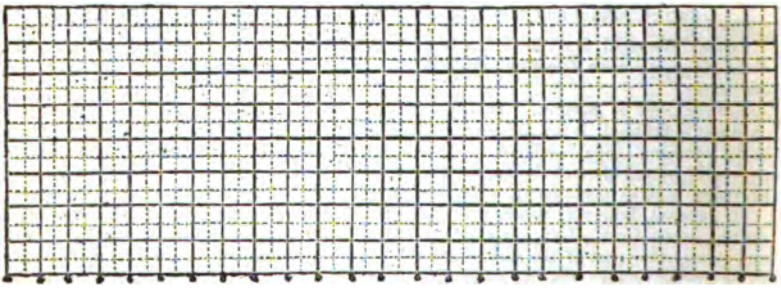
It is a very common practice to plant climbers in such beds and along narrow borders, close to the upright or front glass, to be trained under the roof. We most decidedly disapprove of this plan, in almost every case, as tending to defeat the whole object in erecting such houses. Very luxuriant climbers are thus produced, but it is at the expense of light, not one ray of which, if possible, should be prevented from falling on the plants in the body of the house. Climbers or creepers are highly ornamental, and may be planted in a variety of situations without injuring the other plants:

for example, in the bed, and trained on rods, or up such props as may be necessary to support the roof; or, along the sides of a central walk in a house standing north and south, and trained over the walk on an arcade of rods; or, on a similar arcade over the back path of a single-roofed house, or on the back-wall.

It is a very common thing to see the cobea in green-houses, and the fruit-bearing passion-flowers in stoves, darkening the greater part of the roof, and the plants beneath growing or elongating fast enough, but weak and of an unhealthy languid green. It is only under the broad wooden rafters of old-fashioned hot-houses that any sort of creepers may be trained up the roof without materially injuring the plants below; and even in these cases the injury is considerable, unless they are kept within very narrow bounds. But if creepers are injurious in plant hot-houses, the introduction of vines under the rafters is still worse; for, besides darkening the plants below more than the others with their broader leaves, the incongruity of effect produced by the attempt to unite two opposite characters, is exceedingly disagreeable, and only to be tolerated in humble economical residences, where a green-house, perhaps, is the only glass structure.

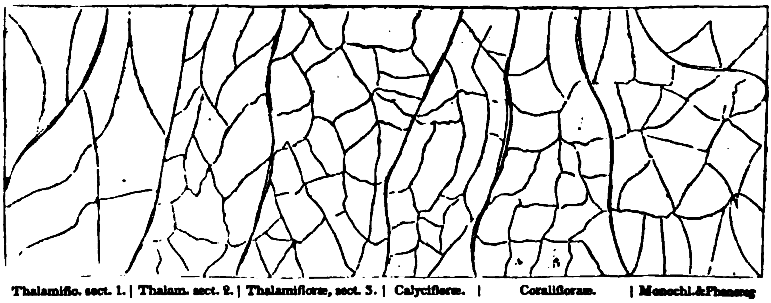
1621. *Arrangement of Plants in Pots.* Where the house and the collection are small, or the plants few and large, the same observations will apply which we have advanced on the subject of planting the beds of conservatories or stoves; but when the houses and collections are extensive, then some plan of arrangement ought to be adopted. Here, as in shrubberies and flower-gardens, there are three modes, by *mingling*, by *grouping*, and by *method*. For general effect the first is the best, but for prolonged enjoyment and examination in detail, the two others are greatly preferable. An abstract view of the modes by mingling and grouping might be represented by lines (*figs.* 429 & 430.),

429



in which, by the mingled mode, the colors are as regularly arranged as chequer-work, while, by the grouping mode (*fig.* 430.), they succeed each other in large irregular masses. By the first mode, there is only one plant of a color by itself; by the second, from half a dozen to three or four dozen, according to the size of the group and the plants.

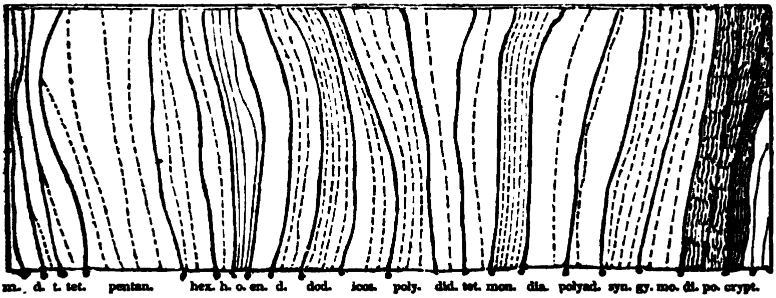
430



By either mode regard must be had to place the plants in gradation according to their size, from the front to the back, or from the lowest to the highest part of the stage, as well to give them every possible advantage as to light, as to present the greatest surface to the eye of the spectator. It is not desirable, however, to dress them so regularly, as that the general slope of verdure shall appear as if shorn or mown, for that both deprives the sides of the plants of a considerable portion of light and air, and the eye of variety of form, and light and shade; it will have a much better effect if somewhat irregular, and if here and there a distinguished individual appear above the rest as a standard.

1622. *In arranging by method or botanically*, either the Linnean or Jussieuean classification may be adopted; the latter is unquestionably preferable, as exhibiting a more perfect relationship; and it may be considered as represented by the same lines as those delineating the mode of grouping by colors (*fig.* 430.) Where the Linnean method is adopted, the classes may either be grouped in irregular roundish masses; or, as the tallest trees and lowest herbs are often placed in the same class, it will answer better to dispose each class and its orders in irregular strips, (*fig.* 431. m. d. t. tet. pentandria, &c.) from the lowest to the highest part of the stage, by which the dwarf plants of each class may be placed in front, and the taller farthest back.

431



The botanic arrangements, it has been already observed, are only adapted for extensive collections and capacious hot-houses; on a smaller scale the mingled method, or that by grouping, will be most advantageously adopted. In the case of green-houses attached to living rooms, and where there are reserve-houses to keep up a supply, only such plants as are in bloom should be introduced, and there the method by grouping the colors may be adopted with great effect. But whatever be the size of the house, or even the extent of a bed, or shelf, or any part of them, never let the plants be placed there in the present indiscriminate mode. In this, no regard is paid to any thing but height; or if any farther object is taken into consideration, it is to mix the kinds as much as possible, with a view, as is alleged, to produce variety. But the effect of this mixture, whether on a large or small scale, instead of variety, is sameness or monotony, which lessens interest, and finally produces indifference in the spectator. It is true, there is as great a degree of sameness in the mingled mode; but then it is the sameness of a formal and avowed regularity; whereas, the sameness resulting from the common mode of mixture, is the sameness of affectation, — a sameness resulting from an abortive attempt at something not attained. The one mode may be compared to the geometrical manner of laying out grounds, and the other to the mode by clumps and belts; both are alike artificial, but the former is avowedly so, and therefore has attained its end, while the latter affects to be an imitation of nature, and therefore disappoints. A safe rule for every gardener to adopt, whether in setting pots of plants on a shelf or a stage, however small either may be, and however limited the collection, is to keep each genus together, placing the tallest plants farthest from the eye. Sometimes this will form a thin, straggling group from the front of the shelf or stage to the back, (*fig.* 432. *pelargonium*, *geranium*, and *erodium*,) and at other times, a sub-orbiculate group in the front (*oxalis*,)

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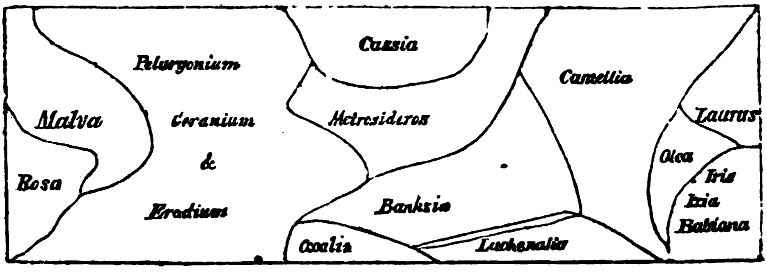

middle (*olea*,) or back parts (*cassia*). This is a very simple rule, easily recollected and applied, and every master and head-gardener who approves of it, ought to insist on its being carried into execution in every case, whether in the open air or in hot-houses, where pots of plants are to be set down together; unless, indeed, it should, in the case of diseased plants, interfere with culture. The effect of this mode may be very well estimated by inspecting the hot-houses, or open air collections of pots in some of the nurseries, and more particularly in Messrs. Loddige's, where this arrangement, both in the extensive green-houses and beds of pots of alpines and other herbaceous plants, is adopted on account of its utility.

1623. After these *general remarks* common to all the plant structures of the ornamental-garden, we shall next select from Sweet, (*Botan. Cult.* 1820.) and Cushing, (*Exotic Gard.* 1814.) some general directions for the culture of the frame, green-house, stove, and reserve hot-houses.

Frame. Very little management is requisite for this department, as the plants kept in cold frames are so hardy, that for seven or nine months of the year the sashes do not require to be put on. All that is requisite is to expose the plants to the air the whole of every day during winter when the weather is open, by drawing off the lights; to attend to watering them moderately, during winter in mild weather in the morning after sunrise, and in summer in the evening. Once a year in spring each plant should be examined, and such changes made in the soil, size of the pot, head of the plant, roots, &c. as the experience of the gardener, the appearance of the plant, or the object desired by cultivating it may dictate. The routine culture of weeding, staking, picking off decayed flowers, leaves, &c. need not be insisted on; and the culture of particular species or even tribes cannot here be entered into. See the *Catalogue of Frame Plants*, in chap. viii.

1624. *Green-house.* The plants of this department, Sweet observes, " only require protection from frost in winter. The more air they have given them when not frosty, the more healthy they will be. On a fine morning, the sooner air is admitted the better; but it is best to shut up pretty early in the afternoon, particularly if likely to be a cold night. No fire is required, except frost is expected in the night, or the house should be damp with continued wet weather; then a little fire is requisite to dry the house, as plants are more liable to be injured by damp than by cold. The plants should be looked over most days to see if any require water, which must only be given when quite dry, in the winter season: from nine to twelve o'clock in the morning is the best time for watering them; for, if watered in the afternoon, they are apt to be chilled at night, which makes their leaves look yellow and unhealthy. When the surface of the mould is green with moss, &c. the top should be taken off, and the surface moved with a flat stick, but not deep enough to disturb the roots; if a little fresh mould is wanting on any of them, it should be added. Always be careful to put the same kind of soil they are already grown in; for a different kind put on injures plants more than some cultivators are aware of.

" When the weather begins to get warm in spring, some air should be left all night to harden the plants before they are set out; a little must be left at first, and continue to increase it every night till they have full air, if the weather will allow of it. The time of setting them out in the open air depends entirely on the weather. Sometimes they may be put out with safety by the middle of May, in other seasons not till the latter end; but they had better stay in a little too long than be put out too soon. Calm cloudy weather is the best time for setting them out, when as sheltered a situation as possible should be chosen for them. The best time for shifting them in fresh pots is early in spring: some shift them before they are set out, and let them make fresh roots while in the green-house, which is a very good plan, particularly for young or tender plants. If any plants are too tall, and want cutting back, it should be done early in spring, as soon as they begin to grow; then they have time to recover themselves, and make good bushy plants by autumn.

" Cuttings require to be put in at various seasons, and in different situations. From Christmas to May may be considered the best time for cuttings in general; but some will require to be put in at various seasons throughout the year, according to the state of the shoots. The best time for watering greenhouse plants in summer, is as late as possible in the afternoon, then they have all the night to refresh them. If watered in the morning of a warm day, they will dry again almost immediately. Plants should not remain out too long in autumn, as they are liable to get too much wet, and the worms get in the pots. The middle of September should be the latest, but give them full air as long as the weather will permit." *Bot. Cultivator*, 121.

1625. *Stove.* " The management of stove-plants," according to the same author, whose experience and success are exceeded by none in the cultivation of exotics, " depends a great deal on the kind of house in which they are grown; but there is little difficulty in growing them well, if the house can be kept up to a proper heat, and a sufficient quantity of air can be given when required. Close glazing is to be preferred; either the lights should be leaded, or the laps stopped with putty, so that a sufficient quantity of air may be always given, and the house kept to a more regular heat. When the laps of the glass are left open, a great deal of air is admitted, which is often injurious, particularly on a cold, windy night. The thermometer should never be allowed to be below 60° of Fahrenheit's scale; if it gets above 70° on a fine day, a little air may be given, which should be taken away early, and the house shut up warm; it then requires less fire to keep up the heat through the night. If the house is heated in the common way by flues, and the plants are plunged in tan, care must be taken not to give these too much bottom-heat, as it will injure their roots, or too much water in winter, as it is apt to rot them. Particular caution is necessary for watering in winter, not to wet the tan, as it makes the worms very troublesome; they often destroy young plants by throwing the mould out of the pots; but a better way is the one now very generally adopted, viz. to do without plunging in tan. Some hot dung or tan may be still kept in the pit to throw up a little warmth, on which should be put a good thickness of sand or gravel for the pots to stand on, and the plants will thrive much better than when plunged in tan: it is also coming nearer to nature, which should be always studied in the cultivation of plants, both in soil and situation. In tropical countries it is the sun that heats the earth in which the plants grow, not the earth that heats the air; and the heat must be kept up in the stoves accordingly. If the houses are heated by steam, no tan is required. The plants may be set on stages, or any way that is most convenient. Some of them may be planted out in the house, where they will grow in greater perfection, and flower and ripen fruit better than when confined in pots.

" To have plants look well, they should be always kept clean and free from insects: if infested with any species of aphis, the house should be smoked with tobacco, which instantly destroys them. The red spiders are likewise a great pest to cultivators, but are also easily destroyed. One pound of sulphur vivum, mixed up in a pail of quicklime, and the flues brushed all over with it as a common whitewash, will destroy any quantity of them, and make the house look light and clean. The mealy bug is also troublesome if left to increase on the plants; but as soon as they appear they should be brushed off as well as the scaly insects; for, if left to increase, they will disfigure the plants, and be very difficult to get rid of. In fine weather the plants should be often sprinkled over with water from an engine, and the house shut up warm afterwards, which is a great means of keeping them clean and making them grow luxuriantly. Air should be given in the morning as early as possible, in fine weather, as it sweetens the house, and makes the plants healthy. It should also be taken away early in the afternoon, and the house shut up warm, that they may not be chilled by the night air.

" In potting plants, care should be taken to drain the pots well with broken potsherds or rough bits of turf; for nothing injures them more than letting them get sodden with too much wet. The best time to shift them in fresh pots is the spring, but some will require to be shifted again in autumn, to have them thrive well. The free-growing kinds cannot be well overpotted if there be plenty of room for them in the houses: they will thrive and flower better for being in large pots. Others that are more tender should be kept in as small pots as possible, that they may not get sodden, and lose their roots." *Bot. Cultivator*, 1.

1626. The *Reserve Hot-houses* of the *Ornamental Garden* may be divided into those for forcing hardy flowering plants and shrubs, and those for propagating exotics by seeds, cuttings, or otherwise.

Herbaceous Plants and Flowering Shrubs are generally forced in pits or low-houses; and as soon as the flower-buds begin to expand, removed to the green-house or drawing-room, there to prolong the flowering season. The shrubs should be previously established in the pots, by being planted and plunged in the open reserve-garden a year before hand: the autumn before forcing, they should be thrown early into a state of rest, by covering them with canvass frames to exclude rain and sun, but so as to admit cold and air. This operation should be commenced in July; and the first course of pots may be removed to the pit in November or earlier. Herbaceous plants of most sorts, especially of the fibrous-rooted kinds, may be taken up with balls, and planted in pots early in the autumn preceding the winter in which they are to be forced. Fusiform-rooted sorts earlier, as they do not rise so easily with balls; and the bulbous sorts, the bulbs being out of ground, may be planted in the end of autumn, plunged in the open ground, and covered with rotten tan or ashes, and taken up as wanted. It is of some consequence to remark, that the flowers should be pinched off, both the shrubs and herbaceous plants, the summer preceding the forcing season, in order to communicate additional strength, and aid in throwing them more early into a state of rest. The bottom heat may either be from tan or dung, or a vault heated by flues or steam; but the former we consider as most to be depended on. The temperature of the air of the house may at first setting-in the plants be kept at 50° or 55°; and in a fortnight, raised 10 degrees higher. After that, it may be kept up to 65° or higher, admitting air during sun-shine. The temperature of the pit should be kept as high as that of the air. Successional supplies should be kept for the first fortnight in a cooler house, or in the coolest part of the pit; or the temperature, on their admission, may be somewhat lowered. The other points of routine culture need not be entered into.

The *Propagation-House* requires to be kept at a much more moderate temperature both as to the atmosphere and the bottom heat than the forcing-pit or the principal stove. It need seldom exceed 60° in winter, and 65° in summer. Abundance of air must be given at certain seasons when damp and mouldiness begin to appear, and shading and watering, so as to produce a moist atmosphere, must be attended to in the summer season.

Chap. VIII.

Floricultural Catalogue. — Herbaceous Plants.

Having treated generally of the culture and management of the flower-garden and shrubbery, our next step is, to give a detailed view of the culture of the leading plants, shrubs, and trees, which enter into their composition. These are so numerous, that we cannot particularize separately the culture of each individual species as in the kitchen-garden catalogue; but, with the exception of some of the more choice sorts, as the florist's flowers, &c., must collect them in groups, and detail a mode of culture applicable to the whole group. We shall first commence with herbaceous flowers, and these we shall arrange as *Florist's, or Select Flowers, Border Flowers,* and herbaceous plants for particular purposes.

Sect. I. *Florists, or Select Flowers.*

The plants of this section are called "florists' flowers," as being "flowers" by way of eminence, and because the principal sorts of them for a long time almost exclusively engaged the attention of the flower-gardener. The Dutch, in this, as in most other departments of gardening, were the first to bring it into notice, and more particularly by the great excellence to which they attained in the culture of florists' bulbs. In the culture of that tribe, they still excell; but the fibrous-rooted flowers, as the carnation, auricula, &c.; and the tuberous-rooted kinds, as the dahlia, pœony, &c. are brought to a higher degree of perfection in Britain than any where else.

Ornamental flowers, like culinary vegetables, which have been long and highly cultivated, acquire a magnitude, succulence, and conformation of parts which render them widely different from what they are in their natural state. This takes place both in double-flowers, that is, when the petals of the corolla are increased in number, or by the transformation of other parts of the flower into petals; and also in single flowers, or those in which the petals do not exceed the common number. A flower so changed by cultivation, can no more be compared to the blossom of the same species in its wild state, than a headed cabbage or a broccoli can be compared to the wild cabbage of our sea-shores. Hence have been formed, by the common consent of florists, what are called canons of criticism, by which to estimate the properties of new varieties of established sorts of florists' flowers. To the hyacinth, tulip, auricula, and a few other sorts, particular canons are adapted; but the merits of a number of other select flowers, double and single, are only to be judged of by general rules, such as fulness of floral leaves, roundness of outline, brilliancy of color, &c. Under each species we shall give the established criterion, or canon, as far as generally agreed on.

We shall take the plants of this section in the order of bulbous, tuberous, ramose, and fibrous rooted flowers.

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Subsect. 1. The *Hyacinth.* — *Hyacinthus Orientalis,* L. (*Bot. Mag.* 937.); *Hex. Monog.* L.; and *Asphodeleæ,* B. P.; *Jacinte,* Fr.; *Hyacinthe,* Ger.; and *Giacinto,* Ital. (*fig.* 433.)

1627. The bulb of this plant is tunicated, the leaves broad and green, from the centre of which arises a scape, with a spike of flowers, pointing in all directions, and by which it is known, at first sight, from *Hyacinthus nonscriptus*, L.; (*Scilla nonscripta*, W.) in which the scape is drooping, and the flowers all turned to one side. It is a native of the Levant, and abundant about Aleppo and Bagdat, where it flowers in February; here it flowers in March and April. It was cultivated by Gerarde in 1596; but had, doubtless, long before been improved by the Dutch, who have added greatly to the strength and beauty of the plant, and produced almost innumerable varieties.

Varieties. Gerarde mentions the single and double blue, the purple, and the white. Parkinson, in 1629, enumerates eight sorts. Miller says, the Haerlem gardeners distinguish near 2000 sorts, and generally publish catalogues of them from year to year. At present, the taste for this flower being considerably abated, the Dutch and English catalogues contain only a few hundred sorts. Mason's Catalogue for 1820, contains three hundred sorts with names. These names are quite arbitrary, being given by the grower after himself or some public character; and therefore they are here omitted. They are arranged as double-blues, whites, reds, and yellows, and single sorts of the same colors; the blues and reds are the most numerous; the yellow, those of which there is least variety.

Only single hyacinths were, at first, cultivated; but about the beginning of the last century, attention was paid to double-flowers by Peter Voerhelm, whose first double-flower was named *Mary*, and is now lost; but his third flower, *the King of Great Britain*, which is now looked upon as the oldest double-hyacinth, was greatly preferred to all the flowers known, and the price of it was then above 1000 florins or 100*l.* sterling. Up to the middle of last century, the greatest attention was paid at Haerlem to raising new sorts of double-flowers; and as much as 200*l.* has been known to be given for a root; but since that period, the taste for this and other bulbous flowers has considerably declined, and at present there are few sorts for which more than 10*l.* are asked, the general price being from one to ten shillings a bulb for the varied sorts, and what are called the common mixtures, are sold at from 2*l.* to 3*l.* a hundred. A variety degenerates, under bad treatment, in two or three years; but in Holland some have been preserved nearly a century.

Criterion of a fine Double-Hyacinth (*fig.* 44. *a.*) "The stem should be strong, tall, and erect, supporting numerous large bells, each suspended by a short and strong peduncle, or foot-stalk, in a horizontal position, so that the whole may have a compact, pyramidal form, with the crown, or uppermost flower, perfectly erect. The flowers should be large, and perfectly double, *i. e.* well filled with broad bold petals, appearing to the eye rather convex than flat or hollow; they should occupy about one-half the length of the stem. The colors should be clear and bright, whether plain, red, white, or blue, or variously intermixed and diversified in the eye; the latter, it must be confessed, gives additional lustre and elegance to this beautiful flower. Strong bright colors are, in general, preferred to such as are pale."

Propagation. By seed for new varieties; and by off-set bulbs for continuing approved sorts.

By Seed. "The seed should be saved from such sorts as have strong and straight stems, and a regular well-formed pyramid of bells, not perfectly single, but rather semi-double. It should not be gathered till it has become perfectly black and ripe, at which time the pericarpium will appear yellow on the outside, and will begin to open. The stem, with which the seed is connected, is then to be cut off, and placed in a dry, airy, cool situation, where it may remain undisturbed till the time of sowing, which is the latter end of October, or beginning of March: it should then be sown about half an inch below the surface of the soil, in a deep box, filled with good sound garden mould, mixed with sand, or the hyacinth compost, which should be afterwards placed in a warm situation during winter. It will never require to be watered, or have any other attention paid to it than to keep it free from weeds and frost, till it has remained in this state two years; it must then, on the approach of winter, have an additional stratum of the compost placed upon it, about half an inch thick; and at the third year, in the month of July, the roots may be taken up, dried, and treated in the same manner as large bulbs or off-sets: some of the roots will flower the fourth year, one-half of them will at the fifth, but by the sixth year, every healthy root will exhibit its bloom, and then the hopes and expectations of the cultivator will be realised or disappointed. He may think himself fortunate, if one-half of the plants that first appeared, are in existence at this period; and if he can at last find one flower in five hundred deserving a name or place in a curious collection, he may rest perfectly content, and be assured that he has fared as well as could reasonably be expected, and better than many who have bestowed equal attention on the subject. *Maddock.*

By Off-sets. These may be planted in the beginning of October, or soon after they have been separated from the parent bulbs. Plant them "in an open part of the garden, in rows about two inches deep, upon a bed raised six or eight inches above the common level, consisting of a sandy soil, pulverized, eighteen inches deep; the surface of the bed should be made rather convex or rounding, so as to throw off heavy rains; no further attention is necessary, except to stir the surface of the bed occasionally, keep it free from weeds, and preserve it from very severe frost. The proper time to take them up is the same as for large roots.

" Off-sets, if preserved in health, will bloom weakly the second year: but by the third, tolerably strong, and may afterwarde be placed on the best bed.

Choice of full-grown Roots. " Such roots as have attained the age of four or five years, bloom stronger in this country than any other; they afterwards gradually decline, either by dividing into off-sets, or diminishing in size and strength; but in Holland, owing to the peculiar circumstances of the soil, climate, situation, &c. the same bulb has been known to produce blossom twelve or thirteen times, nor is it ever known to die merely with age."

Soil and Site. " The bed on which they are to be planted should be situated in rather a dry and airy part of the garden; a southern aspect is to be preferred, sheltered on the north and east. When the situation is determined on, the dimensions of the bed should be marked out, and the soil entirely taken away to the depth of at least two feet; the earth in the bottom must then be dug up and pulverized, one spit or nine inches deeper, and the space above filled up with a compost consisting of one-third coarse sea or river sand; one-third fresh sound earth; one-fourth rotten cow-dung, at least two years old; and earth of decayed leaves for the remainder. These ingredients are to be well-mixed and incorporated, and about a fortnight previous to planting, the bed should be filled up with the compost to about four inches above the level of the path on the south or front side, and ten inches on the north side, so as to form a regular slope or inclination towards the sun."

In St. Simon's work, entitled, *Des Jacintes*, (Amst. 1768, 4to.) in which the Dutch mode of cultivating the hyacinth is fully detailed, the compost used at Haerlam, is said to be rotten cow-dung, rotten leaves, and fine sand. The leaves of elm, lime, and birch are preferred to those of oak, chestnut, walnut, beech, plane, &c. which do not rot so quickly. The cow-dung is collected in winter from cattle, stall-fed upon dry food, without any mixture of straw or other litter. The leaves, when decayed and fit for use, are thus mixed with the other materials: "first, they place a layer of sand, then one of dung, and then one of rotten leaves, each being eight or ten inches thick. These layers are repeated till the heap is six or seven feet high, a layer of dung being uppermost, sprinkled over with a little sand to prevent the too powerful action of the sun upon it. After the heap has lain thus for six months or more, it is mixed, and thrown up afresh, in which state it remains some weeks to settle before it is carried into the flower-beds. This compost retains its qualities about six or seven years; but the Dutch avoid setting hyacinths in it two years successively; in the alternate years they plant tulips, jonquils, narcissuses, crocuses, irises, &c. in the same beds; nor do they venture to set hyacinths in the compost the first season, when the fresh manure might be injurious to them." *Herbert in Hort. Trans.* iv. 165.

Planting. This should take place " from the middle of October to the middle of November; if it is done earlier the plants will appear above ground in the middle of winter; or if it is deferred later, the roots will be weakened by their natural tendency to vegetate. On planting the roots, the surface of the bed should be covered with a little fresh sandy earth, about one inch thick, raked perfectly smooth and even, and have the exact situation for every bulb marked upon it, (*fig.* 434.) regularly mingling the colors of red, blue and white; the yellows being classed with the latter. The width of the surface of the bed may be four feet, and six rows may be placed across it at eight inches asunder, the two outside rows being each four inches from the sides of the bed; consequently the space between the centre of each bulb will be about nine inches and a quarter. On planting hyacinths, a little clean sand should be placed underneath, and likewise upon the roots, to prevent the earth adhering too closely to them; the whole are then to be covered with sound fresh sandy earth, from three to four inches deep, according to the size of the bulb; when this is completed, the bed will be about eight inches above the level of the walk on the south or front side, and about

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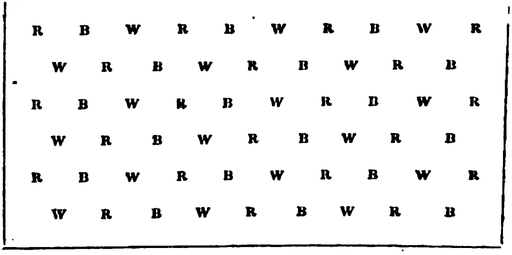

fourteen inches on the north; it will look neater and have a better effect, if it is supported on each side with a strong frame of thick boards or brick-work.

Culture. "In order to preserve it from very heavy rains or severe frosts, it should be hooped over, and mats or canvas should be placed at hand ready to cover the bed on such emergencies; but it will not be necessary to defend it from moderate rains or slight frosts: for too frequent and long covering will deprive the roots of the due action and influence of the air, which ought to be avoided as much as possible: it were even better to run the hazard of incurring a slight injury by the omission of covering on some occasions, than overdo it to the certain detriment of the plants. If frost is permitted to penetrate so far into the soil as to reach the bulbs, especially about the time that the plants begin to appear above ground, it will produce a singular effect, by causing some of them to shoot forth or discharge their stems and blossoms; but if the roots become entirely frozen through, they are in danger of being destroyed. The earlier sorts will begin to open and shew color about the beginning of April; it will be proper to screen such from the too powerful effects of the sun, which, if not prevented, would bleach and tarnish their colors, particularly the reds and deep blues; but if they are properly defended from it, their colors will be preserved, and they will, in some measure, be kept back, so as to be in full bloom with the later sorts, especially if the roots of the early sorts have been planted about an inch deeper than the rest: it is a very desirable object to have an uniform bloom. It will be necessary to support the stems as they advance in height; for this purpose, small sticks or wires, painted green, should be forced into the ground, immediately behind the bulbs, either in an erect position or leaning a little backwards, to which the stems are to be rather loosely tied with small pieces of green worsted, as soon as they begin to bend, or are in danger of breaking with the weight of the corolla or bells: this operation must be repeated as they advance in height, for it is impossible to do it at one time so as to answer the purpose. When the greater part of the bed appears in color, a covering, or awning, should be erected over it, and the path in front: the awning should consist of a strong frame of wood, ten feet high in the centre, and seven feet at the sides, covered with Irish or Scotch-sheeting, or Russia-duck, which will effectually keep out rain, and admit a great degree of light; it should come down close to the bed on the north side, in order to preserve it from cold winds, which are prejudicial to the bloom. The covering (*fig.* 435.) should be so constructed, by means of lines (*a*) and pullies, (*b*) as to be easily and expeditiously rolled up, or let down, as occasion requires, to afford the plants the full benefit of light and air, at all favorable opportunities, that is to say, when the air is mild, and light clouds intervene, so as to blunt the sun's ray. This sometimes, and, indeed, often happens to be the case from seven to nine o'clock in the morning, and from four to six in the evening, at which time the sun has also less power than in the middle of the day. A bed of hyacinths never requires to be watered at any period; the rains that happen after planting are generally more than sufficient both for the roots and the bloom; and after the bloom is over they are rather prejudicial than otherwise, except when very moderate. Although covering in the manner described presents and exhibits the bloom to the greatest advantage, yet it evidently has a tendency to weaken and injure the bulbs, and ought not, therefore, to be continued more than two or three weeks at most; but as soon as the general bloom declines, the bed should be immediately exposed to the open air, and the mats and hoops should be replaced, as before, to keep off heavy rains."

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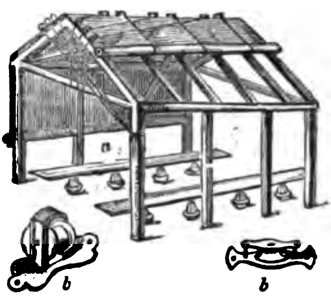

Taking up the Bulbs. "It is the practice in Holland, to take up the bulbs about three weeks or a month after bloom, in the following manner: as soon as the plants begin to put on a yellowish decayed appearance, they take up the roots and cut off the stem and foliage close to, or within half an inch of, the bulb, but leave the fibres, &c. attached to it; they then place the bulbs again on the same bed sideways, with their points towards the north, and cover them about half an inch deep, with dry earth or sand, in the form of a ridge, or little cone, over each: in this state they remain about three weeks longer, and dry or ripen gradually; during which, as much air is admitted as possible, but the bed is preserved from heavy rains, and too hot a sun; at the expiration of this period the bulbs are taken up, and their fibres, which are become nearly dry, gently rubbed off; they are then placed in a dry room for a few days, and are afterwards cleaned from any soil that adheres to them, their loose skins taken off, with such offsets as may be easily separated. When this dressing is finished, the bulbs are wrapped up in separate pieces of paper, or buried in dry sand, where they remain till the return of the season for planting. Another, and less troublesome, mode of treatment after bloom, though perhaps more hazardous, is to keep the bed airy, and rather dry, till the stems and foliage appear nearly dried up or consumed; this will seldom happen to be the case in less than two months; the bulbs are then to be taken up, cleaned from the fibres, soil, &c. and preserved in sand or papers as beforediected."

Herbert says, "The bulbs should be placed in an airy store-room, and not suffered to touch each other; a moveable stage of open lattice-work, furnished with drawers, may be used, and the utmost attention should be paid to ventilation." A French florist, M. P. Baudry, is said (*Caled. Hort. Mem.* iv., 76.) to have lost annually a number of his hyacinth bulbs through dampness until he adopted the expedient of placing them in the store-room with the base of the bulb upwards. Drawers of lattice-work would effect the same object.

Diseases. "Hyacinths are subject to various diseases, arising from different causes; that distemper commonly known by the appellation of the ring-sickness, is of all others the most dangerous and most difficult to cure; in short, the only effectual remedy is to cut out the diseased part, till no brownness, yellowness, or other symptom of distemper remains. The sound part will survive the operation, if it consist of no more than the outside tunic of the bulb, without any heart; but it will, in such case, only be able to produce offsets, and will never recover itself so as to flower again: as soon as the operation is performed, the wounded part should be exposed to the sun, till it becomes dry, to prevent mouldiness, and it will be best to replant it in some dry situation soon after."

"The Dutch," Herbert observes, "are much troubled with this disease; the cause of which appears to be a fungus, the spawn of which is nurtured in the cow-dung. The only remedy is the removal of the distempered bulb, and the compost that was in contact with it."

Duration of Bulbs. "The hyacinth delights in a sandy soil, and saline atmosphere; of consequence it succeeds best on the sea-coast, or in situations very near to the sea. In more inland parts, it will generally be found necessary to procure an annual reinforcement of fresh-imported bulbs, in order to make good or supply the deficiencies arising from the loss, or impaired health and strength of many of those that have bloomed on the best bed the preceding spring. Those who are well acquainted with the hyacinth, always allow about one bulb in twelve to fail, notwithstanding no visible blemish or decay is discernible at the time of planting; such generally have a *corps de reserve*, in narrow deep pots, which, at the commencement of bloom, they plunge or sink into the bed, wherever a vacancy, or weak sickly plant makes its appearance; by which means the uniformity and regularity of the bed is preserved, without any visible defect or alteration."

Herbert says, "My own experience enables me to say, that any nurseryman in the neighbourhood of London may produce hyacinth bulbs equal, if not superior, to those imported from Holland; though, perhaps, with greater loss from disease, owing to his not being able to procure the dung of cattle fed on hard food, and free from straw." *Hort. Trans.* vol. iv. p. 168.

Forcing the Hyacinth. Plant the roots in narrow deep pots, filled with sandy loam, in October; plunge them in and cover them with old bark-leaves or sand; they will soon throw down roots, and a part may then, say in November, be plunged in bottom-heat, which will come into bloom by Christmas, and successional supplies can be taken from the store planted in October, and a bloom thus kept up till they flower in the open air. The best sorts to force are the single blues and reds.

Blowing Hyacinths in Water-Glasses. Blue or dark-colored glasses are more favorable to the progress of the roots than light ones, light being injurious to all roots. The bulbs to be blown in the glasses should be planted in October, in earth in which they push their fibres more regularly, and taken up as wanted, washed from the earth, and placed in the blowing-glass: the glasses may be kept in a warm room or in a stove. The water should be soft, and the glass so full as that it may rise a fourth of an inch on the bulb. As often as it becomes fetid, it should be renewed.

Subsect. 2. The *Tulip*. — *Tulipa Gesneriana*, L. (*Bot. Mag.* 1135.); *Her. Monog.* L.; and *Liliæ*, J. *Tulipe*, Fr. and Ger.; and *Tulipano*, Ital. (*fig.* 436.)

1628. The bulb of this plant is solid, and sends up an upright stem from twelve to eighteen inches high, with glaucous leaves, and a large erect flower, the petals in its wild state having a black base. It is a native of the Levant. It is common in Syria, and is supposed by some to be the "lily of the field," referred to in Christ's address from the mount; though Sir J. E. Smith thinks the *amaryllis lutea* is there meant. In

Persia, where the tulip is abundant, is considered as the emblem of perfect lovers. "When a young man," says Chardin, "presents one to his mistress, he gives her to understand, by the general color of the flower, that he is on fire with her beauty, and by the black base of it, that his heart is burned to a coal. According to Gesner, the tulip was brought to Europe in 1559. It was cultivated in England by James Garnet, in 1577, having been introduced, according to Hakluyt, from Vienna. Towards the middle of the 17th century, the tulip became the object of considerable trade in the Netherlands; it rose to its greatest height in 1634, and the three following years. According to Beckmann (*History of Inventions*, art. *Tulip*), for one root of a variety called the *Viceroy*, articles to the value of 2500 florins were agreed to be delivered. The *Semper Augustus* has been sold for 2000 florins; one person agreed to give 4600 florins (about 460*l.*), with a new carriage, two horses and complete harness; and another agreed to give twelve acres of land for a single root. The trade was generally followed for a time, but having no foundation in real utility, like the Missisippi and South-Sea schemes, it was a mere gambling business, and rightly named Tulipomania.

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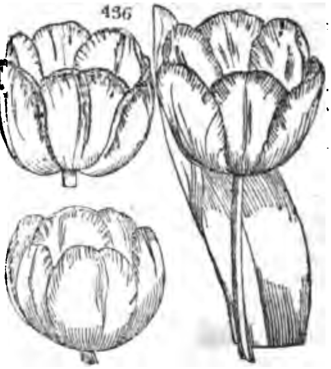

The taste for tulips in England was at its greatest height about the end of the 17th and beginning of the 18th century; about the year 1730 or 40, it had declined and given way to the taste for botany, and new plants from America and other foreign countries. The tulip, however, is still much cultivated both in Holland and England, near large towns, though in the latter country there are now very few good collections in the private gardens of the higher classes. Like the auricula and some other flowers, it is more the flower of the tradesman and operative manufacturer than of the botanist or man of fortune.

Varieties. Parkinson, in 1629, enumerates 140 sorts: but "to tell of all the kinds," he says, "which are the pride of delight, they are so many, and as I may say almost infinite, doth both pass my ability, and, as I believe, the skill of any other." In Parkinson's time, tulips were divided into *præcoces*, or early-blowers, and *serotinæ*, or late-blowers, with an intermediate division of *dubiæ mediæ*, doubtful or middle blowers, which, for the most part, however, belonged to the *serotinæ*. The early-blowers have short stems, and the *duc van tholl* is almost the only variety in repute among modern florists. The great variety in the catalogues is produced from the late blowers, which have tall stems and much richer colors; of these the catalogue of W. Maddocks in 1792 contained the names of 665 sorts. In Mason's catalogue for 1820, are six sorts of early tulips; four of perroquets, or middle-blowers; 22 double-sorts, and upwards of 600 single late-sorts. The Dutch florists class their late blowing-tulips as under: A variety will last an unknown number of years.

Primo Baguets. (*Baguette*, Fr. a rod or wand) very tall; fine cups with white bottoms, well broken with fine brown, and all from the same breeder.

Baguets Rigaut's, (supposed from *Rigaud*, some eminent florist's name), not quite so tall, but with strong stems, and very large well-formed cups, with white bottoms, well broken with fine brown, and all from the same breeder.

Incomparable Verports; very perfect cups, cherry and rose, and white bottoms, well-broken with shining-brown.

Byblomens (with bottoms white, or nearly so, from different breeders; and broken with variety of colors.

Bizarres (*Bizarre*, Fr. odd, irregular); ground yellow, from different breeders, and broken with variety of colors.

The names of the different varieties, classed under these heads, being perfectly arbitrary, and constantly changing, their insertion here could be of no use. See the Annual Catalogues of Bulbous Roots published by the nurserymen and florists. What are called *breeders* are procured from seed, and consist of one plain color on a white or yellow bottom. These being cultivated on a dry and rather poor soil become broken or variegated, and produce new varieties. The time that elapses before they break varies from one to twenty years or more, and sometimes this change never takes place, so that, whoever thinks of raising new varieties of tulips from seed must be possessed of an ample fund of patience and perseverance.

Criterion of a fine variegated late Tulip. "The stem should be strong, elastic, and erect, and about thirty inches above the surface of the bed. The flower should be large, and composed of six petals: these should proceed a little horizontally at first, and then turn upwards, forming almost a perfect cup, with a round bottom, rather widest at the top. The three exterior petals should be rather larger than the three interior ones, and broader at their base: all the petals should have perfectly entire edges, free from notch or serrature; the top of each should be broad and well rounded; the ground-color of the flower, at the bottom of the cup, should be clear white, or yellow and the various rich-colored stripes, which are the principal ornament of a fine tulip, should be regular, bold, and distinct on the margin, and terminate in fine broken points, elegantly feathered or pencilled. The centre of each leaf, or petal, should contain one or more bold blotches, or stripes, intermixed with small portions of the original or breeder-color, abruptly broken into many irregular obtuse points. Some florists are of the opinion that the central stripes, or blotches, do not contribute to the beauty and elegance of the tulip, unless confined to a narrow stripe, exactly down the centre, and that they should be perfectly free from any remains of the original or breeder-color: it is certain that such appear very beautiful and delicate, especially when they have a regular narrow feathering at the edge; but the greatest connoisseurs in this flower unanimously agree, that it denotes superior merit, when the tulip abounds with rich coloring, distributed in a distinct and regular manner throughout the flower, except in the bottom of the cup, which, it cannot be disputed, should be a clear, bright white or yellow, free from stain or tinge, in order to constitute a perfect flower."

Propagation. By seed for new varieties, and by offsets for continuing approved sorts.

By Seed. Select such breeders as have tall strong stems, with large well-formed cups, clear in the bottom, and save seed from these in preference to the finest of the variegated or broken sorts, as the seed of such sorts produces nothing but poor weak breeders of no value. "It should remain growing on the stem till the pericarpium becomes of a brownish color, and begins to open; it is then sufficiently ripe, and should be cut off, with six or eight inches of the stem, and treated afterwards, in all respects, agreeable to the directions given for the management of hyacinth seed. Some of the seedlings will bloom by the fourth or fifth, and most, if not all, by the seventh year."

By Offsets. These should be planted soon after they are separated from the parent bulb, in beds of fresh sandy loam, with a little rotten cow-dung placed from seven to twelve inches below the surface, in a dry, airy situation, from two to four inches deep, according to the size of the roots. The beds should be raised six or eight inches above the alleys, formed rather convex on the surface, and may be provided with hoops and mats, to be used to guard them, as occasion may require, from heavy rains and severe frosts.

Choice of full-grown Bulbs. Select such as have not lost the brown skin, are not mouldy or soft at the root-end, and are full, solid, and rather pointed at the other. Just before planting, strip off the brown skin so as to leave the root perfectly bare and white, performing the operation with great care, to avoid bruising or wounding the root, especially at the lower end, where the fibres are formed, which is, at the season of planting, extremely tender.

Soil and Situation. "The situation for the best bed should be in an open airy part of the garden; when that is fixed upon, the ground should be marked out, agreeable to its intended dimensions, and the soil taken out twenty inches deep; the bottom is then to be filled up with sound fresh earth, ten inches thick, upon which is to be placed a stratum of two year old rotten cow-dung, and earth of the above description, about one-half of each, well-mixed together, twelve inches thick; and again, upon this is to be placed another stratum of the same kind of earth as that of the bottom; this is only to be two inches thick at the sides, and three inches at the middle, which will give it a small degree of convexity; this is to be performed about the 20th of October, *i. e.* a week or two before planting, to give the bed time to settle; at the expiration of two weeks, the earth will have subsided, so as to be about two inches higher than the circumjacent paths; but if heavy rains intervene between this preparation of the bed, and the time of planting, it will be proper to keep them off, in order to preserve the temperature of the earth, as it would be rendered too compact and adhesive, by a redundancy of moisture, for the fibres to pass freely through it, which ought to be avoided"

Hogg recommends a fresh, rich, loamy soil, of rather a sandy nature, which should be dug twelve months at least before it is used, and a small portion of well-rotted dung must be added. He says, an intelligent old tulip-grower assured him, that the best compost he had ever hit on "was three-fourths rich yellow loam; one-fourth leaf-mould; one-sixth two years old horse-dung; and one-eighth sea-sand, well-incorporated, and laid in a bed, or stratum for the plants, two feet deep." *Tr. on the Carnation, Auricula, Tulip,* &c. 142.

Planting. The most proper time is from the end of October to the tenth of November. "On the day made choice of for planting, rake the surface of the bed smooth and even, still preserving its convexity, and mark the exact situation for every root upon it. The proper distance between each root, is seven inches from centre to centre; and if the rows are seven inches asunder, the roots will form squares, of similar diameter, on all parts of the bed. A bed consisting of seven rows, makes the noblest appearance, when it is of sufficient length, with a path round it about two and a half or three feet wide; but where the number of roots is small, five rows may suffice, and the path, in that case, may either extend quite round the bed, or only on one side, at pleasure. If, therefore, the bed consists of seven rows, it should consequently be fifty inches wide, which will allow a space of four inches between the outside rows and the sides of the bed; but if the bed contains only five rows, it will only require to be three feet wide, to give the roots similar distances. Having sprinkled a little clean sand where the roots are to be set, place them with great exactness, and add some very sandy earth, so as to completely envelope each root in a little cone of it; then cover the whole very carefully, with strong, sound, fresh loam, about four inches thick at the middle of the bed, gradually decreasing as it approaches the sides, where it should be about three inches thick; thus will the convexity of the surface be increased in a proper degree, and the roots will be covered with soil, to a depth proportionate to their size and strength; the largest and strongest having been placed in the centre rows, and the smaller and weaker on those of the outside. No tulip-root, whatever may be its size or strength, should be planted more than four inches deep from the upper side of the root; nor should any blooming-root be planted less than two and a half, or three inches deep, however small it may be. The soil made use of for covering the bulbs, should be frequently turned over, and thoroughly exposed to the sun and air, some time before it is made use of, that it may be rendered perfectly sweet, and free from the acrid quality that most soils are subject to, when taken considerably below the surface. But if the bed is only to contain five rows, with a path in the front, and none behind, then it will be proper to plant the smallest and lowest growing roots in the front, next the path, and so gradually to increase in the size of the roots to the fifth or last row, which should contain the strongest and largest of all; when the roots are properly covered with soil, as before-directed, the surface of the bed will slope one way, forming an inclined plane: it will be necessary to support its highest side at least with boards, or brick-work, otherwise the earth would be liable to crumble down, and leave the roots bare, or too shallow."

Future Culture and Management. "When the operation of planting is concluded, the bed may be hooped over, and taken care of, in the manner directed for hyacinths, *i. e.* so as to preserve it from very heavy rains, and severe frosts; but either one or the other, in moderation, will be of more service than injury to it. By the end of February every plant in health will be visible above ground; some tall early sorts will be two or three inches high, others one inch, and the later sorts just making their appearance; indeed, a very few remarkably late sorts may be a week longer before they appear, but not more: if, on examination, any distemper, or canker, is discernible on the foliage, about this time, either above, or an inch or two below the surface of the soil, it should be carefully cut out, with a sharp knife, and the wounded part left exposed to the sun and air, which will presently heal it: a fine dry day should be made choice of for this operation. If the surface of the bed appears to be of toò close and solid a contexture, it should be carefully stirred up, about two inches deep, which will admit the air more freely, and prove, in all respects, very beneficial. By the end of April, some of the plants will probably be grown so tall as to require the hoops to be raised a little, to secure the blossom from injury: attention to this part must not be omitted, for the blossom is very tender and likely to be bruised and disfigured, by a very slight blow, or rub against the hoops. As soon as any of the earlier sorts begin to shew color, they should be shaded from the sun, for, when its heat is considerable, it will cause the colors to run, and intermix, in such a manner as to destroy the elegance and beauty of the flower; some sorts are more particularly liable to this effect than others, and will be spoiled in five minutes. When the greater part of the blossoms have begun to open, a frame, or awning, should be erected over the bed and paths, nearly similar to that for hyacinths (*fig.* 435.): that is to say, so as to keep out rain, and admit as much light as possible; this must be thrown off, or rolled up, at every favorable opportunity, as directed for hyacinths, except that it should be done rather earlier in the morning, and later in the evening; because the sun has acquired a greater degree of power at this season of the year than earlier. If these frequent exposures to the light and air be omitted, the colors of the flowers will be faint and weak, and the grandeur of effect will be lost, or considerably lessened. The cloth-covering should come down on each side, within about three feet of the ground, to allow a free circulation of air, except in windy weather; from the effects of which, the flowers must be most carefully preserved, by a continuation of the covering quite down to the ground, on the windy side; a line of mats sewed together, and their upper edge nailed to the frame on that side, may answer the purpose, if the cloth is not of sufficient length. Tulips never require to be artificially watered, in the hottest and driest seasons, at any period from planting to taking up the roots; nevertheless, moderate rains may always be admitted before, and in very small quantity after the bloom is over; but early in the spring, they are absolutely necessary, in order to procure a strong bloom.

"When the awning is erected, the hoops should be carefully taken away, the sides and ends of the bed should be neatly boarded up, and the paths lowered two or three inches, to bring the flowers nearer to the eye: a slight frame, about two feet high, should surround the bed, to prevent the garments of spectators from rubbing against, or breaking off the flowers; lines of small twine, painted green, and corresponding with the rows of flowers, should pass from one head of the bed to the other, fastened to the end pieces of the frame, and stretched tight; to these the stems of the flowers are to be loosely tied with short pieces of green worsted, which will preserve a pleasing regularity of appearance, without stiffness and formality. Tulips will bear to be covered a longer time in bloom than most other flowers, without sustaining any considerable injury: it may be continued three weeks with great safety.

" If any roots should perish, or fail to produce bloom, the deficiency may be made good by transplanting, with the tube transplanter, (*fig.* 17.) from a reserve bed, or the lower end of the stems of flowers, taken from the reserve-beds, may be immersed in phials, filled with water, and sunk into the bed, so as not to appear above ground; these will continue in bloom several days, without requiring to be changed, and will make a tolerable appearance. About a week or ten days after full bloom, when the petals of many begin to drop off, the awning should be taken down, together with the frame, boards, &c. that surround the bed; and the mats and hoops may be replaced as before, to throw off excess of rain, as the case may require: and as the leaves or petals of any fall, the seed vessel of such should be immediately broken off close to the stem; for if suffered to remain on the plant, it will procrastinate the period of its maturity, and weaken the root considerably.

" The bed may remain in this state about a fortnight longer, by which time the grass, or foliage, will become of a yellowish brown, and two or three inches of the top of the stem will wither, dry up, and become purplish: this denotes the critical period to take up the roots, because if done earlier, they will be weak and spongy, and if deferred later, their juices will become gross; this will be manifest at the succeeding bloom, by too great a redundance of colorific matter in the petals, and the flowers be what is generally termed foul."

Taking up the Roots. Dig them up carefully, and place them under cover, in a dry, airy, shaded situation. Here they may remain untouched till August or September following. " Then it is proper to take off their loose skins, fibres, and such offsets as are easily separated; observing not to leave the roots too bare, because the action of the air upon such, would have a tendency to weaken and injure them, by drying up part of their juices; the last brown skin, which is so intimately connected with the root, should remain on it till the time of planting."

Diseases. The tulip is hardier, and less liable to disease and injury from weather, than most sorts of flowers; it is sometimes attacked by grubs and wire-worms at the root early in spring, and then the best mode is to remove the plant and a portion of the soil, replacing the former from the reserve or offset-buds.

Forcing the Tulip in pots or *water-glasses.* The early dwarf sorts are well-adapted for this purpose, especially the *Duc Van Tholl.* They may be treated as in forcing the hyacinth.

Subsect. 3. The *Ranunculus.* — *Ranunculus Asiaticus,* L.; (*Mill. Ic.* 2. t. 216.); *Poly. Polyg.* L.; and *Ranunculaceæ,* J. *Renoncule,* Fr.; *Ranunkel,* Ger.; and *Ranuncolo,* Ital. (*fig.* 436.)

1629. From a fasciculus of small tubers are sent up several bipartite leaves, and an erect branched stem with a terminating flower variously colored. It is a native of the Levant, and was cultivated by Gerarde in 1596. Though rather a tender plant, innumerable and highly beautiful double-flowered varieties have been raised from seed, chiefly by the English florists, from the middle to the latter end of last century.

Varieties. Only double ranunculuses are held in esteem: of these, Parkinson, in 1629, enumerates eight; and Ray, in 1665, twenty sorts. Justice, in 1764, divides ranunculuses into Turkey and Persian; of the former he enumerates eighteen sorts, and of the latter a hundred. What he calls the Turkey ranunculus, is only a variety or sub-species with a very dark flower, which Miller also considered as a species, and named it *R. sanguineus.* Maddock, in 1792, had upwards of eight hundred sorts. Mason's catalogue for 1820 contains about four hundred names. " There are more varieties of ranunculuses," Maddock observes, " than of any other flower;" but as their names are arbitrary, it would be of little use to enumerate them here. A variety will last from twenty to twenty-five years.

Criterion of a fine Double Ranunculus. (*fig.* 437. *a*) " The stem should be strong, straight, and from eight to twelve inches high, supporting a large well-formed blossom, or corolla, at least two inches in diameter, consisting of numerous petals, the largest at the outside, and gradually diminishing in size as they approach the centre of the flower, which should be well filled up with them.

" The blossom should be of a hemispherical form; its component petals should be imbricated in such a manner as neither to be too close and compact, nor too widely

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separated; but have rather more of a perpendicular than horizontal direction, to display their colours with better effect.

"The petals should be broad, and have perfectly entire, well-rounded edges: their colors should be dark, clear, rich, or brilliant, either consisting of one color throughout, or be otherwise variously diversified, on an ash, white, sulphur, or fire-colored ground, or regularly striped, spotted, or mottled in an elegant manner."

Propagation. By seed, for new varieties, and by off-set tubers, or dividing the tubers for continuing approved.sorts.

By Seed. The seed of the ranunculus, Maddock observes, in no instance ever produces two flowers alike, or the same as the original. It should be saved from such semi-double flowers as have tall strong stems, a considerable number of large well-formed petals, and rich good colors, chiefly preferring the darker, but not to the exclusion of the lighter colored, when their properties answer the foregoing description.

"The seed should remain on the plant till it has lost its verdure, and becomes brown and dry; it may then be cut off, and spread abroad upon paper in the seed-room, exposed to the sun, that every degree of humidity may be exhaled from it; in which state it should be put into a bag, and preserved in a warm dry place.

"January is the proper time to sow the seed, and in order to prepare it, it must be separated from the stalks to which it is connected, in the following manner, viz. in the first place, it should be taken out of the bag, and spread thin upon a sheet of paper or tea-tray, &c. and placed before a moderate fire, till it is just warm, and no more; the seed will then easily scrape off, by means of a pen-knife; but great care must be taken to avoid scraping it off in lumps, or suffering any pieces of the stalk, dried petals of the flower, or other extraneous matter to be mixed with it, which would create a mouldiness when sown, of very destructive consequence: when the seed is scraped in a proper manner, it will have much of the appearance of clean coarse bran, with a little brown or purple speck in the centre of each cuticle, which is the kernel.

"When the seed is thus prepared, it should be sown in a shallow frame, provided with sashes; the soil should have been previously taken out, three feet deep, and spread thin upon the ground, till it has been perfectly frozen throughout, in order to destroy any vermin it may have contained, more particularly the common earth-worms.

"When the pit is filled up again, with the frozen lumps of earth, it should remain till the whole mass has thawed, and subsided to its pristine bulk, or nearly so; its surface should then be made perfectly smooth and even, and the seed sown upon it with the utmost regularity, in such quantity as nearly to cover it; the glasses should be placed over it immediately, and the frame kept closely covered with them, for two or three days, till the seed begins to swell and soften; a little light earth should then be sifted upon it, through a fine sieve, but not sufficient to cover it; this should be repeated once or twice a week, till the greater part of the seed disappears: it is proper to remark in this place, that such seeds as happen to be covered deeper than the thickness of a half-crown piece, will never vegetate, and must of course, inevitably perish.

"It is necessary to keep the seed moderately moist, by gentle waterings with soft water, that has been exposed to the sun till it is a little warmed; the rose of the watering pot should be hemispherical, and perforated with a great number of very small holes, that will discharge fine streams of water, in a very distinct and regular manner.

"About the time that the plants begin to make their appearance, it is proper to stir the surface of the earth with a pin, or silver bodkin, just sufficiently to admit air, and give liberty to the young plants to pass easily through; this operation should be very carefully performed, to prevent breaking off the fibres, or raising and leaving any of the plants out of the earth, because one hour's sun upon such would inevitably destroy them. When the sun shines very hot, it is necessary to admit some fresh air under the glasses, and shade the frame with mats; but it should be close shut up with the glasses when the air is cold, and always at night.

"After the plants are all up, and their two interior leaves appear, more air must be given, by having hurdles, or lattice-work substituted for the glasses; waterings must be regularly continued, in the manner before described, when the long continuance of dry weather renders it necessary: but fine warm showers of rain are always preferable, when they happen in due time. This kind of management is to be continued till the roots are matured, and fit to take up, which is known by the foliage becoming perfectly brown, dry, and nearly consumed.

"The speediest and safest method of taking up these small roots is to pare off the earth, three inches deep, with a trowel or shovel, having previously carefully picked off the dried leaves, and any other extraneous matter that may be found upon it. The earth and roots, thus collected, are to be thrown into a fine brass-wire sieve, that will not permit the smallest roots to pass through it; the sieve is then to be worked in a large vessel or tub, nearly filled with water; the earthy part will, in consequence, be dissolved and washed away, and the roots will remain in the sieve, where, by a little management, they may be easily separated from the stones, &c. which are mixed with them. The upper rim of the sieve must, at all times, be held above the surface of the water, otherwise some of the smallest roots will be lost, as they are frequently found floating on the surface, till they have imbibed a sufficient quantity of water to make them sink. The roots are to be dried and preserved, and are to be planted at the latter end of October, or beginning of November; the greater part, or such as have two or more claws, will blow strong the following summer."

The Rev. W. Williamson sows half his seed in autumn, and the other half in January, in the open air. He prefers the autumnal sowing, if the winter proves mild.

By Offsets. Unlike the offsets of the hyacinth and tulip, those of the ranunculus generally attain perfection in the season of their formation on the parent plant, and are therefore fit to be planted as full-grown tubers the same season in which they are removed. Smaller ones, which are unfit to bloom the following year, may be planted in a bed prepared as to be directed for the full sized roots.

By dividing the Tubers. "In minutely examining the crown of a ranunculus root, several small protuberances will be found; from each of which a shoot will arise, and the root may therefore be divided by a sharp knife into as many parts as there are protuberances; and thus the danger of losing any rare variety is much diminished. These sections will not bloom till the second year." *Hort. Trans.* iv. 380.

Choice of full-grown Roots. Select such as are sound and full in every part, and have plump and prominent buds.

Soil and Situation. According to Maddock, a fresh, strong, rich, loamy soil is preferable to all others. Hogg recommends fresh loam, with a considerable portion of rotten horse, or cow dung. The Rev. W. Williamson (*Hort. Trans.* iv. 375.), uses a stiff clayey loam with a fourth part of rotten dung. The situation should be open, but not exposed to violent winds or currents of air. "The bed should be dug from eighteen inches to two feet deep, and not raised more than four inches above the level of the walks, to preserve the moisture more effectually: at about five inches below the surface should be placed a stratum of two-year old rotten cow dung, mixed with earth, six or eight inches thick; but the earth above this stratum, where the roots are to be planted, should be perfectly free from dung, which would prove injurious, rather than of benefit, if too near them. The fibres will draw sufficient nourishment from it at the depth above-mentioned; but if the dung was placed deeper, it would not receive so much advantage from the action of the air, which is an object of consequence."

Planting. "This may be done either before or after winter: if the soil and situation is remarkably cold and wet, it will be better to defer planting till the middle or end of January or beginning of February, as the weather may favor; but, in other situations, the latter end of October or beginning of November is to be preferred, as the roots will have more time to vegetate, and form themselves, and will in consequence bloom rather stronger, though only a few days earlier than those later planted."

"A bed, consisting of the variety called the scarlet turbaned ranunculus, will produce a most brilliant effect; if planted at the same time as the tulip bed, they will bloom together; they are hardier than any other ranunculuses, but may, in other respects, be treated in the same manner."

"The surface of the bed should be raked perfectly even and flat, and the roots planted in rows, at the distance of about five inches from each other. It is better to plant in shallow trenches, made nearly two inches deep, than to make holes for the reception of the roots: there should be a little clean coarse sand sprinkled into the trench, and the roots should be placed with their claws downwards, from three to four inches asunder, according to their size: when the trench has received its roots, it should be carefully filled up level with the same earth that was taken out, so as to cover the root exactly one inch and a half deep, which is the only true depth to procure a good bloom: it is pointed out, by nature in a singular manner; for when these roots have been planted too shallow or too deep, in either case, a second root is formed at the proper depth, by which the plant is weakened to such a degree that it seldom survives a repetition of it."

Williamson plants in spring, but never after the tenth of February; and he frequently plants the roots in the same place for several years successively. *Hort. Tran.* iv. 376.

Future Culture and Management. "Ranunculus roots will remain several days in the ground after planting, before they begin to vegetate; during this period, they become very much swelled, by imbibing the moisture of the soil, and are, in this state, extremely susceptible of injury from frost, much more so than when vegetation has actually taken place. As soon as the bed is planted, a sufficient quantity of barley or oat straw should be placed near it, ready for a covering: in case of frost, it may perhaps be necessary, during a very severe winter, to cover the bed in this manner, ten or fifteen inches thick; but the straw should be taken off at all favorable times: for the effects of covering too much, or too long, are as destructive as the reverse, especially before the roots have begun to vegetate, because they are then more liable to become mouldy than at any other period, than which nothing can be more prejudicial. Early in the spring, when the plants make their appearance above ground, so as to render the rows easily discernible, the surface of the earth between each row, should be trodden or beaten, so as to make it firm and compact; and if the soil is compressed with the fingers, quite close to the plants, it will keep out cold drying winds, and prove beneficial. It is advisable to make choice of a fine dry day, soon after rain, whilst the ground is still moist, to perform the above operation: when it is finished, a little long straw should be placed between each row, to preserve the surface of the soil cool and moist, till the foliage of the plants is sufficiently grown and expanded, to afford it shade without further assistance.

"April showers, and frequent rains in May, are essentially necessary to the growth and vigour of the plants: if these fail, soft water must be administered in sufficient quantity between the rows, by means of a common watering-pot, with a long tube or spout, held low, so as not to wash the earth into holes; for it is better to avoid watering the plants themselves, as it may chill them too much, and stagnate their juices. The consequences of omitting to water when necessary, are these, viz. the plants will make little progress; the blossom buds of the stronges twill be small, and the weaker plants will not bloom at all; the grass, or foliage, will put on a sickly, yellowish appearance, from which it will never recover during the season; and, lastly, the roots will, when taken up, be small and lean.

"But such kind of waterings, however necessary, are by no means so salutary to these, or any other flowers, as fine warm, natural showers; they can neither be so equally dispensed, nor are the plants naturally disposed to receive them when the atmosphere is dry, because their pores and fibres are contracted, and they are, as it were, in the expectation of dry weather.

"Since it is evident that artificial waterings are, in all respects, so much inferior to natural, it is therefore better to wait a day or two, in hopes of a change of weather, than to be too hasty in watering, although the plants may appear to suffer for the moment, by the omission; for if such a change should fortunately take place, they will receive infinitely more benefit from it than when both themselves and the soil are already saturated, or replenished, with moisture.

"The weather in May is sometimes very clear and hot; the plants ought to be shaded at such times by means of lofty hoops and mats, or some better contrivance, that will admit light and air freely; a frame and covering, similar to that for hyacinths, would answer best, if expence and trouble were not to be considered: it will, however, be absolutely necessary to shade them, in some manner, during the period of bloom, otherwise they will continue but a very short time, especially the dark rich coloured sorts; for, in proportion as their colors approach to black, is the injury they will receive from the rays of the sun, if it is permitted to shine upon them in full force; some of the very darkest cannot stand it one hour, without being entirely spoiled. The light coloured sorts will bear the sun's rays much better, reflecting them in proportion as they approach to white; green is the only color that reflects and absorbs the rays of light in equal proportion, and is more predominant in the vegetable kingdom than any other.

"After the bloom is over, watering is no longer necessary, but shading, in the middle of hot days, is still very beneficial to the plants: it tends to prolong their vegetation, and the size and substance of the roots are thereby increased.

Taking up the Roots. "By the end of June, or soon after, the greater part of the plants will appear brown and dry: vegetation has then ceased, and it is the exact time to take up the roots, because if they are suffered to remain in the ground till rainy weather ensues, they will begin to shoot afresh, and thereby sustain considerable injury. When the roots are taken up, their stems, &c. should be cut off close, and they should be placed in a shady airy room, or situation, to dry gradually; but before this is perfectly accomplished, it will be proper to clean and separate them, because, when quite dried, they become very hard and brittle, and there is great danger of breaking off their claws: some may be separated into many complete roots, although they are so closely connected, as, on a superficial observation, to have the appearance of only one large root. Nothing more remains to be done, till the return of the planting season, except to stow the sorts separately in bags, or boxes, for the sake of convenience, in a dry room, in which state it is possible to keep them out of ground for two or three years, without perishing, although it evidently tends to weaken and injure them: there have been instances known of ranunculus roots surviving till the fifth or sixth year; they ere, however, rendered extremely weak, nor could any but very strong roots retain heir vegetative powers for so long a period."

Williamson takes up the roots immediately after the color of the foliage begins to change.

Forcing. The ranunculus may be forced, but loses much of its strength of stem and brilliancy of color.

Subject. 4. The *Anemone.* — *Anemone*, L.; *Poly. Polyg.* L.; and *Ranunculaceæ*, J. *Anemone*, Fr.; *Windblume*, Ger.; and *Anemone*, Ital.

1630. There are two species of this genus cultivated as florists' flowers, under the common name of anemone: the *A. coronaria*, L. or poppy anemone (*Bot. Mag.* 841.); (*fig.* 438. *a*), a native of the Levant, and introduced in 1596; and the *A. hortenses*, the star or broad-leaved anemone (*b*), a native of Italy, and introduced from Holland in 1597. The anemone has been cultivated from as early a period as the tulip and many fine double varieties produced both by the Dutch and British. The single and semi-double flowers, are nearly in as high estimation as the double ones.

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Varieties. These are numerous, but few of them are named. Parkinson in 1629, enumerates thirty sorts of single narrow leaved anemones, and nearly as many double and single of the broad-leaved sort. Mason's catalogue for 1820 contains seventy-five sorts. A variety will last for twelve or fifteen years.

Criterion of a fine Double Anemone. (*fig.* 439.) " The stem should be strong, elastic and erect, not less than nine inches high. The blossom, or corolla, should be at least two inches and a half in diameter, consisting of an exterior row of large substantial well-rounded petals, or guard leaves, at first horizontally extended, and then turning a little upwards, so as to form a broad shallow cup the interior part of which should contain a great number of long small petals, imbricating each other, and rather reverting from the centre of the blossom; there are a great number of small slender stamens, intermixed with these petals, but they are short, and not easily discernible.

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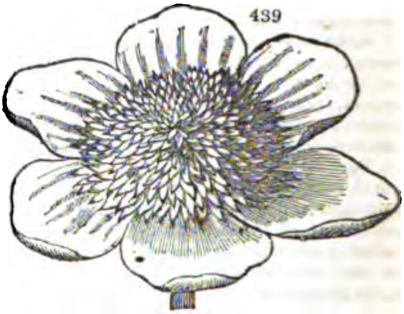

" The colors should be clear and distinct when diversified in the same flower, or brilliant and striking if it consists only of one color, as blue, crimson, or scarlet, &c. in which case, the bottom of the broad exterior petals is generally white; but the beauty and contrast is considerably increased when both the exterior and interior petals are regularly marked with alternate blue and white, or pink and white, &c., stripes which in the broad petals should not extend quite to the margin."

Propagation. By seed for new varieties, and by dividing the root for continuing approved sorts.

By Seed. Select " single or semi-double flowers, that have strong, tall and erect stems, large well-formed cups and petals, of very brilliant colours. The seed must be gathered from time to time as it opens; for, being very downy and light, it will otherwise be blown away by the first breeze of wind, or fall down and be lost: it may be sown at the same time, and be treated in all respects like that of ranunculuses; the seedlings will, like those, blow strong the second year. It will be found very difficult to sow anemone seed in a regular manner: it is united with, and enveloped in a downy substance, that upon being put together in quantity, adheres in such a manner as to render it necessary to make use of some sand or earth to separate it on sowing; nor will this be effected sufficiently without considerable labor in rubbing it for a long time amongst the earth, as it ought not to adhere together in lumps, which would not allow the young plants space enough to form their roots. There will be found but few double flowers amongst the seedlings, nor can it hardly ever be expected there should, if the seed be entirely saved from single ones; of course, the greater number of broad petals the flower of the seed-bearer possesses, so much greater is the probability of procuring large double flowers from the seed of it."

By dividing the Root. When the division is properly made, every piece will blow the first year, and is therefore to be treated in the same way as such as are full grown.

Choice of full-grown Roots. Select fresh plump roots of moderate size; large overgrown roots, which are hollow in the centre, and often decayed; these are to be avoided as they never blow strong.

Soil and Situation, and Preparation of the Bed. The same as for the ranunculus.

Planting and future Culture. The distance between the roots may be the same as for the ranunculus. Attend to place that side of the roots next the soil in which the decayed rudiments of small thread-like fibres will be observed, and cover about two inches deep. "Anemones are hardier than ranunculuses, and, consequently, may be always planted in the autumn with safety; the most advisable time is about the middle of October, by which means they will blow a week or two earlier than the tulips: if they are planted ten days or a fortnight after the tulips, they will all bloom together; but a few days earlier or later in the planting will scarcely be perceptible at the time of flowering: it is, however, proper to observe, that such roots as are planted in October, will blow stronger, and, when taken up, will be found of a larger size than those that are planted towards the end of November, especially if the winter proves mild; but if the winter sets in early, and proves severe, late-planted roots will not have time to vegetate before frosty weather takes place; in which case there will be great danger of their perishing, unless they are covered with straw, just sufficiently to keep frost from the roots, as they are then in a state of inactivity, but replete with moisture, which renders them more susceptible of injury from frost, and, at the same time, in much greater danger of mouldiness than after vegetation has commenced. The covering must therefore be taken off and put on, as often, and in such proportion, as the exigency or circumstance of the case requires." Water and protect from high winds and heavy rains, as directed for ranunculuses.

Taking up the Roots. "Anemones continue longer after bloom in a state of vegetation than ranunculuses, probably because of their greater degree of succulency; and even at the proper time to take them up, it will sometimes happen, that part of their foliage will not be entirely divested of greenness and moisture; this will often be the case when frequent showers of rain intervene, and are admitted between the times of blowing and the maturity of the roots: when it thus happens much skill is required to ascertain the critical period to take up the roots; for if they are suffered to remain in the damp or wet ground a few days too long, they will shoot afresh, and be thereby materially weakened and injured; it is, indeed, better to take them up rather too early, than suffer them to re-vegetate in this manner; but the roots will not be so firm and solid as if done at the exact time. The safest and most effectual method to preserve them from these disagreeable consequences, is to keep off all rains after the bloom is quite over, by means of mats on hoops; the roots will then regularly and gradually mature, and the foliage will, in like manner, become brown and dry, which will point out the true time to take up the roots; and this will usually happen to be about a month after full bloom.

"The whole subsequent treatment of the roots, till the time for planting, is the same as for ranunculuses, with only the following caution, viz. that as the roots are exceedingly brittle, it is necessary to handle them very gently upon dressing or cleaning away their fibres, and the soil that adheres to them; however, should only small pieces break off, such should not be thrown away, as each will, in the course of a few years, become a blooming root, if it has an eye, without which it is of no value; but that seldom happens to be the case." *Maddock.* Anemones may be forced, like the ranunculus, but, as it generally destroys the roots, the finest sorts should not be devoted to this purpose.

SUBSECT. 5. The *Crocus.* — *Crocus,* L.; *Trian. Monog.* L.; and *Irideæ,* B. P. *Safran,* Fr.; *Safran,* Ger.; and *Zaffarano,* Ital.

1631. The bulb is round, solid and compressed with a netted skin, from the centre of which arise four or five grass-like leaves, and one or two flowers. Out of the centre of the tube of the flower arises a slender style, crowned by a broad flat stigma of a gold color. After the flower is past, the germ, which hitherto was seated on the bulb at the base of the tube, pushes out of the ground, and ripens its seeds; a singular economy in nature, and which occurs only in the colchicum, and a few other plants.

All the known species of this genus may be considered as florists' flowers. Many botanists, indeed, consider that there is only two species, the *C. vernus*, or spring-blowing crocus; and the *C. sativus*, the saffron, or autumn crocus.

From the *Crocus vernus*, (*Eng. Bot.* 343. and our *fig.* 440.) they consider that the *C. versicolor* (*fig.* 441.), the *C. biflorus* (*fig.* 442. *a*) the *C. susiana* (*b*) the *C. sulphureus* (*c*), and the *C. mæsiacus* (*d* and *e*), with their numerous sub-varieties, have been produced by culture or locality. From the *Crocus sativus*, or saffron crocus (*Eng. Bot.* 343. and our *fig.* 443. *a*), they think it likely that the *C. serotinus* (*fig.* 443. *b*), and the *C. nudiflorus* (*fig.* 443. *c*), have been also originated by cultivation or accident.

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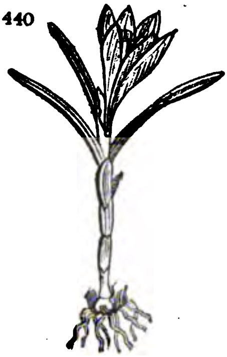

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It is sufficient for our purpose to observe, that all the sorts have been time out of mind, and still are, great ornaments to the garden; the spring sorts coming into flower in February and March, and the autumn sorts in September and October.

The color of the spring crocus in its wild state in Switzerland, is white with a purple base; it is considered as naturalized in England, but when found wild, is almost always of a yellow color. The autumn crocus, or saffron, is also found wild in some places, and considered as naturalized; but it appears to be an African plant, and introduced originally in Edward the Third's time, which its Arabic name, *sahafaran*, seems to justify. Its colour is generally purple or blue, as is that of most of the autumn varieties in cultivation at present.

Varieties. None of these are double. Of the spring crocus, Parkinson has enumerated twenty-seven varieties; the fundamental colours of which are blue, purple, yellow, and white. Miller recites twelve as leading sorts. Mason's catalogue for 1820 mentions " twenty named sorts," besides the light, dark, and striped purple, cloth of gold; the Scotch crocus beautifully striped, the white, the large and small yellow, and several striped sorts. The Dutch are continually producing new varieties, as are some florists in this country, of which Haworth (*Hort. Trans.* i. 122.) may be cited as an instance.

Of the autumn crocus, Parkinson has enumerated four; and Ray, six varieties. Miller has only four: the sweet-smelling, of a deep blue; the mountain, of a paler blue; the many-flowering, bluish; and the small flowering. Most of these varieties are now lost.

Criterion of a good Crocus. Clear or brilliant colors, and each color distinctly marked and finely pencilled in the striped and variegated sorts.

Propagation. By seed, for new varieties; and by off-set bulbs, for common purposes. The latter generally flower the first spring after planting, and are treated in all respects as full-grown roots.

By Seed. The following directions are by Haworth. "The seeds of crocuses are best sown immediately after being gathered, in light, dry earth, in large pots, or pans, or small shallow boxes, with a sufficiency of holes and potsherds at the bottom, for the purpose of draining off with certainty, all superfluous moisture, thinly; for almost every seed will vegetate, and cover not more than half an inch with the mould. The most eligible aspect, or situation, for the seminal boxes, until the autumnal rains set in, is a moderately shady yet unsheltered one; permitting them to receive all the influence of the weather, except such heavy showers as would wash bare the seeds. As soon, however, as the autumnal rains commence, remove the boxes to a warm aspect; and protect them from all excessive rains, frosts, and snows, by the occasional shelter of a garden frame: allowing them, nevertheless, the benefit of the full air at other times, but more especially after the seminal leaf (for they have but one, being monocotyledonous plants), eager to commence the career of life, urges its fine setaceous point above the surface of the earth. This occurs sometimes about the end of the year; but oftener in earliest spring. After this, it is quite essential that they should have complete exposure to the air, even in frosty weather; screening them, however, occasionally, like early radishes, with loose straw, from other injurious effects of frost; so as to prevent their being raised out of their infantile beds by its baneful effects.

"In this manner may the young crocuses be treated until the sun acquires sufficient power to dry the earth in their boxes, so as to require daily waterings. It will be then found advantageous to remove them to a cooler, but not sheltered situation, and here they may remain until their leaves die down; giving them, as just hinted, at all times, and in every situation, while their leaves are growing, such discretional rose-waterings, when the sun is not shining, as they may reasonably appear to require: but never until the earth they grow in becomes dry: nor any whatever, after their leaves begin to look yellow. After this period, it is necessary to defend them from all humidity, except dews and gentle rains, until the end of August, or beginning of September.

"From weeds and from worms, from slugs and snails, it is almost needless to observe, they should constantly be kept as clear as possible. And if the surface of the earth in their boxes is occasionally stirred with the point of a knife, or fine piece of stick, it will never fail to be attended with beneficial effects, and invigorate the bulbs: operating, no doubt, as a sort of hoeing, and like that important practice, (as the writer of this paper conceives,) proving salubrious to vegetables of every denomination, not only by lightening the soil, but by admitting *new accesses* of atmospheric air towards their roots; and thereby facilitating, and stimulating their absorbent inspiration of its oxygen: without a due supply of which all vegetables, as well as animals, eventually become feeble and sick. If, notwithstanding the precaution of thinly sowing the seeds, the plants in any of your seminal boxes should have grown so thickly together, as to have incommoded each other, it will be desirable to have such taken up; and replanted immediately further asunder in fresh earth, and about three quarters of an inch deep. But if they are not too crowded, they will require no shifting this, their first autumn; but merely about a quarter of an inch of fresh mould sifting over them, previously stirring and cleaning the surface of the old from moss and weeds; and observing not to bury the young bulbs, not yet so large as lentils, deeper than three quarters of an inch, or an inch at the most.

"The *second* season requires exactly the same management as the first. But as soon as their second year's foliage has passed away, the roots should all be taken up, and replanted again the same or following day, into fresh earth, of the same kind as before, about an inch deep, and as much apart, and treated as above.

"Nor does the *third* season demand any alteration in their management, sifting over them in autumn half an inch of fresh earth.

"The spring following, if they have been duly attended to, most of them will show flowers (a few, perhaps, having done so the season before) in the midst of their fourth crop of leaves; fully rewarding with the cheering colors of their new faces all the preceding assiduity and care." *Hort. Trans.* i. 125.

Choice of Bulbs. Observe that the base is not mouldy, nor the bud or summit of the bulb decayed.

Soil, Situation, and Culture. They will grow in any common soil, but prefer a loamy sand. October is the best season for planting; the more select varieties are grown in beds like the hyacinth, and the colors mingled in the same manner; the distance from bulb to bulb about three inches. The more ordinary sorts are grown as border-flowers, and form an important part of the early flowers of the front row (*fig.* 402. *a*). They are very hardy, and require no care till the leaves begin to fade, when they should be taken up, and kept in a state of rest for two or three months. Some do not take and the various rich-colored stripes, which are the principal ornament of a fine tulip, should be regular, bold, and distinct on the margin, and terminate in fine broken points, elegantly feathered or pencilled. The centre of each leaf, or petal, should contain one or more bold blotches, or stripes, intermixed with small portions of the original or breeder-color, abruptly broken into many irregular obtuse points. Some florists are of the opinion that the central stripes, or blotches, do not contribute to the beauty and elegance of the tulip, unless confined to a narrow stripe, exactly down the centre, and that they should be perfectly free from any remains of the original or breeder-color: it is certain that such appear very beautiful and delicate, especially when they have a regular narrow feathering at the edge; but the greatest connoisseurs in this flower unanimously agree, that it denotes superior merit, when the tulip abounds with rich coloring, distributed in a distinct and regular manner throughout the flower, except in the bottom of the cup, which, it cannot be disputed, should be a clear, bright white or yellow, free from stain or tinge, in order to constitute a perfect flower."

Propagation. By seed for new varieties, and by offsets for continuing approved sorts.

By Seed. Select such breeders as have tall strong stems, with large well-formed cups, clear in the bottom, and save seed from these in preference to the finest of the variegated or broken sorts, as the seed of such sorts produces nothing but poor weak breeders of no value. "It should remain growing on the stem till the pericarpium becomes of a brownish color, and begins to open; it is then sufficiently ripe, and should be cut off, with six or eight inches of the stem, and treated afterwards, in all respects, agreeable to the directions given for the management of hyacinth seed. Some of the seedlings will bloom by the fourth or fifth, and most, if not all, by the seventh year."

By Offsets. These should be planted soon after they are separated from the parent bulb, in beds of fresh sandy loam, with a little rotten cow-dung placed from seven to twelve inches below the surface, in a dry, airy situation, from two to four inches deep, according to the size of the roots. The beds should be raised six or eight inches above the alleys, formed rather convex on the surface, and may be provided with hoops and mats, to be used to guard them, as occasion may require, from heavy rains and severe frosts.

Choice of full-grown Bulbs. Select such as have not lost the brown skin, are not mouldy or soft at the root-end, and are full, solid, and rather pointed at the other. Just before planting, strip off the brown skin so as to leave the root perfectly bare and white, performing the operation with great care, to avoid bruising or wounding the root, especially at the lower end, where the fibres are formed, which is, at the season of planting, extremely tender.

Soil and Situation. "The situation for the best bed should be in an open airy part of the garden; when that is fixed upon, the ground should be marked out, agreeable to its intended dimensions, and the soil taken out twenty inches deep; the bottom is then to be filled up with sound fresh earth, ten inches thick, upon which is to be placed a stratum of two year old rotten cow-dung, and earth of the above description, about one-half of each, well-mixed together, twelve inches thick; and again, upon this is to be placed another stratum of the same kind of earth as that of the bottom; this is only to be two inches thick at the sides, and three inches at the middle, which will give it a small degree of convexity; this is to be performed about the 20th of October, *i. e.* a week or two before planting, to give the bed time to settle; at the expiration of two weeks, the earth will have subsided, so as to be about two inches higher than the circumjacent paths; but if heavy rains intervene between this preparation of the bed, and the time of planting, it will be proper to keep them off, in order to preserve the temperature of the earth, as it would be rendered too compact and adhesive, by a redundancy of moisture, for the fibres to pass freely through it, which ought to be avoided"

Hogg recommends a fresh, rich, loamy soil, of rather a sandy nature, which should be dug twelve months at least before it is used, and a small portion of well-rotted dung must be added. He says, an intelligent old tulip-grower assured him, that the best compost he had ever hit on "was three-fourths rich yellow loam; one-fourth leaf-mould; one-sixth two years old horse-dung; and one-eighth sea-sand, well-incorporated, and laid in a bed, or stratum for the plants, two feet deep." *Tr. on the Carnation, Auricula, Tulip,* &c. 142.

Planting. The most proper time is from the end of October to the tenth of November. "On the day made choice of for planting, rake the surface of the bed smooth and even, still preserving its convexity, and mark the exact situation for every root upon it. The proper distance between each root, is seven inches from centre to centre; and if the rows are seven inches asunder, the roots will form squares, of similar diameter, on all parts of the bed. A bed consisting of seven rows, makes the noblest appearance, when it is of sufficient length, with a path round it about two and a half or three feet wide; but where the number of roots is small, five rows may suffice, and the path, in that case, may either extend quite round the bed, or only on one side, at pleasure. If, therefore, the bed consists of seven rows, it should consequently be fifty inches wide, which will allow a space of four inches between the outside rows and the sides of the bed; but if the bed contains only five rows, it will only require to be three feet wide, to give the roots similar distances. Having sprinkled a little clean sand where the roots are to be set, place them with great exactness, and add some very sandy earth, so as to completely envelope each root in a little cone of it; then cover the whole very carefully, with strong, sound, fresh loam, about four inches thick at the middle of the bed, gradually decreasing as it approaches the sides, where it should be about three inches thick; thus will the convexity of the surface be increased in a proper degree, and the roots will be covered with soil, to a depth proportionate to their size and strength; the largest and strongest having been placed in the centre rows, and the smaller and weaker on those of the outside. No tulip-root, whatever may be its size or strength, should be planted more than four inches deep from the upper side of the root; nor should any blooming-root be planted less than two and a half, or three inches deep, however small it may be. The soil made use of for covering the bulbs, should be frequently turned over, and thoroughly exposed to the sun and air, some time before it is made use of, that it may be rendered perfectly sweet, and free from the acrid quality that most soils are subject to, when taken considerably below the surface. But if the bed is only to contain five rows, with a path in the front, and none behind, then it will be proper to plant the smallest and lowest growing roots in the front, next the path, and so gradually to increase in the size of the roots to the fifth or last row, which should contain the strongest and largest of all; when the roots are properly covered with soil, as before-directed, the surface of the bed will slope one way, forming an inclined plane: it will be necessary to support its highest side at least with boards, or brick-work, otherwise the earth would be liable to crumble down, and leave the roots bare, or too shallow."

Future Culture and Management. "When the operation of planting is concluded, the bed may be hooped over, and taken care of, in the manner directed for hyacinths, *i. e.* so as to preserve it from very heavy rains, and severe frosts; but either one or the other, in moderation, will be of more service than injury to it. By the end of February every plant in health will be visible above ground; some tall early sorts will be two or three inches high, others one inch, and the later sorts just making their appearance; indeed, a very few remarkably late sorts may be a week longer before they appear, but not more: if, on examination, any distemper, or canker, is discernible on the foliage, about this time, either above, or an inch or two below the surface of the soil, it should be carefully cut out, with a sharp knife, and the wounded part left exposed to the sun and air, which will presently heal it: a fine dry day should be made choice of for this operation. If the surface of the bed appears to be of too close and solid a contexture, it should be carefully stirred up, about two inches deep, which will admit the air more freely, and prove, in all respects, very beneficial . By the end of April, some of the plants will probably be grown so tall as to require the hoops to be raised a little, to secure the blossom from injury: attention to this part must not be omitted, for the blossom is very tender and likely to be bruised and disfigured, by a very slight blow, or rub against the hoops. As soon as any of the earlier sorts begin to shew color, they should be shaded from the sun, for, when its heat is considerable, it will cause the colors to run, and intermix, in such a manner as to destroy the elegance and beauty of the flower; some sorts are more particularly liable to this effect than others, and will be spoiled in five minutes. When the greater part of the blossoms have begun to open, a frame, or awning, should be erected over the bed and paths, nearly similar to that for hyacinths (*fig.* 435.): that is to say, so as to keep out rain, and admit as much light as possible; this must be thrown off, or rolled up, at every favorable opportunity, as directed for hyacinths, except that it should be done rather earlier in the morning, and later in the evening; because the sun has acquired a greater degree of power at this season of the year than earlier. If these frequent exposures to the light and air be omitted, the colors of the flowers will be faint and weak, and the grandeur of effect will be lost, or considerably lessened. The cloth-covering should come down on each side, within about three feet of the ground, to allow a free circulation of air, except in windy weather; from the effects of which, the flowers must be most carefully preserved, by a continuation of the covering quite down to the ground, on the windy side; a line of mats sewed together, and their upper edge nailed to the frame on that side, may answer the purpose, if the cloth is not of sufficient length. Tulips never require to be artificially watered, in the hottest and driest seasons, at any period from planting to taking up the roots; nevertheless, moderate rains may always be admitted before, and in very small quantity after the bloom is over; but early in the spring, they are absolutely necessary, in order to procure a strong bloom.

"When the awning is erected, the hoops should be carefully taken away, the sides and ends of the bed should be neatly boarded up, and the paths lowered two or three inches, to bring the flowers nearer to the eye: a slight frame, about two feet high, should surround the bed, to prevent the garments of spectators from rubbing against, or breaking off the flowers; lines of small twine, painted green, and corresponding with the rows of flowers, should pass from one bead of the bed to the other, fastened to the end pieces of the frame, and stretched tight; to these the stems of the flowers are to be loosely tied with short pieces of green worsted, which will preserve a pleasing regularity of appearance, without stiffness and formality. Tulips will bear to be covered a longer time in bloom than most other flowers, without sustaining any considerable injury: it may be continued three weeks with great safety.

" If any roots should perish, or fail to produce bloom, the deficiency may be made good by transplanting, with the tube transplanter, (*fig.* 17.) from a reserve bed, or the lower end of the stems of flowers, taken from the reserve-beds, may be immersed in phials, filled with water, and sunk into the bed, so as not to appear above ground; these will continue in bloom several days, without requiring to be changed, and will make a tolerable appearance. About a week or ten days after full bloom, when the petals of many begin to drop off, the awning should be taken down, together with the frame, boards, &c. that surround the bed; and the mats and hoops may be replaced as before, to throw off excess of rain, as the case may require: and as the leaves or petals of any fall, the seed vessel of such should be immediately broken off close to the stem; for if suffered to remain on the plant, it will procrastinate the period of its maturity, and weaken the root considerably.

" The bed may remain in this state about a fortnight longer, by which time the grass, or foliage, will become of a yellowish brown, and two or three inches of the top of the stem will wither, dry up, and become purplish: this denotes the critical period to take up the roots, because if done earlier, they will be weak and spongy, and if deferred later, their juices will become gross; this will be manifest at the succeeding bloom, by too great a redundance of colorific matter in the petals, and the flowers be what is generally termed foul."

Taking up the Roots. Dig them up carefully, and place them under cover, in a dry, airy, shaded situation. Here they may remain untouched till August or September following. " Then it is proper to take off their loose skins, fibres, and such offsets as are easily separated; observing not to leave the roots too bare, because the action of the air upon such, would have a tendency to weaken and injure them, by drying up part of their juices; the last brown skin, which is so intimately connected with the root, should remain on it till the time of planting."

Diseases. The tulip is hardier, and less liable to disease and injury from weather, than most sorts of flowers; it is sometimes attacked by grubs and wire-worms at the root early in spring, and then the best mode is to remove the plant and a portion of the soil, replacing the former from the reserve or offset-buds.

Forcing the Tulip in pots or *water-glasses.* The early dwarf sorts are well-adapted for this purpose, especially the *Duc Van Tholl.* They may be treated as in forcing the hyacinth.

Subsect. 3. The *Ranunculus.* — *Ranunculus Asiaticus,* L.; (*Mill. Ic.* 2. t. 216.); *Poly. Polyg.* L.; and *Ranunculaceæ,* J. *Renoncule,* Fr.; *Ranunkel,* Ger.; and *Ranuncolo,* Ital. (*fig.* 436.)

1629. From a fasciculus of small tubers are sent up several bipartite leaves, and an erect branched stem with a terminating flower variously colored. It is a native of the Levant, and was cultivated by Gerarde in 1596. Though rather a tender plant, innumerable and highly beautiful double-flowered varieties have been raised from seed, chiefly by the English florists, from the middle to the latter end of last century.

Varieties. Only double ranunculuses are held in esteem: of these, Parkinson, in 1629, enumerates eight; and Ray, in 1665, twenty sorts. Justice, in 1764, divides ranunculuses into Turkey and Persian; of the former he enumerates eighteen sorts, and of the latter a hundred. What he calls the Turkey ranunculus, is only a variety or sub-species with a very dark flower, which Miller also considered as a species, and named it *R. sanguineus.* Maddock, in 1792, had upwards of eight hundred sorts. Mason's catalogue for 1820 contains about four hundred names. " There are more varieties of ranunculuses," Maddock observes, " than of any other flower;" but as their names are arbitrary, it would be of little use to enumerate them here. A variety will last from twenty to twenty-five years.

Criterion of a fine Double Ranunculus. (*fig.* 437. *a*) " The stem should be strong, straight, and from eight to twelve inches high, supporting a large well-formed blossom, or corolla, at least two inches in diameter, consisting of numerous petals, the largest at the outside, and gradually diminishing in size as they approach the centre of the flower, which should be well filled up with them.

" The blossom should be of a hemispherical form; its component petals should be imbricated in such a manner as neither to be too close and compact, nor too widely

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separated; but have rather more of a perpendicular than horizontal direction, to display their colours with better effect.

"The petals should be broad, and have perfectly entire, well-rounded edges: their colors should be dark, clear, rich, or brilliant, either consisting of one color throughout, or be otherwise variously diversified, on an ash, white, sulphur, or fire-colored ground, or regularly striped, spotted, or mottled in an elegant manner."

Propagation. By seed, for new varieties, and by off-set tubers, or dividing the tubers for continuing approved sorts.

By Seed. The seed of the ranunculus, Maddock observes, in no instance ever produces two flowers alike, or the same as the original. It should be saved from such semi-double flowers as have tall strong stems, a considerable number of large well-formed petals, and rich good colors, chiefly preferring the darker, but not to the exclusion of the lighter colored, when their properties answer the foregoing description.

"The seed should remain on the plant till it has lost its verdure, and becomes brown and dry; it may then be cut off, and spread abroad upon paper in the seed-room, exposed to the sun, that every degree of humidity may be exhaled from it; in which state it should be put into a bag, and preserved in a warm dry place.

"January is the proper time to sow the seed, and in order to prepare it, it must be separated from the stalks to which it is connected, in the following manner, viz. in the first place, it should be taken out of the bag, and spread thin upon a sheet of paper or tea-tray, &c. and placed before a moderate fire, till it is just warm, and no more; the seed will then easily scrape off, by means of a pen-knife; but great care must be taken to avoid scraping it off in lumps, or suffering any pieces of the stalk, dried petals of the flower, or other extraneous matter to be mixed with it, which would create a mouldiness when sown, of very destructive consequence: when the seed is scraped in a proper manner, it will have much of the appearance of clean coarse bran, with a little brown or purple speck in the centre of each cuticle, which is the kernel.

"When the seed is thus prepared, it should be sown in a shallow frame, provided with sashes; the soil should have been previously taken out, three feet deep, and spread thin upon the ground, till it has been perfectly frozen throughout, in order to destroy any vermin it may have contained, more particularly the common earth-worms.

"When the pit is filled up again, with the frozen lumps of earth, it should remain till the whole mass has thawed, and subsided to its pristine bulk, or nearly so; its surface should then be made perfectly smooth and even, and the seed sown upon it with the utmost regularity, in such quantity as nearly to cover it; the glasses should be placed over it immediately, and the frame kept closely covered with them, for two or three days, till the seed begins to swell and soften; a little light earth should then be sifted upon it, through a fine sieve, but not sufficient to cover it; this should be repeated once or twice a week, till the greater part of the seed disappears: it is proper to remark in this place, that such seeds as happen to be covered deeper than the thickness of a half-crown piece, will never vegetate, and must of course, inevitably perish.

"It is necessary to keep the seed moderately moist, by gentle waterings with soft water, that has been exposed to the sun till it is a little warmed; the rose of the watering pot should be hemispherical, and perforated with a great number of very small holes, that will discharge fine streams of water, in a very distinct and regular manner.

"About the time that the plants begin to make their appearance, it is proper to stir the surface of the earth with a pin, or silver bodkin, just sufficiently to admit air, and give liberty to the young plants to pass easily through; this operation should be very carefully performed, to prevent breaking off the fibres, or raising and leaving any of the plants out of the earth, because one hour's sun upon such would inevitably destroy them. When the sun shines very hot, it is necessary to admit some fresh air under the glasses, and shade the frame with mats; but it should be close shut up with the glasses when the air is cold, and always at night.

"After the plants are all up, and their two interior leaves appear, more air must be given, by having hurdles, or lattice-work substituted for the glasses; waterings must be regularly continued, in the manner before described, when the long continuance of dry weather renders it necessary: but fine warm showers of rain are always preferable, when they happen in due time. This kind of management is to be continued till the roots are matured, and fit to take up, which is known by the foliage becoming perfectly brown, dry, and nearly consumed.

"The speediest and safest method of taking up these small roots is to pare off the earth, three inches deep, with a trowel or shovel, having previously carefully picked off the dried leaves, and any other extraneous matter that may be found upon it. The earth and roots, thus collected, are to be thrown into a fine brass-wire sieve, that will not permit the smallest roots to pass through it; the sieve is then to be worked in a large vessel or tub, nearly filled with water; the earthy part will, in consequence, be dissolved and washed away, and the roots will remain in the sieve, where, by a little management, they may be easily separated from the stones, &c. which are mixed with them. The upper rim of the sieve must, at all times, be held above the surface of the water, otherwise some of the smallest roots will be lost, as they are frequently found floating on the surface, till they have imbibed a sufficient quantity of water to make them sink. The roots are to be dried and preserved, and are to be planted at the latter end of October, or beginning of November; the greater part, or such as have two or more claws, will blow strong the following summer."

The Rev. W. Williamson sows half his seed in autumn, and the other half in January, in the open air. He prefers the autumnal sowing, if the winter proves mild.

By Offsets. Unlike the offsets of the hyacinth and tulip, those of the ranunculus generally attain perfection in the season of their formation on the parent plant, and are therefore fit to be planted as full-grown tubers the same season in which they are removed. Smaller ones, which are unfit to bloom the following year, may be planted in a bed prepared as to be directed for the full sized roots.

By dividing the Tubers. "In minutely examining the crown of a ranunculus root, several small protuberances will be found; from each of which a shoot will arise, and the root may therefore be divided by a sharp knife into as many parts as there are protuberances; and thus the danger of losing any rare variety is much diminished. These sections will not bloom till the second year." *Hort. Trans.* iv. 380.

Choice of full-grown Roots. Select such as are sound and full in every part, and have plump and prominent buds.

Soil and Situation. According to Maddock, a fresh, strong, rich, loamy soil is preferable to all others. Hogg recommends fresh loam, with a considerable portion of rotten horse, or cow dung. The Rev. W. Williamson (*Hort. Trans.* iv. 375.), uses a stiff clayey loam with a fourth part of rotten dung. The situation should be open, but not exposed to violent winds or currents of air. "The bed should be dug from eighteen inches to two feet deep, and not raised more than four inches above the level of the walks, to preserve the moisture more effectually: at about five inches below the surface should be placed a stratum of two-year old rotten cow dung, mixed with earth, six or eight inches thick; but the earth above this stratum, where the roots are to be planted, should be perfectly free from dung, which would prove injurious, rather than of benefit, if too near them. The fibres will draw sufficient nourishment from it at the depth above-mentioned; but if the dung was placed deeper, it would not receive so much advantage from the action of the air, which is an object of consequence."

Planting. "This may be done either before or after winter: if the soil and situation is remarkably cold and wet, it will be better to defer planting till the middle or end of January or beginning of February, as the weather may favor; but, in other situations, the latter end of October or beginning of November is to be preferred, as the roots will have more time to vegetate, and form themselves, and will in consequence bloom rather stronger, though only a few days earlier than those later planted."

"A bed, consisting of the variety called the scarlet turbaned ranunculus, will produce a most brilliant effect; if planted at the same time as the tulip bed, they will bloom together; they are hardier than any other ranunculuses, but may, in other respects, be treated in the same manner."

"The surface of the bed should be raked perfectly even and flat, and the roots planted in rows, at the distance of about five inches from each other. It is better to plant in shallow trenches, made nearly two inches deep, than to make holes for the reception of the roots: there should be a little clean coarse sand sprinkled into the trench, and the roots should be placed with their claws downwards, from three to four inches asunder, according to their size: when the trench has received its roots, it should be carefully filled up level with the same earth that was taken out, so as to cover the root exactly one inch and a half deep, which is the only true depth to procure a good bloom: it is pointed out, by nature in a singular manner; for when these roots have been planted too shallow or too deep, in either case, a second root is formed at the proper depth, by which the plant is weakened to such a degree that it seldom survives a repetition of it."

Williamson plants in spring, but never after the tenth of February; and he frequently plants the roots in the same place for several years successively. *Hort. Tran.* iv. 376.

Future Culture and Management. " Ranunculus roots will remain several days in the ground after planting, before they begin to vegetate; during this period, they become very much swelled, by imbibing the moisture of the soil, and are, in this state, extremely susceptible of injury from frost, much more so than when vegetation has actually taken place. As soon as the bed is planted, a sufficient quantity of barley or oat straw should be placed near it, ready for a covering: in case of frost, it may perhaps be necessary, during a very severe winter, to cover the bed in this manner, ten or fifteen inches thick; but the straw should be taken off at all favorable times: for the effects of covering too much, or too long, are as destructive as the reverse, especially before the roots have begun to vegetate, because they are then more liable to become mouldy than at any other period, than which nothing can be more prejudicial. Early in the spring, when the plants make their appearance above ground, so as to render the rows easily discernible, the surface of the earth between each row, should be trodden or beaten, so as to make it firm and compact; and if the soil is compressed with the fingers, quite close to the plants, it will keep out cold drying winds, and prove beneficial. It is advisable to make choice of a fine dry day, soon after rain, whilst the ground is still moist, to perform the above operation: when it is finished, a little long straw should be placed between each row, to preserve the surface of the soil cool and moist, till the foliage of the plants is sufficiently grown and expanded, to afford it shade without further assistance.

" April showers, and frequent rains in May, are essentially necessary to the growth and vigour of the plants: if these fail, soft water must be administered in sufficient quantity between the rows, by means of a common watering-pot, with a long tube or spout, held low, so as not to wash the earth into holes; for it is better to avoid watering the plants themselves, as it may chill them too much, and stagnate their juices. The consequences of omitting to water when necessary, are these, viz. the plants will make little progress; the blossom buds of the stronges twill be small, and the weaker plants will not bloom at all; the grass, or foliage, will put on a sickly, yellowish appearance, from which it will never recover during the season; and, lastly, the roots will, when taken up, be small and lean.

" But such kind of waterings, however necessary, are by no means so salutary to these, or any other flowers, as fine warm, natural showers; they can neither be so equally dispensed, nor are the plants naturally disposed to receive them when the atmosphere is dry, because their pores and fibres are contracted, and they are, as it were, in the expectation of dry weather.

" Since it is evident that artificial waterings are, in all respects, so much inferior to natural, it is therefore better to wait a day or two, in hopes of a change of weather, than to be too hasty in watering, although the plants may appear to suffer for the moment, by the omission; for if such a change should fortunately take place, they will receive infinitely more benefit from it than when both themselves and the soil are already saturated, or replenished, with moisture.

" The weather in May is sometimes very clear and hot; the plants ought to be shaded at such times by means of lofty hoops and mats, or some better contrivance, that will admit light and air freely; a frame and covering, similar to that for hyacinths, would answer best, if expence and trouble were not to be considered: it will, however, be absolutely necessary to shade them, in some manner, during the period of bloom, otherwise they will continue but a very short time, especially the dark rich coloured sorts; for, in proportion as their colors approach to black, is the injury they will receive from the rays of the sun, if it is permitted to shine upon them in full force; some of the very darkest cannot stand it one hour, without being entirely spoiled. The light coloured sorts will bear the sun's rays much better, reflecting them in proportion as they approach to white; green is the only color that reflects and absorbs the rays of light in equal proportion, and is more predominant in the vegetable kingdom than any other.

" After the bloom is over, watering is no longer necessary, but shading, in the middle of hot days, is still very beneficial to the plants: it tends to prolong their vegetation, and the size and substance of the roots are thereby increased.

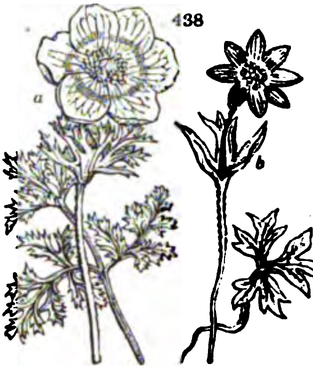
Taking up the Roots. " By the end of June, or soon after, the greater part of the plants will appear brown and dry: vegetation has then ceased, and it is the exact time to take up the roots, because if they are suffered to remain in the ground till rainy weather ensues, they will begin to shoot afresh, and thereby sustain considerable injury. When the roots are taken up, their stems, &c. should be cut off close, and they should be placed in a shady airy room, or situation, to dry gradually; but before this is perfectly accomplished, it will be proper to clean and separate them, because, when quite dried, they become very hard and brittle, and there is great danger of breaking off their claws: some may be separated into many complete roots, although they are so closely connected, as, on a superficial observation, to have the appearance of only one large root. Nothing more remains to be done, till the return of the planting season, except to stow the sorts separately in bags, or boxes, for the sake of convenience, in a dry room, in which state it is possible to keep them out of ground for two or three years, without perishing, although it evidently tends to weaken and injure them: there have been instances known of ranunculus roots surviving till the fifth or sixth year; they were, however, rendered extremely weak, nor could any but very strong roots retain their vegetative powers for so long a period."

Williamson takes up the roots immediately after the color of the foliage begins to change.

Forcing. The ranunculus may be forced, but loses much of its strength of stem and brilliancy of color.

Subject. 4. The *Anemone.* — *Anemone*, L.; *Poly. Polyg.* L.; and *Ranunculaceæ*, J. *Anemone*, Fr.; *Windblume*, Ger.; and *Anemone*, Ital.

1630. There are two species of this genus cultivated as florists' flowers, under the common name of anemone: the *A. coronaria*, L. or poppy anemone (*Bot. Mag.* 841.); (*fig.* 438. *a*), a native of the Levant, and introduced in 1596; and the *A. hortenses*, the star or broad-leaved anemone (*b*), a native of Italy, and introduced from Holland in 1597. The anemone has been cultivated from as early a period as the tulip and many fine double varieties produced both by the Dutch and British. The single and semi-double flowers, are nearly in as high estimation as the double ones.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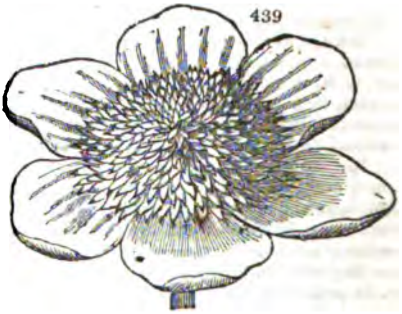
Varieties. These are numerous, but few of them are named. Parkinson in 1629, enumerates thirty sorts of single narrow leaved anemones, and nearly as many double and single of the broad-leaved sort. Mason's catalogue for 1820 contains seventy-five sorts. A variety will last for twelve or fifteen years.

Criterion of a fine Double Anemone. (*fig.* 439.) "The stem should be strong, elastic and erect, not less than nine inches high. The blossom, or corolla, should be at least two inches and a half in diameter, consisting of an exterior row of large substantial well-rounded petals, or guard leaves, at first horizontally extended, and then turning a little upwards, so as to form a broad shallow cup the interior part of which should contain a great number of long small petals, imbricating each other, and rather reverting from the centre of the blossom; there are a great number of small slender stamens, intermixed with these petals, but they are short, and not easily discernible.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"The colors should be clear and distinct when diversified in the same flower, or brilliant and striking if it consists only of one color, as blue, crimson, or scarlet, &c. in which case, the bottom of the broad exterior petals is generally white; but the beauty and contrast is considerably increased when both the exterior and interior petals are regularly marked with alternate blue and white, or pink and white, &c., stripes which in the broad petals should not extend quite to the margin."

Propagation. By seed for new varieties, and by dividing the root for continuing approved sorts.

By Seed. Select "single or semi-double flowers, that have strong, tall and erect stems, large well-formed cups and petals, of very brilliant colours. The seed must be gathered from time to time as it opens; for, being very downy and light, it will otherwise be blown away by the first breeze of wind, or fall down and be lost: it may be sown at the same time, and be treated in all respects like that of ranunculuses; the seedlings will, like those, blow strong the second year. It will be found very difficult to sow anemone seed in a regular manner: it is united with, and enveloped in a downy substance, that upon being put together in quantity, adheres in such a manner as to render it necessary to make use of some sand or earth to separate it on sowing; nor will this be effected sufficiently without considerable labor in rubbing it for a long time amongst the earth, as it ought not to adhere together in lumps, which would not allow the young plants space enough to form their roots. There will be found but few double flowers amongst the seedlings, nor can it hardly ever be expected there should, if the seed be entirely saved from single ones; of course, the greater number of broad petals the flower of the seed-bearer possesses, so much greater is the probability of procuring large double flowers from the seed of it."

By dividing the Root. When the division is properly made, every piece will blow the first year, and is therefore to be treated in the same way as such as are full grown.

Choice of full-grown Roots. Select fresh plump roots of moderate size; large overgrown roots, which are hollow in the centre, and often decayed; these are to be avoided as they never blow strong.

Soil and Situation, and Preparation of the Bed. The same as for the ranunculus.

Planting and future Culture. The distance between the roots may be the same as for the ranunculus. Attend to place that side of the roots next the soil in which the decayed rudiments of small thread-like fibres will be observed, and cover about two inches deep. "Anemones are hardier than ranunculuses, and, consequently, may be always planted in the autumn with safety; the most advisable time is about the middle of October, by which means they will blow a week or two earlier than the tulips: if they are planted ten days or a fortnight after the tulips, they will all bloom together; but a few days earlier or later in the planting will scarcely be perceptible at the time of flowering: it is, however, proper to observe, that such roots as are planted in October, will blow stronger, and, when taken up, will be found of a larger size than those that are planted towards the end of November, especially if the winter proves mild; but if the winter sets in early, and proves severe, late-planted roots will not have time to vegetate before frosty weather takes place; in which case there will be great danger of their perishing, unless they are covered with straw, just sufficiently to keep frost from the roots, as they are then in a state of inactivity, but replete with moisture, which renders them more susceptible of injury from frost, and, at the same time, in much greater danger of mouldiness than after vegetation has commenced. The covering must therefore be taken off and put on, as often, and in such proportion, as the exigency or circumstance of the case requires." Water and protect from high winds and heavy rains, as directed for ranunculuses.

Taking up the Roots. "Anemones continue longer after bloom in a state of vegetation than ranunculuses, probably because of their greater degree of succulency; and even at the proper time to take them up, it will sometimes happen, that part of their foliage will not be entirely divested of greenness and moisture; this will often be the case when frequent showers of rain intervene, and are admitted between the times of blowing and the maturity of the roots: when it thus happens much skill is required to ascertain the critical period to take up the roots; for if they are suffered to remain in the damp or wet ground a few days too long, they will shoot afresh, and be thereby materially weakened and injured; it is, indeed, better to take them up rather too early, than suffer them to re-vegetate in this manner; but the roots will not be so firm and solid as if done at the exact time. The safest and most effectual method to preserve them from these disagreeable consequences, is to keep off all rains after the bloom is quite over, by means of mats on hoops; the roots will then regularly and gradually mature, and the foliage will, in like manner, become brown and dry, which will point out the true time to take up the roots; and this will usually happen to be about a month after full bloom.

"The whole subsequent treatment of the roots, till the time for planting, is the same as for ranunculuses, with only the following caution, viz. that as the roots are exceedingly brittle, it is necessary to handle them very gently upon dressing or cleaning away their fibres, and the soil that adheres to them; however, should only small pieces break off, such should not be thrown away, as each will, in the course of a few years, become a blooming root, if it has an eye, without which it is of no value; but that seldom happens to be the case." *Maddock.* Anemones may be forced, like the ranunculus, but, as it generally destroys the roots, the finest sorts should not be devoted to this purpose.

SUBSECT. 5. The *Crocus.* — *Crocus,* L.; *Trian. Monog.* L.; and *Irideæ,* B. P. *Safran,* Fr.; *Safran,* Ger.; and *Zaffarano,* Ital.

1631. The bulb is round, solid and compressed with a netted skin, from the centre of which arise four or five grass-like leaves, and one or two flowers. Out of the centre of the tube of the flower arises a slender style, crowned by a broad flat stigma of a gold color. After the flower is past, the germ, which hitherto was seated on the bulb at the base of the tube, pushes out of the ground, and ripens its seeds; a singular economy in nature, and which occurs only in the colchicum, and a few other plants.

All the known species of this genus may be considered as florists' flowers. Many botanists, indeed, consider that there is only two species, the *C. vernus*, or spring-blowing crocus; and the *C. sativus*, the saffron, or autumn crocus.

From the *Crocus vernus*, (*Eng. Bot.* 343. and our *fig.* 440.) they consider that the *C. versicolor* (*fig.* 441.), the *C. biflorus* (*fig.* 442. *a*) the *C. susianus* (*b*) the *C. sulphureus* (*c*), and the *C. maesiacus* (*d* and *e*), with their numerous sub-varieties, have been produced by culture or locality. From the *Crocus sativus*, or saffron crocus (*Eng. Bot.* 343. and our *fig.* 443. *a*), they think it likely that the *C. serotinus* (*fig.* 443. *b*), and the *C. nudiflorus* (*fig.* 443. *c*), have been also originated by cultivation or accident.

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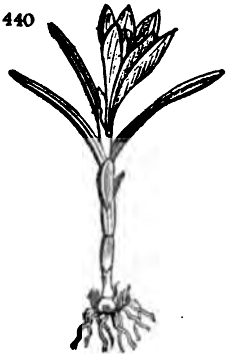

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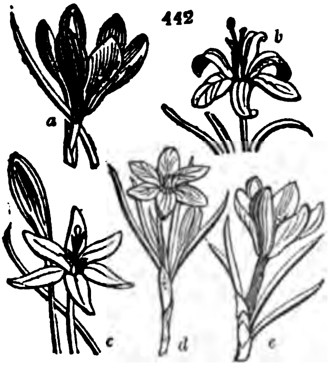

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It is sufficient for our purpose to observe, that all the sorts have been time out of mind, and still are, great ornaments to the garden; the spring sorts coming into flower in February and March, and the autumn sorts in September and October.

The color of the spring crocus in its wild state in Switzerland, is white with a purple base; it is considered as naturalized in England, but when found wild, is almost always of a yellow color. The autumn crocus, or saffron, is also found wild in some places, and considered as naturalized; but it appears to be an African plant, and introduced originally in Edward the Third's time, which its Arabic name, *sahafaran*, seems to justify. Its colour is generally purple or blue, as is that of most of the autumn varieties in cultivation at present.

Varieties. None of these are double. Of the spring crocus, Parkinson has enumerated twenty-seven varieties; the fundamental colours of which are blue, purple, yellow, and white. Miller recites twelve as leading sorts. Mason's catalogue for 1820 mentions "twenty named sorts," besides the light, dark, and striped purple, cloth of gold; the Scotch crocus beautifully striped, the white, the large and small yellow, and several striped sorts. The Dutch are continually producing new varieties, as are some florists in this country, of which Haworth (*Hort. Trans.* i. 122.) may be cited as an instance.

Of the autumn crocus, Parkinson has enumerated four; and Ray, six varieties. Miller has only four: the sweet-smelling, of a deep blue; the mountain, of a paler blue; the many-flowering, bluish; and the small flowering. Most of these varieties are now lost.

Criterion of a good Crocus. Clear or brilliant colors, and each color distinctly marked and finely pencilled in the striped and variegated sorts.

Propagation. By seed, for new varieties; and by off-set bulbs, for common purposes. The latter generally flower the first spring after planting, and are treated in all respects as full-grown roots.

By Seed. The following directions are by Haworth. " The seeds of crocuses are best sown immediately after being gathered, in light, dry earth, in large pots, or pans, or small shallow boxes, with a sufficiency of holes and potsherds at the bottom, for the purpose of draining off with certainty, all superfluous moisture, thinly; for almost every seed will vegetate, and cover not more than half an inch with the mould. The most eligible aspect, or situation, for the seminal boxes, until the autumnal rains set in, is a moderately shady yet unsheltered one; permitting them to receive all the influence of the weather, except such heavy showers as would wash bare the seeds. As soon, however, as the autumnal rains commence, remove the boxes to a warm aspect; and protect them from all excessive rains, frosts, and snows, by the occasional shelter of a garden frame: allowing them, nevertheless, the benefit of the full air at other times, but more especially after the seminal leaf (for they have but one, being monocotyledonous plants), eager to commence the career of life, urges its fine setaceous point above the surface of the earth. This occurs sometimes about the end of the year; but oftener in earliest spring. After this, it is quite essential that they should have complete exposure to the air, even in frosty weather; screening them, however, occasionally, like early radishes, with loose straw, from other injurious effects of frost; so as to prevent their being raised out of their infantile beds by its baneful effects.

" In this manner may the young crocuses be treated until the sun acquires sufficient power to dry the earth in their boxes, so as to require daily waterings. It will be then found advantageous to remove them to a cooler, but not sheltered situation, and here they may remain until their leaves die down; giving them, as just hinted, at all times, and in every situation, while their leaves are growing, such discretional rose-waterings, when the sun is not shining, as they may reasonably appear to require: but never until the earth they grow in becomes dry: nor any whatever, after their leaves begin to look yellow. After this period, it is necessary to defend them from all humidity, except dews and gentle rains, until the end of August, or beginning of September.

" From weeds and from worms, from slugs and snails, it is almost needless to observe, they should constantly be kept as clear as possible. And if the surface of the earth in their boxes is occasionally stirred with the point of a knife, or fine piece of stick, it will never fail to be attended with beneficial effects, and invigorate the bulbs: operating, no doubt, as a sort of hoeing, and like that important practice, (as the writer of this paper conceives,) proving salubrious to vegetables of every denomination, not only by lightening the soil, but by admitting *new accesses* of atmospheric air towards their roots; and thereby facilitating, and stimulating their absorbent inspiration of its oxygen: without a due supply of which all vegetables, as well as animals, eventually become feeble and sick. If, notwithstanding the precaution of thinly sowing the seeds, the plants in any of your seminal boxes should have grown so thickly together, as to have incommoded each other, it will be desirable to have such taken up; and replanted immediately further asunder in fresh earth, and about three quarters of an inch deep. But if they are not too crowded, they will require no shifting this, their first autumn; but merely about a quarter of an inch of fresh mould sifting over them, previously stirring and cleaning the surface of the old from moss and weeds; and observing not to bury the young bulbs, not yet so large as lentils, deeper than three quarters of an inch, or an inch at the most.

" The *second* season requires exactly the same management as the first. But as soon as their second year's foliage has passed away, the roots should all be taken up, and replanted again the same or following day, into fresh earth, of the same kind as before, about an inch deep, and as much apart, and treated as above.

" Nor does the *third* season demand any alteration in their management, sifting over them in autumn half an inch of fresh earth.

" The spring following, if they have been duly attended to, most of them will show flowers (a few, perhaps, having done so the season before) in the midst of their fourth crop of leaves; fully rewarding with the cheering colors of their new faces all the preceding assiduity and care." *Hort. Trans.* i. 125.

Choice of Bulbs. Observe that the base is not mouldy, nor the bud or summit of the bulb decayed.

Soil, Situation, and Culture. They will grow in any common soil, but prefer a loamy sand. October is the best season for planting; the more select varieties are grown in beds like the hyacinth, and the colors mingled in the same manner; the distance from bulb to bulb about three inches. The more ordinary sorts are grown as border-flowers, and form an important part of the early flowers of the front row (*fig.* 402. *a*). They are very hardy, and require no care till the leaves begin to fade, when they should be taken up, and kept in a state of rest for two or three months. Some do not take them up oftener than once in three years, which answers very well for the border sorts. Even these, however, should not be left longer, because, as the young bulbs are formed on the tops of the others, they come nearer to the surface every year, till at last, if neglected, they are thrown out and lost.

Subsect. 6. The *Narcissus*. — *Narcissus*, L.; *Hex. Monog.* L.; and *Amaryllideæ*, B. P. *Narcisse*, Fr. and Ger.; and *Narcisso*, Ital.

1632. The bulb is pear-shaped and tunicated, the leaves succulent and linear, and the flower-stems, which are from six to eighteen inches in height, bear either solitary or fasciculated flowers; the color of the flower is either white or yellow, and generally highly odoriferous. Most of the species are natives of the south of Europe, but one, the *N. Pseudo-Narcissus*, is a native of England, and common in woods in clayey soils. They come into flower in February, March, and April.

Species and Varieties. The popular division of this genus is into daffodils, white narcissi, jonquils, , and polyanthus narcissi.

The *Daffodils* are, *N. pseudo Narcissus* (*Eng. Bot.* 17.), of which the varieties are the common double, the double with white petals and a yellow cup; the single with yellow petals and a golden cup; three or four concentric cups; Tradescant's daffodil and above a dozen other nameless varieties; the peerless, or two-flowered daffodil, *N. biflorus*, (*Eng. Bot.* 276), and a variety *N. b. a. tenuior* with one flower only on the scape; the two-colored daffodil, *N. bicolor*, (*Bot. Mag.* 1137.), a native of Spain, and a variety of the great yellow Spanish, the largest flower of the genus; the least daffodil *N. minor*, (*Bot. Mag.* 6.); the rush-leaved, *N. triandrus*, (*Bot. Mag.* 48.), and some other species and varieties.

The *White Narcissi* are the poets' narcissus, *N. poeticus*; the early-flowered, *N. p. a. angustifolius*; and the late-flowered *N. p. majalis*; the musk narcissus, *N. moschatus*, (*Eng. Bot.* 1300.); the eastern narcissus, *N. orientalis*, (*Bot. Mag.* 948.), and the yellowish and large-flowered varieties; the hoop-petticoat narcissus, *N. bulbocodium*, (*Bot. Mag.* 88.); and the paper narcissus, *N. papyraceus*, with other varieties.

The *Jonquils* are, the common, *N. jonquilla*, (*Bot. Mag.* 15.), so named from its rush or jonc-like leaves; the double-flowered jonquil; the sweet-scented jonquil, *N. odorus*, (*Bot. Mag.* 934.); the great jonquil, *N. calathinus*, (*Bot. Mag.* 78.), and some minor varieties.

The *Polyanthus Narcissi* are the common *N. tazetta*, (*Bot. Mag.* 925.); the sulphur-colored, single and double; the white and yellow, single and double; and above a hundred other sorts, with arbitrary names given by the Dutch, who have highly improved this division of the genus. Some of these sorts are considered species by botanists.

Criterion of a good Narcissus. Strong erect stems; regularity of form and disposition in the petals and nectars; distinctness and clearness of color; and in the many-flowered sorts, the peduncles all of the same length, and coming into flower at once.

Propagation. By seed for new varieties, but generally by offsets, which, as they seldom flower the first year after separation, should not be planted with the full-grown roots, but in a bed of light loamy soil by themselves in the reserve-garden. They should not be planted later than the beginning of September.

By Seed. Miller directs to sow in flat pans, filled with fresh, light, sandy earth, about the beginning of August, soon after the seed is ripe; to place the pans where they will receive only the morning sun till October. Then expose them to the full sun, and protect them from heavy rains and frosts till April, when they will have come up, and must be removed to their first situation. In June, the leaves will have decayed, when some fresh earth is to be shifted over the surface of the pans. Treat them in other respects during the second winter as during the first. The end of the second summer after sowing, the roots are to be taken up and planted at about three inches' distance every way, in beds raised and rounded to throw off the water. These beds are to be protected in winter by old tan ashes or haulm. After remaining two years in this situation, they are to be taken up and planted in others, dug deep, and with a little rotten cow-dung buried in the bottom for the fibres to strike into. Here the roots are to be planted at six inches' distance, having earth sifted over them when the leaves decay, and tan or ashes in winter. The second season of their growth in this bed, that is, the fifth from sowing, most of the bulbs will come into flower. Such as are esteemed good flowers may be taken up and treated as full-grown bulbs; but those which have not flowered, or of which the flowers are of doubtful excellence, may remain another year. Miller says, none should be rejected till they have flowered two or three times: as it often happens, that their first blowing is not near so beautiful as their second and third.

Choice of full-grown Bulbs. Select such as are rounded towards the base rather than compressed, with full sound tops, and bottoms free from mouldiness or decayed fibres.

Soil, Situation, and Planting. An eastern aspect is to be preferred; and, according to Miller, the best soil is fresh light, hazel loam, mixed with a little very rotten cow-dung. The bed in which they are to be planted must be excavated three feet deep, and filled with this compost, and then the roots planted on it about eight inches' distance every way, and covered from six to eight inches, in the manner directed for tulips. The best time for planting is August, or the beginning of September.

Culture. Stirring the soil, weeding and watering are all that is in general required: but such as wish to produce a very perfect show of flowers, shelter with an awning in the manner recommended for hyacinths. In winter, the beds require the protection of tan or litter, which should be put on in October or November, and removed, and the soil stirred in February or March. Where the narcissi are cultivated for commercial purposes, the strength of the bulb is greatly increased by cutting off the flower-stem when the flowers begin to expand. The flower is still valuable, being expanded till in a marketable state by inserting the stalk in water. " Some years ago I gained admittance into the grounds of Daniel Carter, at Fulham, who has long cultivated large quantities of polyanthus narcissuses for sale, and was surprised to find all the crop nearly gathered, though very early in the season. His son, however, explained the mystery, by taking me into a large barn, which was filled with the gathered flowers, blowing in pans of water; and he told me that by doing this, the bulbs continued to produce as abundant crops every year, as new ones imported from Holland. The practice was suggested to him by remarking, that in a bed left for seed one year, very few roots sent up a complete bunch of flowers the following season, and many roots none at all. He therefore now cuts off the stalk close to the ground, as soon as two or three of the flowers are expanded, but is very careful not to injure the leaves." *Hort. Trans.* i. 362.

Taking up the Bulbs. The bulbs should not be taken up oftener than every third year, if they are expected to flower strong and make a great increase. If they remain longer than three years, the offsets will become so numerous as to weaken the bulbs, which will at first flower weakly, and in time cease almost entirely to show flowers. The Dutch take up these roots every year, because their object is to furnish a round, plump root, and the way to accomplish this is to take off the offsets annually, to prevent their pressing against and flattening the parent bulb. The bulbs being dried in the shade, may be laid in an airy situation in the seed-loft till wanted for planting.

Forcing. These bulbs force well, and either in deep pots of sandy loam, or in water-glasses; their previous treatment is the same as we have prescribed for the hyacinth; and they are highly odoriferous and ornamental in apartments.

SUBSECT. 7. The *Iris.* — *Iris*, L.; *Trian. Monog.* L. and *Irideæ*, B. P. *L'Iris*, Fr.; *Schwertlilie, Ger.*; and *Iride*, Ital. (*Figs.* 444. *and* 445.)

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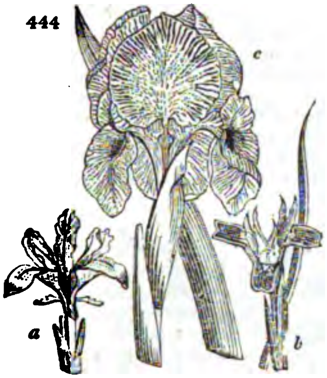

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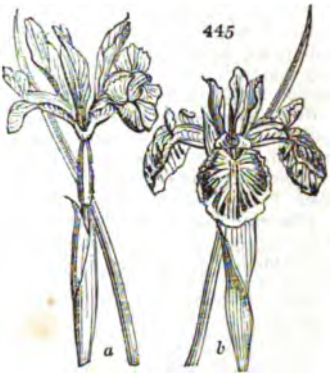

1633. There are several species of this genus, which are considered florists' flowers.

The *Persian Iris, I. Persica,* (*Bot. Mag.*, and our *fig.* 444. *a*), a very low bulbous-rooted plant, with delicate blue and violet-colored flowers, greatly esteemed for their beauty and sweet smell, which is so powerful that one plant will scent a whole room. It is a native of Persia, and was cultivated by Parkinson in 1629. The bulbs are generally imported from Holland, and blown in water-glasses, or pots of sand with very little earth intermixed, in February and March.

The *Snake's-head Iris, I. tuberosa,* (*Bot. Mag.* 531. and *fig.* 444. *b*), has long narrow four-cornered leaves, and a dark purple flower, which appears in April. It is a native of the Levant, and was cultivated in 1597. The tubers are generally imported from Holland.

The *Chalcedonian Iris, I. susiana,* (*Bot. Mag.* 91, and *fig.* 444. *c*), has finely striated leaves, a scape a span high, and the largest and most magnificent corolla of all the species. Its petals are of a delicate texture, almost as broad as a hand, purple or black striped with white. It flowers in the beginning of June; is a native of the Levant, and was cultivated by Gerarde in 1596.

The *bulbous-rooted*, or *Spanish Iris, I. xiphium,* (*Bot. Mag.* 686, and *fig.* 445. *a*), has channelled leaves, convoluted during their whole length, and awl-shaped at the tip; the flowers of the wild plant are blue, with emarginate petals, and appear in June; but cultivation has produced a great number of varieties with yellow, white, violet, and variegated flowers. It is a native of the south of Europe, and was cultivated by Gerarde in 1596.

The *Great bulbous-rooted Iris*, the *English Iris* of the *Dutch, I. xiphioides* (*Bot. Mag.* 687, and *fig.* 56. *b*), is much larger than the other in all its parts, the flower-stalk is near twice the height, and the flowers are more than double the size. It is equally prolific in varieties as *I. xiphium*, of which it is by some botanists considered only a variety. The tubers of both sorts are annually imported from Holland.

Culture of the first three Species. These seldom ripen their seeds in this country, nor are they often propagated here from offsets, annual supplies of bulbs being obtained from Holland, and generally forced like the hyacinth. Justice says (*Brit. Gard. Direct.* 222.), the Dutch florists told him, that they never could obtain any varieties from sowing the seeds of the Persian iris; nor could this author himself, who cultivated the plant, and raised seedlings at Crichton, near Edinburgh, with great care and considerable success. The three sorts are best cultivated under the protection of a frame, where their flowers will be less liable to injury than in the open air, and where their leaves will be stronger and more able to nourish the bulbs and offsets. The Chalcedonian iris, Curtis observes, thrives best in a loamy soil and sunny exposure, with a pure air, but guarded from moisture, and from frosts during winter. The Persian iris thrives best in a light sandy loam and eastern exposure, sheltered from rains and frosts, like the other. The snake's-head iris is the hardiest of the three, requires the same soil and exposure as the Persian, but less care during winter. None of these sorts need be taken up oftener than once in three years, when the leaves decay; they should be replanted in a month or six weeks afterwards, at six inches' distance every way, and covered from two to four inches according to the size of the bulbous tuber. If the soil in which the bulbous and tuberous sorts of iris is planted be loose and deep, and the plants not taken up every three, or at most four years, they will run down and be lost.

Culture of the bulbous Irises. Miller and Justice recommend a light sandy loam, not rich, and an eastern exposure. The plants are multiplied abundantly by offsets, and as they also produce seeds freely, many new varieties are obtained in that manner. Justice says, he raised a great number with very little trouble (*Brit. Gard. Direct.* 430.); and Masters says, "I know of no flower that better repays the time and attention of the horticulturist." The following are this author's directions for its propagation by seed. "In August the seeds become ripe, and are plentifully produced on all seedling plants, although, like many other plants, but sparingly, and very frequently not at all, on such as have been long increased by offsets, or parting the roots; they may be sown in slight drills, about six inches asunder, as soon as ripe; and in the March following, they will make an appearance very similar to rows of young onions. With no other care than frequent weeding, they may remain in the seed-bed for three years, for they are much more hardy than most kinds of seedling bulbs, and, therefore, will not even require protection from the frosts. In August or September of the third year, it will be necessary to transplant them into beds, at one foot distance, row from row, and the bulbs six inches apart; and in two years from their removal, most of the strongest will shew blossom, and nearly all in the year following, or the sixth from the seed.

"If, during the time the roots are at rest, the top surface of the earth is carefully removed, and fresh light loam is substituted, a year will be saved, for this treatment will greatly promote the growth of the bulbs, and with these, as well as many other seedling plants, it is not a stated time that must pass before they blossom, but only such a portion as will allow the bulb to attain a size sufficient to contain vigor to produce and perfect a flower-stem, the rudiment of which is formed in the preceding summer. When they blossom, a selection can be made, and the varieties perpetuated by the increase of their offsets. The most proper time for removing the bulbs is in August and September, those kept out of ground until Christmas rarely blossom in the succeeding summer." *Hort. Trans.* iv. 413.

Flowering Bulbs. Every third year in August is the most proper time for taking them up, and they should, if possible, be replanted in September following. Masters says, "those kept out of ground till Christmas rarely blossom in the succeeding summer. They may be planted either in beds, at eight inches or a foot distance every way, or in mingled borders, care being taken in either case to prevent the roots running down by removal every third year, or by a substratum of tyles or compact rubbish within eighteen inches of the surface. These species are very hardy, and flowering so late as June, require no protection either in summer or winter. They are seldom or never forced.

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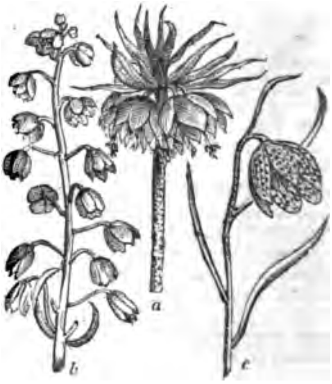

Subsect. 8. The *Fritillary.* — *Fritillaria*, L.; *Hexan. Monog.* L.; and *Liliæ*, J. (*fig.* 446.)

1634. Of this genus there are three species which are considered as florists' flowers; of these species there are numerous varieties.

The *Crown Imperial*, *F. Imperialis* (*Bot. Mag.* 194.) *La Couronne Imperiale*, Fr.; *Kaiserkrone*, Ger.; and *La Corona Imperial*, Ital. (*fig.* 446. *a*), has a scaly bulb, from which arise strong stems, from two to four feet in height, furnished with numerous broad shining green leaves, and crowned with a whirl of showy pendulous flowers, yellow, red, or striped in various ways, which appear in March and April. It is one of the earliest ornaments of the flower garden, producing a fine appearance in the middle of large borders, at a season when such flowers are most wanted. The "singular nectary," Professor Martyn observes, "cannot but engage the attention of the curious observer; it is a white glandular cavity, at the base of each petal, and has a drop of limpid nectarious juice standing in it, when the flower is in vigour. Another of the wonders of nature may be observed in the peduncles which bend down while the plant is in flower, but become upright as the seed ripens." There are above a dozen varieties in cultivation, distinguished by the different shades of yellow, white, and red in the flower, and by being striped double or semi-double.

The *Persian Fritillary*, *F. Persica* (*Bot. Mag.* 1537, and *fig.* 446. *b*), has a large round root, the size of an orange; the stem is three feet high, and the flowers in a loose spike at the top, forming a pyramid. They are of a dark purple color, and appear in May, but seldom produce seeds in England. It is a native of Persia, and was cultivated here in 1596. There is a smaller variety, with a shorter stem, and smaller leaves and flowers.

The *Common Fritillary* or *Checkered Lily*, *F. Meleagris* (*Eng. Bot.* 622.) *La Fritillaire Meleagre*, Fr.; *Kiebitzey*, Ger.; and *Giglio variegato*, Ital. (*fig.* 446. *c*), has a solid tuber, about the size of a nut, a stem from twelve to eighteen inches high, with linear leaves, and one or more pendulous flowers on the top of the stem. It is a native of Britain, and flowers in April and May, or in March in mild seasons. There are nearly twenty varieties, with red, white, purple, black, striped, and double flowers, besides an umbellate fritillary, a mule between this species and the crown imperial.

Propagation. The common method is by off-sets; but they may be raised from seed, which ripens readily, and is to be treated in all respects like that of the tulip, the seedlings of the crown imperial flowering in the fifth or sixth year, and those of the two other species in the third or fourth year

Culture of Flowering Bulbs. They delight in a light soil, not too wet nor very full of dung. It should be dug deep, and the bulbs may be planted six inches deep, and from eighteen inches to two feet distance every way; but they have the best effect in a mingled flower border. They need not be taken up above once in three years, when the stems are withered in May or June, and they should not be kept longer out of the ground than two months.

Subsect. 9. The *Lily.* — *Lilium*, L.; *Hexan. Monog.* L.; and *Liliæ*, J. *Lis*, Fr.; *Lilie*, Ger.; and *Giglio*, Ital.

1635. Of this genus there are sixteen species introduced in Britain, and the whole of them may be reckoned very choice flowers. We shall notice particularly, only those species, of which numerous varieties have been produced. These are:

The *White Lily*, *L. Candidum* (*Bot. Mag.* 278.), has a large scaly bulb, a leafy stem, from three to four feet in height, terminating in large pure white flowers on peduncles. It is a native of the Levant, and was in most gardens in Gerarde's time. Of this species, there are above eight varieties.

The *Orange Lily*, *L. bulbiferum*, (*Bot. Mag.* 36), has a scaly bulb, a leafy stem, two feet and a half high, terminating in orange-colored flowers. Sometimes the stem produces small green bulbs in the axillæ of the leaves. Of this species, there are eight or ten varieties and sub-varieties.

The *Martagon* or *Turk's Cap*, *L. Martagon*, (*Bot. Mag.* 893.), has a large scaly bulb, a stalk furnished with narrow leaves, near three feet high, and terminating peduncles of fine carmine flowers in July. Of this species there are half a dozen varieties, besides the scarlet martagon (*L. Chalcedonicum*), of which there are also different sorts.

Besides the above species and their varieties, there are the *L. Canadense*, *superbum*, or Turk's cap; the *Pomponium*, and *Tigrinum*, or Tiger Lily; all equally meriting cultivation as select flowers.

Propagation. This is almost always by offset bulbs; but new varieties may be raised from seed, which ripens in most sorts in August: being treated as directed for raising new varieties of the narcissus, the young bulbs will flower the fourth and fifth years.

Culture of Flowering Bulbs. The more common sorts, species, and varieties, will thrive in any soil and situation, even under the shade of trees. The Canadian, Pomponian, and Philadelphian martagons are somewhat tender, and require the protection of ashes or rotten bark in winter. They are generally planted in borders, and need not be taken up oftener than every three or four years in September, and replanted six inches deep in the October following. None of the species can be safely transplanted after they have pushed leaves without weakening them, so as to prevent their flowering for several years. This remark, indeed, will apply to most bulbous-rooted plants.

Subsect. 10. The *Amaryllis.* — *Amaryllis*, L.; *Hex. Monog.* L.; and *Amaryllideæ*, B. P.; *Lis-narcisse*, Fr.; *Narcissenlilie*, Ger.; and *Giglio Narcisso*, Ital.

1636. This is a splendid genus (lately subdivided into those of *Nerine*, *Coburgia*, and *Brunsvigia*, see *Bot. Mag.*), of which almost every species may be considered a select flower. The *A. amabilis*, *Josephina*, and *Vittata*, are reckoned the most splendid of bulbous-rooted plants; and the *A. formosissima*, or *Jacobea lily*; *Sarniensis*, or *Guernsey lily*; *Belladona*, &c. are less magnificent, but of very great beauty. Most of the species are green-house or stove-plants, and natives of the Cape of Good Hope, China, or South America.

Propagation and Culture. New sorts, as in similar cases, are procured by seed; but the most usual mode, as few of these plants have ripened their seeds in this country, is by off-sets from the flowering bulbs, removed yearly, or every time the bulbs are taken out of the ground.

The great art in cultivating these, and all other bulbs, is to procure vigorous leaves, as on these depend the quantity of nutritive matter prepared and deposited in the bulb, and consequently its ability to flower the following season. The circumstance of several of these plants, as the Guernsey lily, flowering in the autumn, and producing their leaves afterwards under the disadvantages of a winter's sun, is the reason why they have been hitherto cultivated with so little success in this country, and why we are obliged to import the bulbs annually from other countries. The observations of T. A. Knight on this subject are particularly valuable; they more immediately refer to the Guernsey lily, but they are equally applicable to all exotic bulbs.

"Bulbous roots increase in size, and proceed in acquiring powers to produce blossoms, only during the periods in which they have leaves, and in which such leaves are exposed to light; and these organs always operate most efficiently when they are young, and have just attained their full growth. The bulb of the Guernsey lily, as it is usually cultivated in this country, rarely produces leaves till September, or the beginning of October, at which period, the quantity of light afforded by our climate is probably quite insufficient for a plant, which is said to be a native of the warm and bright climate of Japan; and before the return of spring, its leaves are necessarily grown old, and nearly out of office, even when they have been safely protected from frost through the winter. It is, therefore, not extraordinary, that a bulb of this species, which has once expended itself in affording flowers, should but very slowly recover the power of blossoming again. Considering, therefore, the deficiency of light and heat, owing to the late period of its vegetation, as the chief cause why this plant so often fails to produce flowers, I inferred that nothing more would be required to make it blossom, as freely, at least, as it does in Guernsey, than such a slight degree of artificial heat, applied early in the summer, as would prove sufficient to make the bulbs vegetate a few weeks earlier than usual in the autumn.

" Early in the summer of 1816, a bulb, which had blossomed in the preceding autumn, was subjected to such a degree of artificial heat, as occasioned it to vegetate six weeks, or more, earlier than it would otherwise have done. It did not, of course, produce any flowers; but in the following season, it blossomed early, and strongly, and afforded two off-sets. These were put in the spring of 1818, into pots, containing about one-eighth of a square foot of light and rich mould, and were fed with manured water, and their period of vegetation was again accelerated by artificial heat. Their leaves, consequently, grew yellow from maturity, early in the present spring, when the pots were placed in rather a shady situation, and near a north wall, to afford me an opportunity of observing to what extent, in such a situation, the early production of the leaves in the preceding seasons had changed the habit of the plant. I entertained no doubt but that both the bulbs would afford blossoms, but I was much gratified by the appearance of the blossoms in the first week in July.

" From the success of the preceding experiment, I conclude that if the off-sets, and probably the bulbs, of this plant which have produced flowers, be placed in a moderate hot-bed, in the end of May, to occasion the early production of their leaves, blossoms would be constantly afforded in the following season: but it will be expedient to habituate the leaves, thus produced, gradually to the open air, as soon as they are nearly fully grown, and to protect them from frost till the approach of spring."

The Rev. W. Williamson has adopted the same rationale as T. A. Knight; and, with the aid of a glass frame, without artificial heat, brought bulbs which had flowered into a state to flower again after two winters. Had he applied artificial heat, he thinks one winter might probably have been sufficient. *Hort. Trans.* iii. 450.

A similar treatment of this bulb by the Hon. and Rev. W. Herbert has been attended with corresponding success. He says, " The only attention which the Guernsey lily requires here, (Spofforth, in Yorkshire), is to give it sufficient air while the leaves are growing, that they may be strong and dark coloured; to protect the leaves from frost, keeping the pots near the light, if under glass; to give a moderate and regular supply of water, and to leave the bulbs nearly dry, from the time the leaves decay, that is, about Midsummer, at latest, till the end of August, when the flower-buds should appear. If the bulbs are not left dry early in the summer, the autumnal shoot will be delayed, till the season becomes too cold for the proper growth of the flowers or leaves, and the natural course and vigor of the plant will be interrupted, after which it will require at least a year to repair the injury it will have received. Whenever the sprouting of the bulb is tardy, it should be assisted by placing it, for a short time, in a warmer situation. If the stigma does not expand so as to become, after a few days, trifid, it is a sign that the temperature is rather too low to suit the plant, and the leaves will probably not push freely without more heat. I have obtained seed from the Guernsey lily by procuring the blossom early in an airy situation." The *soil* Herbert recommends is a good yellow loam, without any manure; but he thinks " they will thrive in any wholesome compost, which does not canker their bulbs. They should be planted partly above ground, for the wet earth round their necks will prevent their flowering or thriving, and will even sometimes destroy them." *Hort. Trans.* iv. 177.

The same treatment, with very few exceptions, he adds, suits the whole of the bulbs included under amaryllis, as well as a number of other allied genera, as hæmanthus, pancratium, agapanthus, &c. Some species of these genera, as *Amaryllis longifolia*, W., and *Crinum Asiaticum Rox*, are natives of dry ditches that communicate at certain seasons with the water of the rivers in Bengal, where they root deeply in the mud. These species, and some others, Herbert found to succeed perfectly when plunged during summer in a pond. " Most of the crinums," he says, " are swamp plants, or or grow in river mud, and should be cultivated in our stoves, with a pan of water under them, the bulbs being raised above the earth, and stripped of all dead integuments. *Agapanthus umbellatus* flowers best when so treated; the *Amaryllis longifolia* (which, he says, should be *Crinum capense*), will, he has no doubt, " flower as a hardy aquatic, if planted in any pond or river of two feet water, not liable to freeze at the bottom." *Hort. Trans.* iii. 188.

Some account of the culture of the Guernsey lily in the Island of Guernsey is given by Dr. Macculloch (*Caled. Mem.* ii. 62.): there they grow it in the open air, and protect it with sand during winter.

Subsect. 11. *Ixiæ* and *Gladioli*, W.; *Trian. Monog.* L. and *Irideæ*, B. P.

1637. The *Ixiæ* and *Gladioli* include a number of recently formed genera (see *Bot. Mag.* and *Bot. Reg.*) of Cape bulbs which may be flowered in the open air, under frames, without bottom heat, or on shelves near the glass in green-houses. The Hon. W. Herbert, who has paid great attention to the culture of bulbs, is "persuaded that the African gladioli will become great favorites with florists, when their beauty in the open border, the facility of their culture, and the endless variety which may be produced from seed by blending the several species, are fully known, nor will they be found to yield in beauty to the tulip and ranunculus." *Hort. Trans.* iv. 154.

Propagation and Culture. They may either be propagated by seed or offset bulbs; by the former mode, Herbert has produced numerous beautiful varieties. The proper soil for these and similar bulbs is peat with sand: and in a bed of this compost, the seeds should be sown in spring, and well watered before and after they come up. "At the beginning of October, or as soon as the leaves wither, the young bulbs should be taken up and dried; they may be replanted again at any time, placing them about eight inches under ground, to prevent the frost reaching them. Next year they will generally flower." The best way of treating gladioli which are to be flowered in pots, is whenever the bulbs are potted, to plunge the pots about eight inches under ground in a bed of peat, and raise them nearer the surface in spring, as soon as the very severe frosts are over; or not to plunge them so deep, and protect them with moss leaves, rotten tan, &c.

Various other bulbous irideæ, and also oxalis, lachenalia, cyclamen, &c. may be successfully treated in a similar manner. *Herbert* in *Hort. Trans.* and *Maddock* in *Flor. Dir.*

Subsect. 12. The *Tuberose*. — *Polianthes Tuberosa*, L. (*Bot. Reg.* 63.); *Hex. Monog.* L.; and *Hemoracallideæ*, B. P. *Tuberose*, Fr. and Ger.; and *Tuberoso*, Ital.

1638. This is a bulbous rooted plant, with linear leaves of a whitish green, and stems four or five feet high, terminating in a sparse spike of white flowers, of very powerful fragrance. It is a native of India, whence it was first brought to Europe about 1524, and to England in 1629. It is generally cultivated in frames or the green-house, but in warm situations will flower in the open air. The tubers of this plant are annually imported from the warm provinces of North America and Italy, but, like those of the Guernsey lily, might, by proper treatment, as R. A. Salisbury has proved, be produced in this country equally fit for flowering. There is a double variety, which is in most esteem, but both are equally fragrant.

General Treatment. The bulbs are planted in pots of sandy loam in March or April, and brought forward in a hot-bed or hot-house till the flower-buds begin to appear. The plants are then removed to the green-house or the open air, or to halls or churches, as in Italy, where the cooler temperature procures a prolonged bloom.

Culture to produce Flowering Roots. The following is the process followed by R. A. Salisbury, by which he produced for many years in the open air at Chapel Allerton, flowering bulbs equal to those imported. The situation he preferred, was a dry warm border; in this he made an excavation two or three feet deep, and of any convenient length and width; about the middle of April, he filled this pit with fresh stable dung, and covered it with light sandy earth; then, on the bed so formed, the small lateral roots, or those from foreign bulbs, or from those which had flowered in this country the preceding year, and been preserved through the winter in sand, were planted at five inches' distance every way, the upper part of the tuber being just covered with earth. The bed was protected from nightly frosts and heavy rains, little or no water was given, but when the leaves were an inch long, a little fresh compost was added to the surface. In June and July, when the leaves were in full vigor, it was watered copiously after warm days; but in autumn and the beginning of winter, it was carefully protected from heavy rains. In the beginning of December, the decayed leaves being removed, the bed was thatched over a foot thick with dry straw, sloping it well to throw off the wet; or covered with a frame and litter. In February the roots were taken up, preserving their fibres, and packed in dry sand in a cellar where the cold could not penetrate, till April, when their fibres being shortened in proportion to their decay, and all the offsets excepting one or two on each bulb being removed, they were replanted as before. A few strong roots flowered in this second year. In the succeeding winter the bed was thatched as before, and in February the roots were taken up for forcing, or any of the purposes for which tuberose roots are grown.

By this process bulbs were produced equal, if not superior, to those imported; and therefore the author thinks their culture might become an object to the commercial gardener, especially in the southern counties near the sea, and in the vicinity of London. The great object, he says, is to obtain "a sufficient degree of heat in summer to bring the leaves out to their full magnitude, that of the roots following of course. The theory," he adds, "which I would recommend any intelligent gardener to adopt in its general management is, to keep the roots growing as vigorously as possible from May to October, but in a state of complete rest and drought for the remainder of the year." *Hort. Trans.* i. 53.

Subsect. 13. The *Paeony.* — *Paeonia*, L.; *Polyan. Dig.* L.; and *Ranunculaceae*, J. *Pivoine*, Fr.; *Päonie*, Ger.; and *Peonia*, Ital.

1639. Most of the species of this plant introduced in this country may be considered as select flowers; but that which has been longest cultivated is the *P. officinalis* (*Bot. Mag.* 1784.) The roots are composed of roundish tubers, the stalks of the leaves rise between two and three feet high, and terminate in large red or purple flowers, which appear in May. The leaves are composed of many unequal lobes, variously cut into many segments. It is a native of Switzerland, Dauphine, and other parts of Europe, and also of China and Japan; and was cultivated here in 1562. The roots were formerly much used in medicine.

Varieties. Originally the common paeony was said to be of two sorts, male and female, the flowers of the former being smaller and lighter colored than those of the latter. These distinctions, which had no sexual allusion in this case, the paeony being hermaphrodite, are now laid aside, and the varieties of *P. officinalis* have been reduced by J. Sabine (*Hort. Trans.* ii. 273.) to the following:

The *double red*, the most common, and formerly highly prized; being, when introduced at Antwerp, near 250 years ago, sold for twelve crowns.
The double flesh-colored.
The double white.
The double fringed.
The double white Chinese.
The double sweet-scented Chinese. (*Hort. Trans.* vol. ii. pl. 15.)
Whitley's double white Chinese.

Propagation and Culture. By seed from the single and semi-double sorts for new species, and by dividing the roots for ordinary purposes. Miller directs to sow the seeds which ripen in September, immediately afterwards in light fresh earth, covering them half an inch. They will come up the following spring, and may remain in the seed-bed two years before they are transplanted, sifting a little rich earth over them when the leaves decay at the end of the growing season. Having made two years' growth in the seed-bed, they are to be transplanted in September into other well prepared beds of light fresh earth, and placed six inches asunder every way, and three inches deep. Here they are to remain till they flower, which is generally the fourth or fifth summer after sowing.

Full-grown Roots are readily propagated by parting, taking care to preserve a bud on the crown of each off-set. The plants are very hardy; they will grow in almost any soil and situation, and even under the shade of trees, where, Miller says, they continue longest in beauty. They are chiefly planted in flower-borders, and form a splendid ornament both to the parterre and shrubbery.

Subsect. 14. The *Dahlia.* — *Dahlia superflua* and *D. frustranea*, H. K. (*Cav. Ic.* i. t. 80. and 266.); *Polyg. Super.* L.; and *Corymbiferae*, J.

1640. The roots are tuberous and fasciculated; the stems rise from five to eight feet, covered with large compound leaves, resembling those of the common dwarf elder, and with side branches bearing numerous flowers of a great variety of colors, which appear in August, and continue till destroyed by frost. The plant grows wild in Mexico, in sandy meadows, and was sent to Madrid in 1789, and thence to England in the same year; but the plants being lost, seeds were reintroduced by Lady Holland in 1804, and from these and some plants imported from France during the peace of 1814, the present extensive stock of dahlias has originated. Till this last period they were much more cultivated in France and Germany than in England, and more especially by the Count Lebeur, at Paris, and M. Otto, at Berlin. At present the dahlia is the most fashionable flower in this country, and the extent of its culture in some of the nurseries, especially that of J. Lee, is truly astonishing. Nor is this to be wondered at, as Sabine observes, for, independently of the great beauty and diversity of the flowers, they are in perfection at a season when, till they came into notice, our gardens had but little ornament. The roots are edible, but not agreeable.

Varieties. The leading varieties of the fertile-rayed species *D. superflua*, are, the purple, rose, pale, white, sulphur, yellow, tawny, copper, brick red, dark-red, pomegranate colored, dark purple, very dark, and lilac flowered single, semi-double, and double, with innumerable sub-varieties.

Of the barren-rayed species, *D. frustranea*, there are the scarlet, bright-scarlet, orange, saffron, and yellow flowered, single, semi-double, and double, with several sub-varieties, though this species has not sported nearly so much as the other.

At the Hammersmith nursery, above 200 sorts may be procured.

Propagation. By dividing the roots, and by cuttings for ordinary purposes, and by seed for new varieties, and also for increasing the stock of this plant, as the seedlings flower the first year. In dividing the root care must be had to preserve a bud to each section, otherwise, though the tubers will throw out roots, they will not produce leaves.

Criterion of a good Dahlia. The plant short, stiff, and bushy, polific in flowers having short peduncles; the flower well expanded and standing boldly to the view, and the colors clear and distinct.

By Cuttings. Take these from the root-shoots in spring, or the tops of the young shoots, as early in summer as may be; cut the lower end smoothly off in the middle of a joint, and leave the leaves on the top, excepting such as would be buried in planting the cutting. Plant in sandy earth on heat, and cover with a hand-glass, and they will strike and produce both flowers and tubers before the autumn.

By Seed. The following directions are extracted from an excellent paper on this subject (*Hort. Trans.* iii. 238.) by J. Sabine.

Collect the seeds in September from the dwarf plants, where no preference exists on other accounts, and from semi-double flowers when double varieties are chiefly desired. Perhaps seeds obtained from those particular florets of the disc which have altered their form, may have a greater tendency than others to produce plants with double flowers. Sow in March, or earlier, on a heat of 55° or 65 ; the young plants to be pricked out, if necessary, in pots, and kept in a moderate temperature, say 50° or 55°, till the end of April. Now plant out where they are to remain, covering each plant at night with an empty pot for some weeks, to avoid injury from spring frosts. If in a compartment by themselves, plant in rows three feet wide, and at two feet distance in the row: if in the flower-border, plant in the back rows. In either case they require to be staked. Seedlings thus treated will blow in July, and continue in perfection till the autumn; but the first frost takes the same effect on the dahlia as it does on the potatoe and kidney-bean. A blow may be prolonged by planting in large pots and removing early in autumn to the green-house.

Soil and Situation. Dahlias thrive best in rich loam, and a clear open space, neither sheltered by trees or walls. Like the potatoe, they exhaust the soil considerably, and do not thrive well when repeatedly planted on the same spot.

Planting full-grown Roots. These may either be planted on the spot where they are to flower, early in April, and protected by covering with litter or by empty pots, as in transplanting seedlings; or, when an early blow is wanted, they may be planted in large pots and forwarded in frames or pits, or in any spare house, with a temperature equal to that of the green-house, till the middle of May, when they may be planted where they are finally to remain, and will flower in June. J. Sabine says, " Dahlias look best in a large mass, unmixed with other plants; in this plan of growing them, some nicety is required in the due distribution of the sorts, so as to have a proper and good mixture of colors; and particular care is necessary to keep the tallest plants either in the centre or at the back of the clump, according as it is destined to be viewed, from one side only, or all sides, and to place the whole so that there shall be no unevenness in the general shape of the entire mass, arising from the irregular arrangement of the individual plants, according to their respective heights. The roots should be planted about three feet from each other every way; this distance will keep each sufficiently distinct, and yet so united that the whole clump will have the appearance of an unbroken wood or forest of dahlias. They look very handsome if planted in the manner of an avenue, in a straight line, on each side of a walk."

General Culture. No particular care is requisite after the plants are neatly tied to stakes, till they have been attacked by the frost, they should then be cut down and the roots covered with as much haulm, old tan, or leaves, as would be necessary to keep the frost from the tubers of a potatoe-plant left in the soil. If this is done, they will blow well and early next season. But the most general way, especially with the valuable sorts, is to dig up the roots with a portion of the stem attached, and plant or bed them in pots or boxes among sand or dry mould, and keep them under the stage of a green-house, or in some dry airy place, free from the access of frost, till the spring. On a large scale, they may be pitted like potatoes, or packed in ridges with sand in cellars, and covered with straw; the object being to keep them sufficiently moist and plump to maintain the living principle, and yet not to rot them, or have them destroyed by frost.

SUBSECT. 15. The *Auricula.* — *Primula Auricula*, L. (*Jac. aus.* 5. t. 415.); *Pent. Monog.* L.; and *Primulaceæ*, B. P. *Oreille d'ours*, Fr.; *Aurikel*, Ger.; and *Orecchio d'orso*, Ital. (*fig.* 447.)

1641. All the species and varieties of primula are beautiful, but the auricula greatly excels. It is a small fibrous-rooted plant, with fleshy succulent leaves, generally mealy on the edges; a native of the mountains of Switzerland, Austria, Syria, and the Caucasus, &c. We have gathered it in abundance near the post-house on the Simplon road. It was cultivated by Gerarde in 1597, under the name of bear's-ears, or mountain cowslips. To show what cultivation may perform on this plant, Professor Martyn relates, from Morant's Colchester, (pub. 1768), p. 92, that Henry Stow, a gardener, near that place, a famous grower of auriculas, had some plants with no less than 133 blossoms on one stem.

About a hundred years ago the passion for this flower in England was much greater than at present; and, as Justice remarks, we supplied the Dutch, who afterwards, till the late war, used to re-supply us with the progeny of our own flowers. Justice was the most enthusiastic cultivator of the auricula, and indeed of all florists' flowers of his time. After him the Lancashire growers are next to be distinguished, and more especially J. Maddock, the well-known author of the Florist's Directory, originally from Warrington. Emmerton is, at this time, one of the most enthusiastic admirers of this flower; and the best collections are to be found among the commercial gardeners near London, and the operative manufacturers and artisans near Manchester, Paisley, and other large towns. It is like the tulip, pink, &c., a poor man's flower, and a fine blow is rarely to be seen in the gardens of the nobility and gentry.

Varieties. — The colors of the flower in its wild state are yellow, purple, and variegated. Gerarde figures the yellow, purple, red, scarlet, blush-colored, and bright-red, most of which grew in the London gardens in his time. Parkinson, in 1629, enumerates 20 varieties, and says many more were to be found. Rea, in 1702, has an increased number, classed as purples, reds, yellows, and whites. In 1792, the catalogue of J. Maddock contained nearly 500 named varieties, divided into *Agioises* selfs or plain one-colored sorts, double flowers, and painted or variegated sorts. The latter only are held in esteem, and few collections contain more than two or three selfs of the fundamental colors, and as many double flowers. Double varieties are not in esteem.

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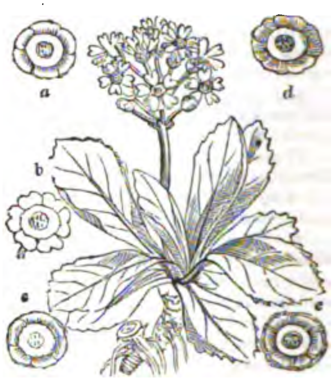

Criterion of a fine Variegated Auricula, (*fig.* 447. *a, b, c, d, e.*) "The stem should be strong, erect, and elastic, and of a proper height, that the bunch or truss may be above the foliage of the plant. The peduncles or foot-stalks of the flowers should also be strong and elastic, and of a proportional length to the size and quantity of the pips, which should not be less than seven in number, that the bunch may be rather round, close, and compact. The component parts of the pip are the tube, (with its stamens and anthers); the eye, and the exterior circle, containing the ground-color, with its edge or margin: these three should be all well-proportioned, which will be the case if the diameter of the tube be one part, the eye three, and the whole pip six, or nearly so. All the admirers of this flower agree that the pips ought to be round; but this seldom happens; and we must be content if they are so nearly round as not to be what is termed starry. The anthers, or summits of the stamens, ought to be large, bold, and fill the tube well, and the tube should terminate rather above the eye; the eye should be very white, smooth, and round, without any cracks, and distinct from the ground or self-color. The ground-color should be bold and rich, and equal on every side of the eye, whether it be in one uniform circle, or in bright patches; it should be distinct at the eye, and only broken at the outward part into the edging; a fine black, purple, or bright coffee color, contrast best with the eye; a rich blue, or bright pink, is pleasing, but a glowing scarlet, or deep crimson, would be most desirable, if well edged with a bright green; but this must seldom be expected. The green edge, or margin, is the principal cause of the variegated appearance in this flower; and it should be in proportion to the ground-color, *i. e.* about one half of each. The darker grounds are generally covered with a white powder, which seems necessary, as well as the white eye, to guard the flowers from the scorching heat of the sun's rays, which would soon destroy them if they were exposed to it."

Propagation. By rooted slips, or dividing the root for continuing approved sorts, and by seed for obtaining new varieties. The best time for taking off slips, or dividing the root, is after the plant has done flowering and ripening its seed, if this last is permitted. The operation is therefore generally performed in July and the beginning of August. Emmerton says, the Lancashire growers will not take off, or sell a slip before the 5th of August, on which day they begin to execute orders for young plants.

By Seed. Maddock says, "the surest and best method to obtain fine auriculas from seed, is to provide young, healthy, and strong plants, of capital high-colored sorts, possessing first-rate properties; these, on the approach of bloom, should be detached from the rest to a remote part of the garden, and there exposed to the sun, air, and rain, when the last is in moderation; but if in excess, they should be preserved from it by mats on hoops, or small hand-glasses may be placed over them. In dry weather, they must be regularly watered, as often as they appear to require it; for much depends on a due attention to this particular point."

Emmerton is a warm advocate for raising the auricula from seeds, and says, any one who will follow his directions may be certain of raising very fine sorts. He selects the flowers he intends to breed from, according to the properties he desires in the offspring. Thus, he advises to procure the following sorts, sufficiently well-known to the London and Manchester florists, and to plant them in pots; six plants of two sorts in each pot, viz.

For breeding *light-green or grey-edged seedlings.* — A pot with 2 of Barlow's king and 4 of Grimes's privateer; one with 2 of Barlow's king and 4 of Butterworth's Lord Hood; one with 2 of Barlow's King and 4 of Kenyon's ringleader.

For breeding *fine grass-green or clean green-edged seedlings.* — Pots with six plants in each, viz. 3 of Barlow's king, 3 of Pollit's Highland boy; 3 of Barlow's king, 3 of Buckley's jolly tar; 3 of Barlow's king, 3 of Warris's Prince Blucher; 3 of Barlow's king, 3 of Stretch's Emperor Alexander.

For breeding *fine choice tinted violet ground-colored seedlings* with green edges. — Pots with six plants in each, viz. 3 of Bearless's superb, 3 of Foden's victory; 3 of Bearless's superb, 3 of Warris's Prince Blucher; 3 of Bearless's superb, 3 of Chilcot's king.

For breeding *fine white-edged seedlings.* — Pots with six plants in each, viz. 3 of Schooley's Mrs. Clarke, 3 of Taylor's incomparable; 3 of Schooley's Mrs. Clarke, 3 of Crompton's Admiral Gardner; 3 of Schooley's Mrs. Clarke, 3 of Popplewell's conqueror; 3 of Schooley's Mrs. Clarke, 3 of Wild's black and clear.

Each of these pots is to be set apart, and at a distance from all other auriculas before the flowers have expanded, to prevent accidental impregnation, and to be kept so detached till auriculas in general are out of flower. They may be then placed on a platform of scoria or tyles, there to remain till they have ripened their seeds.

The seed will commonly ripen in June and July, and is to be gathered in single capsules as it ripens, and kept in them till the sowing season, which is January or February, according to Maddock; and from the middle of February to the 10th or 12th of March, according to Emmerton. Maddock sows in boxes, covers as lightly as possible, and sets the boxes in a hot-bed; preserving a moderate and equal degree of warmth both day and night, admitting fresh air occasionally. The advantage of this mode is, that it forces every live grain into vegetation in about three weeks, if the warmth of the bed be properly kept up; whereas, by the more usual mode of exposure to the open air, the greater part does not vegetate till the second year; and the weaker seeds, which are probably the most valuable, seldom vegetate at all.

"The earth and seed must always be kept moderately moist, but never very wet; the best method of watering it, is by means of a hard clothes'-brush, dipped into soft water, which has had its chill taken off by standing in the sun, the hair side being quickly turned upwards, and the hand rubbed briskly over it, will cause the water to fly off in an opposite direction, in particles almost as fine as dew; a sufficient watering may, in this manner, be given in a few minutes. If the surface of the earth in the box is inclining to become mossy or mouldy, it must be stirred all over very carefully with a pin, about as deep as the thickness of a shilling. At the expiration of three, four, or at most, five weeks, the young plants will all make their appearance; it then becomes necessary to give them very gradually more air, in order to harden and render them fit for an entire exposure to it, which they will be able to bear in a fortnight or three weeks afterwards; at which time the box should be taken out of the frame, and placed in rather a warm situation, though not too much exposed to the sun, till towards the end of April, when it may again be removed to a cooler aspect, where it can only receive the sun till nine o'clock in the morning; and in May, if the weather is hot, it should be placed in the most cool and airy part of the garden, not neglecting, at any time, to keep the earth moderately moist; but at the same time preserving it from violent rains whenever they occur. As soon as any of the plants appear with six leaves, such should be taken out from the rest, and transplanted into other boxes, filled with the compost, about an inch and a half or two inches asunder; and when they are again grown, so as nearly to touch each other, they may be a second time transplanted into larger boxes, or round small pots, at the distance of three or four inches, where they should remain till they blow, which will generally happen the following spring, perhaps before they have acquired any considerable size; and then such as appear to be possessed of merit should be marked, and the inferior ones destroyed. As soon as the bloom is over, such as have been marked should be taken up, and planted separately in small pots, and be taken the same care of as other auriculas, till they blow again; at which time their respective merits and properties may be ascertained with more accuracy. Such weakly plants as are not able to blow the first or second year, ought nevertheless to be carefully preserved; for amongst these it often happens that the most valuable flowers are found. A great proportion of the seedlings, although the seed was saved from the best flowers, will be plain-colored, or selfs, which, unless possessed of excellent properties in other respects, or being singularly beautiful in their colors, are of no value, but as common border-flowers."

Emmerton sows in small pots, about six inches over the top, and six deep, filled half-full with coal-ashes or cinders, for the sake of drainage. He covers as thinly as possible with the auricula compost, then puts on a bell-glass, and places the pots in a situation quite excluded from the sun, except in the morning. The bell-glass, he says, will cause the seed to vegetate much sooner, and by pouring the water over the top of it, the earth in which the seeds are will receive sufficient moisture, so that there will be no occasion to remove it. "If convenient," he says, "I would recommend the front of a green-house, or a cool frame, for the seed-pots to be placed in, but by no means a hot-bed; or if not that accommodation, a hand-glass, having tiles or slates placed underneath, to keep the worms out of the pots; great care being taken to keep the earth in a regular moist state. In about four or five weeks, perhaps three weeks, if in a green-house, the seeds will break ground; and when the leaf begins to appear, you must take care by degrees to admit air." After this, his treatment of the young plants till they flower, is essentially the same as that recommended above by Maddock. All *pin-eyed* flowers, or such as show only the stigmas and not the anthers, he throws away as of no value, either as border-flowers or select sorts.

Hogg says, auricula seed may be sown either in pots, or in the open air about the 1st of March, and covered with a hand-glass. When the plants will bear transplanting, he removes them into pots of the smallest size, one in a pot.

Soil. The different composts used by florists in growing this flower, are almost as numerous, Hogg observes, as the florists themselves. "Persons often take extraordinary pains, and incur unnecessary expence, to injure, if not destroy, their flowers. Weak minds are soon misled by quackery and novelty, having no sound judgment of their own; and quackery, even in the growing of flowers, has as many followers as in any other line." *Treatise, &c.* p. 103.

The compost recommended by Maddock is as follows: "One-half rotten cow-dung, two years old. The cow-dung produced near London is more crude and gross than that of the country, occasioned by the difference of food on which the animal subsists; it of course requires longer preparation and exposure to the atmosphere than the latter, but two years and a half will be found sufficient for it in its grossest and most crude state. One-sixth fresh sound earth, of an open texture. One-eighth earth of rotten leaves. One-twelfth coarse sea or river sand. One twenty-fourth soft decayed willow wood. One twenty-fourth peaty or moory earth. One twenty-fourth ashes of burnt vegetables." This compost is to be thoroughly incorporated and exposed to the air in an open situation for a year before it is made use of.

Good compost, Emmerton observes, is "the food, the very life of the auricula;" it must be very rich, and properly tempered and sweetened by the sun, frost, and air. His materials are goose or pigeon-dung, night-soil, sugar-baker's scum, yellow loam, or loam from such land as will grow good crops of wheat, and sea-sand. He does not use salts of any kind, which are, no doubt, supplied by the sugar-baker's scum, that substance being chiefly blood, lime-water, and oily matter. He gives various proportions, all of which he found successful; in some, night-soil and sand are wanting, thus: three barrows-full of goose-dung steeped in blood from butchers; three barrows-full of sugar-baker's scum; two barrows-full of fine yellow loam: or, two barrows-full of goose-dung, steeped in blood; two barrows-full of scum; two barrows-full of night-soil; and two barrows-full of fine yellow loam. These composts require two years' preparation; in the first, they are mixed up in a hole in the earth; and in the next, turned over every month in an open, exposed situation, so as every part may be thoroughly frozen in winter, and heated by the sun, and penetrated by the air in summer. Those composts, he says, he used with very great success, though they contained no sand. He next introduces that material thus: four barrows-full of loam, steeped in night-soil and urine; two barrows-full of goose-dung, mixed with blood; two barrows-full of sugar-baker's scum, and two pecks of sea-sand: or, two barrows-full of night-soil; one barrow-full of cow-dung; one barrow-full of fine yellow loam; and one peck of sea-sand: or, two barrows-full of night-soil; two barrows-full of goose-dung; two barrows-full of cow-dung; two barrows-full of fine yellow loam; and two pecks of sea-sand. Great stress is laid on the blood, which, "when rotted down with other manure, does wonders beyond all idea;" but unless the above composts are "stirred and turned over frequently, it will poison and rather kill and destroy your plants, than nourish them. Rendered sweet and wholesome, it will be the means of throwing brilliant colors into the pips or petals, and of giving life and vigor to the plants, as much as fine old port or rich Madeira wine does to the human constitution. *Cult. of the Auricula, &c.* p. 77.

"The late *Peter Kenny*," Hogg observes, "gardener by profession, was, perhaps, one of the most successful and eminent growers of auriculas in his day, and who won as many prizes as most men, during the course of ten or twelve years that he lived at Totteridge, in Middlesex. He certainly had all the benefit of air, situation, and soil, which, coupled with his fondness for the flower, and his skilful treatment of it, to (say nothing of his being almost constantly in the garden,) gave him a decided superiority over many of his competitors, and insured as it were his chance of success. He always kept by him a quantity of sound staple loam, of rather a sandy nature; this he sweetened, by frequent turning. His next principal ingredient was sheep-dung and hay-litter, obtained from the sheds used to rear early lambs, well rotten, by being turned, mixed, and fermented in the same manner as the gardener does horse-dung and straw-litter. His proportions were one-third, loam; two-thirds, sheep-dung and hay-litter; one-tenth, coarse sand. These formed his compost for growing them in; but he had another of a richer quality, if I may so term it, with which he used to top-dress his plants, and this he would do sometimes twice in the year. When they killed any sheep, he always reserved the blood, and mixed it with the dung of poultry. These two ingredients he added to his loam and sheep-dung, and these constituted his compost for surface-dressing." (*Treatise, &c.* 104.) This compost was employed and much approved of in the Hammersmith nursery.

The *Lancashire growers*, Hogg informs us, "use horse-dung and cow-dung indiscriminately, sometimes mixt, sometimes apart; the dung of poultry most frequently, and old decayed willow wood, when they can get it, with the mould cast up by moles, taking care that the same be properly mixed, sweetened, and pulverized. In winter, they throw it up in narrow ridges, and when the top of it is frozen, they take it off, and so continue to do, till the whole of it has been frozen."

Justice gives the culture of the auricula in a "hitherto-unattempted manner, and which, although repugnant to the rules given by our cultivators of auriculas, I shall here insert, as the only true method to procure a fine blow of auriculas, such as I had this last spring, 1762; which, to the sight of numbers of spectators, exceeded all the blows of any auriculas ever seen in Scotland, in England, or in Europe; which was composed of the most capital flowers in England and Holland, and some very fine new seedlings of my own raising."

The soil he recommends, is: one half free, fresh loam, from under an old pasture; one half composed of the following parts, viz. three parts three-years' old cow-dung; and one part sea or river-sand: no horse-dung to be used, and the ingredients not to be mixed together till a few days before being made use of: "for otherwise, when they are mixed for some time, they breed vermin and worms." He adds, "if you use fuller's-earth to them, it must be done in the proportion only of an eighth part, and at no time but in the spring dressing; for if used in autumn, it is prejudicial; and even when it is used in spring, it must be well dissolved in warm water before being used, and then use no sand." *Brit. Gard. Direct.* art. *Auricula.*

S. Curtis, in a note to the last edition of Maddock's work, says, "We have seen the strongest auriculas produced from the following ingredients; two-thirds of the rotten dung from old hot-beds reduced to fine mould; one-third containing equal parts of coarse sand and peat or bog earth, such as is used in the culture of heaths, mixed well together by shifting or screening, and suffered to be well aired by frequent turnings during the frosts of winter." *Florist's Direct.* 161.

The compost in most *general use* among auricula growers is of fresh loamy soil and perfectly decomposed cow-dung, equal parts of each, adding one-tenth of the mixture of sea or river sand. Some use leaf-mould instead of cow-dung. The whole incorporated and prepared for one summer and one winter before using in the usual manner.

Manner of Growing. The common sorts are grown in beds or in mingled borders; but all the fine flowers in pots. Maddock recommends pots of six inches and a half interior diameter at top, seven inches deep, and the interior bottom diameter four inches, for full-grown flowering plants; and smaller sizes for seedlings and newly-separated off-sets.

Emmerton uses pots for large blooming plants, eight inches high, five inches and a half diameter at the top, and four inches and a half at the bottom outside measure.

Time of Potting and Transplanting full-grown Plants. The most advisable time to pot auriculas, according to Maddock, "is immediately, or soon after bloom, and this should be repeated annually (notwithstanding the opinion of some who say the plants bloom better the second year after potting) for this obvious reason, that it preserves the health and constitution of the plants, by affording them a fresh supply of nutriment; and at the same time the cultivator has an opportunity of curtailing their fibres, if grown very long, or of cutting off the lower part of the main root, if too long, or the end of it, if decayed; thereby forcing the plants, as it were, into a state of action, and causing a continued circulation of their juices, during the summer, in the formation of new fibres, for their necessary sustenance and support: whereas, if this operation of potting is not performed till the second year, the soil must have lost a considerable part of its nutritious quality, which will produce a proportionate decline in the strength of the plants: and if it be deferred till the autumn, there will not be time for a sufficient reproduction of the fibres before winter sets in, the effects of which will be a faint-colored and weak bloom the ensuing spring.

"The only objection of any importance, against spring-potting, is, that some sorts will in consequence be more inclined to blow in the following autumn, and thereby deprive the plant of its capacity to bloom well the ensuing spring; this, however, occurs but in few instances.

"In potting or transplanting auriculas, the plant should be carefully turned out of the former pot, and the earth shaken from its fibres, which should be curtailed if found too long and numerous, together with the lower end of the main root, and the fibres attached to that part, if it appears too long, or somewhat decayed; the plant is to be at the same time carefully examined, and wherever any unsoundness appears, it must be entirely eradicated by means of a sharp penknife, let the extent of it be ever so great, till no appearance of decay remains; particularly in that part of the main root where it enters the surface of the earth, or as the sailors phrase it, betwixt wind and water, which being alternately wet and dry, is more subject to decay than any other part, and for the same reason is the most difficult to heal: the wounded part should be immediately exposed to the sun, and when the surface of the wound is perfectly dry, a cement should be applied, consisting of bees'-wax and pitch, about one-half of each, warmed and softened in the sun, or by a fire, to make it adhere more firmly on application: this will become close and hard when cold, will resist moisture, and is the best application yet discovered, to prevent further progress of the decay. Whenever the lower leaves of the plant, next the surface of the earth, become yellow, or dried up, it is proper to strip them off, in a direction downwards. On replanting, a pot suitable to the size of the plant is to be selected; it is to have a hollow oyster-shell placed with its convex side upwards, over the hole at the bottom, and then to be about three parts filled with compost, higher in the middle than at the sides: the plant is next to be placed thereon, with its fibres regularly distributed all round, so as nearly or quite to reach the sides of the pot, which is afterwards to be filled up with the compost, adding a little clean coarse sand close round the stem of the plant, on the surface: the bottom of the pot should then be gently struck two or three times against the table, which is supposed to be made use of for the sake of convenience in the operation, in order to render the soil more firm and compact; this will cause it to sink or subside about half an inch below the top of the pot, which will prevent the loss of water when it is administered.

"The true depth to plant an auricula, is within about half an inch of the bottom of its lowest or outside leaves; as the new and most valuable fibres proceed from that part, so they should immediately meet with earth to strike into, or otherwise they will perish: it will likewise encourage the off-sets, if there be any, to strike root sooner than they would do if not in contact with the soil." *Florist's Direct.* 129.

On the foregoing directions, by Maddock, his editor, S. Curtis, has the following note: "Notwithstanding the author has so particularly recommended the annual fresh potting of auriculas, we must beg leave to differ in opinion from him, as far as relates to those plants which are intended to bloom strong the following spring, the mode of potting advised being to shake the whole of the earth from amongst the fibres of the plant, in order to examine the lower end of the main root, this severe operation being performed in the spring, when the plants ought to be making their most luxuriant growth will have evil consequences. The case is simply this: the plant being firmly established, nature intends its greatest growth in the spring; during this rapid growth the operation gives an unnatural shock to vegetation; the consequence is, the plant must remain dormant until fresh fibres are formed sufficient to draw nourishment for supporting the growth necessary to form a strong-blooming plant. Having given our opinion against it, we substitute the following recommendation: select those plants intended for strong blooms the following spring from the younger ones, turn them out with their balls of earth entire, and if the fibres are healthy, return the balls into a set of pots one size larger than they were in before, adding new compost to fill up: we have no objection to remove as much earth as can be done without disturbing the mass of fibre; in this state treat them as usual, and when those which have bloomed strong on this plan are out of bloom, pot them on the plan recommended by the author. We beg leave also to notice that it sometimes happens that the oyster-shell placed at the bottom of the pot by fitting too close confines the water in it, which is inevitable destruction to the plant; we should advise particular care to be taken for the effectual drainage of a superabundance of wet, by putting two or three pieces of broken pot over the surface of the bottom."

Emmerton disapproves both of spring and autumn transplanting, and says, "the best time for the operation is soon after they are out of bloom; say about the 22d or 23d of May;" but he adds, "I have transplanted my flowers with great success from the 29th of May to the 12th of June, even also as late as the 13th of July. On no account remove a general collection a week later, at least, those you intend to bloom very strong: by this means they will have three or four months to get well-rooted before winter, which they ought to have; and if you transplant them early in the spring, it will be so near their time of blowing, that the check they will receive by transplanting will prevent their blooming strong. Strong blowing roots should not be removed more than once in two years; to do it oftener would be to run a risk of not having any fine flowers to exhibit on your stage: because these plants never thrive rightly, till the roots have reached the sides of the pots, and it seldom or never happens that they get sufficiently well established in a full-sized auricula pot, in one year. By no means remove your large blooming auricula plants in dry, hot weather, as by shaking the mould clean out of the plant the roots will not freely draw fresh fibres, except the weather is inclined to be showery, and what is termed a cool moist air. I am satisfied dry hot weather is an improper time, except they are fine young maiden plants, in small pots, which should be slipped out of the pot with the whole ball of earth, and then immediately planted in a full-sized blooming-pot for the ensuing season; in this last case I used to pay no attention whatever to the dry weather. If your large blooming plants have not been removed for two or three years, their small roots will have filled the pots, and probably their large, or what is called by some the carrot root, may be grown so long as to require shortening; in this case the plant must be taken out of the pot, and the earth entirely shaken from it; you will see what is necessary to be done; shorten the carrot root, if necessary, for if you suffer it to remain too long, it will either get rotten at the end, and always keep the plant weak, or will be too long for an ordinary pot; besides, it would want shifting every year, and never produce fine strong flowers. Reduce their small roots to about ten or a dozen, leaving those that are nearest the leaves; they will be sufficient again to support and vegetate your plant. If you perceive any canker or rottenness in the root, cut it boldly to the quick, till it appear fresh and lively, and no spots or symptoms of decay remain; put on the wounds a little mastich, bees'-wax, turpentine, and white rosin, in equal parts, to heal and dry them; leaving as many fibres to it as possible.

" If a large blooming plant, or any other one you remove, has been in the pot but one year since it was last transplanted, you must slip it out of the pot with all its earth about it, and although its fibres may have reached the outside, they will not be so large and numerous, or so matted together, as the older plants that have remained in one pot two clear years. You need not therefore shake the earth from it, but with a sharp knife cut the fibres and earth away till you reduce it to the size of a cricket-ball, or rather larger, as much depends on the size and age of your plant." *Treatise*, 132.

Hogg recommends the first week in August, because " if you put your plants at this early period of the summer into pots, in which they are to remain till they flower again next spring, the space of nearly twelve months, the strength of the compost must be greatly reduced before that time, particularly as they require so much watering during the hot months of June and July; this must tend, beyond all doubt, to exhaust the nutriment contained in so small a body of earth, as is in the pots; by which means they will be less able to throw out strong fibres, or to produce you strong blooms in the spring.

" Early potting is attended with another evil consequence; for, the plants being removed into fresh and more vegetative earth, accompanied with daily waterings, forces them prematurely into a state of active vegetation, and causes them to flower late in the autumn, a circumstance which the florist always views with regret, as it in a great measure destroys his hopes of a fine bloom at their natural and expected season, towards the latter end of April: this last argument of itself appears to me quite conclusive in favor of late potting. The slips or off-sets will also have acquired more strength and better roots, by being suffered to adhere to the parent plant till the beginning of August, and will occasion you less trouble in protecting and shading them. From the beginning of August to the beginning of November, is a period quite long enough for the plants to strike fresh fibres, and to get well-established in the pots, before winter; and, with the return of spring, you may expect a vigorous growth of the plant in all its parts. The customary mode is, to shake the mould completely from the roots every second year; but, in doing this, you must be guided by the state and condition of your plants. The late P. Kenny let his remain very frequently until the third year, reducing the ball of earth only, trimming the fibres, and examining the carrot or main root. Transplanting should be done in a cloudy sky and a moist atmosphere."

Justice pots suckers, and transplants old plants, in August.

Removal and potting of Off-sets. When off-sets have formed one or more fibres, an inch or two in length, Maddock directs to remove them by means of a piece of hard wood, or by the use of the fingers, be separated from the old plant with safety, and replanted round the sides of a small pot, filled with the same compost, till they become sufficiently grown to occupy pots separately: if a small hand-glass be placed over each pot containing these newly-planted off-sets, it will cause their fibres to grow more rapidly; but it should not be long continued, as it would have a tendency to draw and weaken the plants. *Florist. Direc.* 130.

Emmerton says, " You may separate off-sets from the mother plant any time between February and August, according as they are in size, or are wanted for increase, and plant them immediately against the side of pots four or five inches diameter. If a strong and superior bloom of flowers is derived, no off-sets must be allowed to grow on the old plant, and especially none on the stem *without fibres.* Rub them all off when they are about the size of hemp-seed." *Treatise on the Auricula, &c.* 126.

General Culture. Maddock keeps his auriculas during one part of the year in what he calls a summer repository, (*fig.* 448.), and the other in a winter repository.

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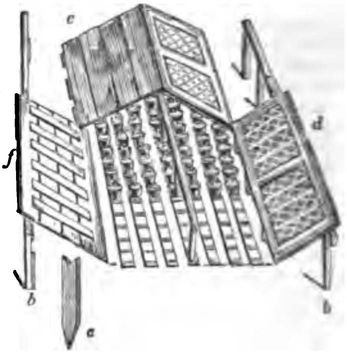

Summer Repository. "The following is recommended as a proper plan for the summer repository, viz. in the first place, there should be a bed of coal-ashes formed in the place where it is intended to be erected, about five or six inches thick; or a platform of plain square tiles, closely fitted to each other, on the surface of the ground, to preserve the pots from the common earth-worm, which, by gaining admittance into them, would perforate, and alter the consistence of the soil, in such a manner as to prove very injurious; upon this foundation, rows of bricks (*fig.* 448.) are to be placed in straight lines, about two or three inches asunder, which will allow a free circulation of air under and between the pots when placed upon them, an object of great importance, especially in warm weather, when the air is most inclined to stagnate, and become impregnated with noxious effluvia. The plants, by the above plan, will be raised from nine to twelve inches above the level of the ashes or platform. There should be two rows of substantial stakes, three feet long, and five inches by three wide, one row of which should be placed on each side, at about three or four inches distance from the two outside rows of pots (*b*): these stakes (*c*) should be driven twenty inches into the ground, with their narrow sides towards the pots, and have notches cut in their tops, to receive the edges of the shutters they are intended to support. By way of illustration, suppose the whole length of the platform to be twelve yards, and the width three feet, it will contain seven rows, and each row about seventy pots; a sufficient number to constitute a moderate collection for a private gentleman. Three shutters (*f*), made with feather-edged inch deal boards, each four yards long, and two feet six inches wide, will reach the whole length on one side: three of the notched stakes will be sufficient to support one of these shutters; of course, fifteen stakes at proper distances will completely answer the purposes on one side: the notches are to be cut in the form of a V, two inches deep, and three inches wide at the top, which will give room for the shutters to move backwards and forwards without difficulty or danger of slipping out. Both sides are thus to be provided with stakes and shutters, the upper edge of the latter should meet over the centre of the platform (*e*), when the plants require to be covered with them, in the form of the ridge or roof of a house, well-fitted and sloping equally on both sides, so as to throw off rain, without even admitting it to drip through upon the plants in any part.

"It is necessary that a rail, or row of stakes, of a proper height and strength, should proceed from the ground between the two middle rows of pots, to support the shutters when closed or closing, especially as it is usually more convenient to begin to cover or uncover on one side first, and finish on the other; without a support of this kind, in such case, the shutters must fall down upon the plants: a similar, exterior rail, or row of stakes, is necessary on each side, to support the shutters when open, with the same degree of slope, in a contrary direction than when closed; by which means the plants will have a free communication with the air, whether covered or open; nor are they entirely deprived of light, when the shutters are closed, because the lower edge of the shutters is as high or higher than the top of the plants at all times. The peculiar advantage arising from this plan is, that when the plants require to be shut up from excess of rain, they have at the same time the advantage of a continual supply and free circulation of fresh air, which passes amongst their leaves in all directions; whereas those who are obliged to shut up their plants in a close frame, to exclude excess of rain from them, oftentimes shut them up in a wet state, as soon as it is judged they have had a sufficiency: this is a very dangerous, though not unusual practice, and often produces a mildew which is attended with the most destructive consequences.

"The importance of a proper constructed repository, and suitable treatment of the plants, for the summer season, will sufficiently apologise for any prolixity in the description: it cannot, indeed, be too strongly impressed on the mind of the cultivator of this delicate flower, that his success more particularly depends on the health and vigor of his plants towards the end of summer, than at any other period of the year. The plants, after being placed in the summer repository, are to be kept moderately moist; if the rains that happen are not sufficient, they must be occasionally watered with soft water, by a small pot with a round curved spout, taking care not to let an water fall into the heart, or amongst the interior leaves of the plant, as it could not speedily dry up in that part, and, of course, would endanger a decay; any water lodging in the heart of the plants in spring, when the blossoms begin to make their appearance, cannot fail to injure them considerably. The plants are to remain in their summer situation till September or October, as the weather may be more or less favorable, or until the heat of the sun has considerably decreased."

Emmerton places his pots, after the plants have done flowering, in a shady situation, and full north aspect. He sets them on bricks placed on a bed of ashes, in the same manner as Maddock; but he provides no covering to exclude the rain. *Treatise on the Auricula, &c.* 143.

Hogg removes his auriculas which have blown in spring from the show-stage to a north-east aspect, to avoid the scorching rays of the summer sun. He then sets them upon thin boards or thin slates, lying on a bed of coal-ashes. *Treatise, &c.* 115.

Justice sets his plants in a full northern exposure, and without covering, to the 20th of October. Whichever of these plans be adopted, the plants must be kept clear of weeds, the soil gently stirred when it gets hard or massy, water supplied in dry weather, and the leaves, as they become yellow, drawn off close to the stem.

Winter Repository. In the end of September or beginning of October, Maddock removes his auriculas to the winter repository, "which is to be constructed in a manner exactly similar to that for the summer season, with only one exception, viz. that the south-side of it should consist of frames of glass (*fig.* 448. *d*), instead of the wooden shutters: these are to act in the same manner, but will admit of light when the plants are of necessity shut up from adverse weather, which so frequently occurs during winter; the admission of light at such times is indispensably necessary to the well-being of the plants, especially when the long continuance of rain, or severe frost, renders it requisite to keep them covered, sometimes perhaps for a day or two, with little or no intermission. In the first favorable weather that occurs in February, it is necessary to divest the plants of their decayed exterior leaves; and by the middle of that month, the operation of earthing up, as it is termed, should commence; that is to say, the superficial earth of the pot should be carefully taken away, about an inch deep, and fresh compost, with the addition of a little loam, to give it more tenacity, should be substituted in its stead: this will contribute greatly to the strength of the plants, and the vigor of their bloom; at the same time it will afford a favorable opportunity to separate such off-sets as shall appear possessed of sufficient fibre, to be taken off at this early season with safety: these off-sets, when properly planted in small pots, should be placed in a frame, in some warm sheltered situation, till their roots are established.

"The auricula is by no means a tender plant, yet it will be proper to cover the repository with mats, in case of severe frost; for although it probably would not destroy the plants, unless it happened in an extreme degree; it would, however, injure them, and perhaps spoil their bloom, particularly early in the spring, when the stem begins to rise; it would certainly, at that period, destroy or render the pips or corollas abortive. If any plant is possessed of more than one or two principal stems, it is advisable to pinch off the pips of the smallest and weakest, in order to render the blossoms of the remaining one larger and more vigorous than they would be if this was omitted to be done in due time.

"It is a curious fact, that those sorts which are naturally possessed of a fine green on the edge or margin of the flower, are often known to lose that property, when the stem proceeds from the very heart or centre of the plant; whereas those stems that proceed from the side, produce larger pips, possessing their true natural colours in much greater perfection: these last are called the winter stems, because they are usually forwarder, and produce their flowers rather earlier in the season than those which proceed from the centre of the plant.

"When the pips become turgid, and begin to expand, they must be preserved from rain; nor should they remain any longer in a situation exposed to cold winds; on the contrary, such plants ought to be selected from the rest, and removed to a calm shady corner, where they should have small hand-glasses suspended over them in such a manner as to preserve the bloom from rain, &c. and yet admit a free circulation of air, both to the plant and to the blossom, it being equally necessary for the one as for the other."

Emmerton, about the middle of October, makes choice of a full southern aspect, and in general put his pots of plants into small frames of about three and a half to four feet long, and each light about three feet wide. So soon as they are placed in their winter situation, during the autumn and winter months, even down to the 5th of April, or thereabouts, he exposes them, during the day, to as much air as possible, by leaving the lights entirely off. It is necessary they should be kept very dry, in November and December, as in case of a severe frost the weather has less power on the roots of the plants. During January, and most likely the greater part of February, much depends upon the depth of snow and the intense frost. Some winters are more favorable than others: if the season has now the appearance of open weather, you may treat your plants nearly in the same manner as the two last months; but if you have snow, and the weather is now a severe frost, you must be rather more cautious as to the exposure; a trifling frost is of no serious consequence to these hardy plants, but the mould should not be severely frozen in the pots, as by the end of January the bloom is formed, although very low in the heart of the plant; he therefore covers with mats till the weather becomes mild and open, giving air, however, a few hours in fine days, but no water till natural rains fall. *Treatise on Auricula, &c.* p. 85.

In February he top-dresses with rich compost, and transplants off-sets intended to bloom, from small pots into larger ones. He exposes the plants to all the gentle rains of this month, at the same time carefully defending them from frosts and hail-storms, or long continued rains. From the 10th or 12th of March he covers up with "warm clothing," to defend the coming bloom against frost.*

Hogg puts his auriculas into frames in October; the frames are placed on a bed of ashes, and are raised on bricks to admit a free current of air under them; but when the frost sets in, about Christmas, the bricks are removed, and the frames rest on the ground. In all dry and temperate weather the plants are exposed to the air, very little water is given, and the plants are kept free from decayed leaves, and the surface of the pots from mouldiness.

From the second week of February, and during March, the plants are allowed the benefit of gentle rains for an hour or two; they are top-dressed, such as require it are shifted, and suckers are taken off where they are large, and while all possible air is given during day, the frames are shut close at night, to prevent the opening blossoms being nipped by the frost.

The Lancashire growers have no frames or lights, but make use of weather-boarding, with hinges, fixed against some wall or fence, in a south aspect, to defend them against the rain and snow, resting, when shut close, upon a board nine inches high; but this is never done except in very severe weather: the pots are plunged up to the rim in saw-dust or coal-ashes. *Hogg.*

Justice places his auriculas in what he calls a bunker or shed, on the 10th of October. This bunker is a stage with boarded ends, front and cover, placed against a wall with a north-eastern exposure. He gives water sparingly, but as much air as possible; by the end of February he top-dresses the plants, and if they are weak he adds the proportion of one-eighth of fullers'-earth to the compost.

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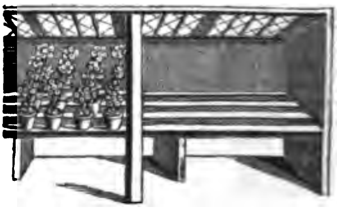

Blooming Stage. (*fig.* 449.) "This," according to Maddock, "should have a northern aspect, that the sun may not shine on the flowers; it should consist of four rows of shelves, in the form of steps, but must not exceed five; the front, or lowest shelf, should be two feet five inches from the ground, the second about three inches higher than the first, and the rest in the same proportion; these shelves should be about six inches wide, strong, and well-supported, otherwise the weight of the pots will cause them to bend or give way. If the stage consists of four rows of shelves, its depth, from front to back, ought to be about two feet eight inches; the north or front elevation of the stage should not be less than seven feet, gradually sloping to about five feet six inches on the south side: the roof should consist of frames of glass.

"The frames of glass made use of on the south side of the winter repository will answer extremely well for this purpose; but as they will not be wide enough to form the roof completely, without addition, a single row of feather-edged boards may be placed on the lowest part of the slope, and the lower edge of the frames of glass may rest upon them; these boards will answer another good purpose, by preventing the sun, which at this season of the year has obtained a considerable degree of altitude, from shining on the first and second rows of plants, during the middle of the day, when it has most power; although the plants of the back row will, in consequence, have rather less light, yet it is not so materially injurious as the former.

"The posts supporting the roof of the stage, on the south-side, may be so constructed, and placed at such distances from each other, as that the wooden shutters, made use of on the north side of the winter repository, may fit between them, and form a regular shed, as low or lower than the higher shelf: the remaining space to the ground may be left open in mild calm weather, or may be easily closed up, by a line of mats sewed together, when it is otherwise. The east and west ends of the stage should be entirely boarded up from top to bottom, and the front left open, unless in unfavorable weather, and at night; at these times, it may be defended by frames of wood covered with canvass: these should be about six feet wide, suspended from the front edge of the roof by hinges; they will serve both to defend the bloom, when let down, and also by each having two small iron rods, about five feet six inches long, connected with their lowest edges by staples, that will allow them to move in any direction, and support them when up, will defend the path in front from rain, take off the glare of light when the sun shines, and at the same time defend the spectators from its heat. The inside of the back and ends of the stage, and the shelves likewise, should be painted black, or some very dark colour, by way of contrast to the white eyes, &c. of the flowers: and if a large looking-glass be placed at each end of the stage, the effect produced will be very pleasing, by apparently lengthening the stage each way as far as the eye can reach.

" As auriculas and hyacinths generally blow exactly at the same time, the beauty and elegance of the scene is considerably increased by having a stage of the former, and a bed of the latter, under the same awning, with an intermediate path, about six feet wide; in which case, if the cloth covering of the hyacinths is fine enough to admit a sufficiency of light, it may be continued over the auricula stage, instead of the glass and boards, and will answer all purposes tolerably well with little trouble: or otherwise, the edge of the cloth covering, for the bed and path, may be nailed to the upper or front edge of the glass frames, over the auriculas, in such manner as effectually to prevent rain dripping through in that quarter. A row of fine polyanthuses, in pots, may likewise be introduced in front of the hyacinths, as they likewise blow at the same time; it will add to the variety, and form altogether a more elegant assemblage of beautiful fragrant flowers than any other season of the year can afford.

" The tallest blowing auriculas should stand on the last or most distant shelf, and the shortest in front; those stems which are weak and bend should be supported with small wires, fixed in the earth behind them, so as not to be easily discerned. If any of the stems and blossoms of those in the back row incline forward too much towards the light, they may be easily recovered to an erect position, by turning the pots for a few hours in the morning; but the glass roof will render very little of this trouble necessary: the pots must be regularly watered, two or three times every week, during the bloom.

" No person can depend on a complete stage of auriculas, who is not provided in autumn, or early in the spring with twice as many blowing plants as his stage will contain, because some will eventually prove defective, and fail in one respect or other: and a succession of proper plants in bloom will be required to replace such as, being earlier than the rest, or of shorter duration, are no longer eligible to remain on the stage, and ought, in consequence, to be taken away, and more suitable ones brought on in their stead.

" When the bloom is declined, the plants are to be removed into their summer repository, where they will soon recover their former strength and vigour, which notwithstanding the utmost care and precaution, will have been, in some degree, impaired by standing two or three weeks upon the stage."

" To bloom your auriculas well," Emmerton observes, " too great attention cannot be paid to them for about four or five weeks, viz. to use the language of a florist, to prevent them from being set, when all trouble and danger will be completely over. This strict care commences about the 20th or 22d of March, and ends, as I calculate, by the 25th of April, or thereabouts. Around London, many fine plants of the choicest sorts have always been spoilt by nursing them as they do their geraniums, that is, by keeping their plants under glass so many weeks, night and day. Many florists keep their lights continually over their flowers, day as well as night, from the 1st of January till the 1st of May, and only admit a current of air behind their frames: this is the rock, fatal to bloom, which so many split on. This mode of treatment, I am convinced, is highly improper; it draws up the flower stem, and renders it weak and spindling, in a state unfit to bear or produce a bold truss. To bloom an auricula in perfection, it does not require to be continually under glass night and day, longer than twenty-four days, or thereabouts; as a criterion, say from the 4th to the 28th of April: you will find your middle pips expanded, or nearly so, and well adapted to be exhibited on the stage at this time." Previously to this period, however, say from the 10th to the 16th of April, he removes them from the frames (which have a south aspect), and places them under hand-glasses in a full or north-eastern exposure. Here they remain till the 26th or 28th of April, and are then removed to the stage in a full north aspect.

In April, Hogg keeps the lights over his auriculas, night and day, to preserve their beauty unimpaired. Air he admits by raising the sashes behind; he covers up close at night, "this being the very crisis of time that requires your most particular care." He thins out the pips or blossoms, leaving not more than thirteen, nor fewer than seven on a truss or umbel. In thinning "they should be taken out two or three at a time, and it requires some taste, nicety and art, to perform this operation well, that the blossoms which are left on may grow in a regular equidistant form, so that any common spectator might suppose that no such thinning of the pips had taken place, but that they had grown exactly in that form, and with that number, from the first." Towards the end of the month the flowers are removed to the stage fronting the east."

The Lancashire growers, "in blooming time set their large show-plants under hand-glasses, in an east aspect, to receive the morning sun only. The plants are, perhaps, not so early in bloom as those wintered in frames, but when their stems are not drawn, and they are able to support the trusses firmly: the mildew and rot do not take them so readily as when in closer situations."

Justice blows his flowers in the bunkers, or sheds, exposed to the full north; he gives them all the air he can, but excludes the sun, shelters them from winds, and waters them well twice a week. *Brit. Gard. Direct.* art. *Auricula.*

Subsect. 16. The *Polyanthus.* — *Primula vulgaris, var. Polyanthos,* L.; *Pent. Monog.* L.; and *Primulaceæ,* B. P.; *Primula,* Fr. Ger. and Ital.

1642. This plant, in its wild state, is the common primrose, too well known to require any description, which produces its flowers on numerous peduncles; but, by cultivation, throws up a scape, bearing an umbel of numerous flowers, brown, purple, red, and yellow. Linnæus asserts, that the peduncles in the common wild primroses spring from a scape, which being so short as to be concealed among the leaves, has not been observed. Curtis, however, found it in a few plants, and also that wild primroses, introduced into Dr. Buxton's garden, at Maize-hill, near Greenwich, produced flowers both with and without a scape, and became, color excepted, perfect polyanthuses. Many botanists consider, that the polyanthus, primrose, cowslip, and oxlip are one species; and the Rev. W. Herbert, seems to have proved it, and the same thing as to *primula auricula, helvetica, nivalis,* and *viscosa.* (*Hort. Trans.* iv. 19.) It is sufficient for our purpose to observe, that the polyanthus is a very permanent variety, which does not readily return to the primrose, and that it is in high repute as a select and border flower, appearing in March and April, when there are few others to decorate the flower garden.

Varieties. These are as numerous as the varieties of auricula; and as in that plant, single flowers are most esteemed.

Criterion of a fine Polyanthus "Its properties are, in most respects, similar to those of a fine auricula, viz. the stem, peduncles, or foot-stalks, and formation of the bunch or truss; therefore a definition of its pips, or petals, (*fig.* 450. *a.*) only remain necessary to be considered in this place.

"The tube of the corolla above the calyx, should be short, well filled with the anthers or summits of the stamens, and terminate fluted, rather above the eye. The eye should be round, of a bright clear yellow, and distinct from the ground color; the proportion as in the auricula, throughout the flower. The ground color is most admired when shaded with a light and dark rich crimson, resembling velvet, with one mark or stripe in the centre of each division of the limb, bold and distinct, from the edging down to the eye, where it should terminate in a fine point. The pips should be large, quite flat, and as round as may be, consistent with their peculiar beautiful figure, which is circular, excepting those small indentures between each division of the limb, which divide it into five or six heart-like segments. The edging should resemble a bright gold lace, bold, clear, and distinct, and so nearly of the same color as the eye and stripes as scarcely to be distinguished; in short, the polyanthus should possess a graceful elegance of form, a richness of coloring, and symmetry of parts, not to be found united in any other flower." *Maddock.*

Propagation. By dividing the root, or by slips, for ordinary purposes: and by seed, for obtaining new varieties.

By Seed. The plants from which seed is to be saved are to be separated from the stems, and treated in the same manner as seed bearing auriculas. When ripe, it should be cut off with part of the stem, and so preserved till the sowing season, which, as well as the mode of procedure, are, according to Maddock, the same as for the auricula. Emmerton says, flowers intended for seed should be selected on the same principle as he directs for the auricula; and he recommends Pearson's Alexander and Nicholson's Tantarara as excellent flowers to breed from.

Justice says, he "has had great success in raising polyanthuses and primroses from seed." He gathered the seed generally about the 25th of June, and sowed it ten days afterwards in boxes, placed in the open air, under a wall or hedge with a north aspect.

In July, he directs to "prepare a nursery-bed of the same earth in which they were sown, and plants them carefully out, taking up as much earth about their roots as you can, so as not to disturb their young fibres, planting them twelve inches asunder, and shading them from all sun until they have struck new roots; keep them clear from weeds, and give them gentle waterings, and let this nursery-bed be made in such a situation as to have the morning sun only. Some of them will show their flowers the same autumn, and many of them in the spring following. Select the best, and plant them in a bed by themselves in a shady moist situation. In November, top-dress the plants, which will greatly strengthen them for the succeeding spring. They require to be transplanted every two years." *Brit. Gard. Direct.* 218.

Soil. Maddock and Emmerton recommend the same compost as for auriculas, but with more loam. Justice used the following: "to one load of well rotted cow-dung, or leaves of trees, take half a load of fine white sand, and two loads of fine hazely loam, taken from a pasture some months before, and which has had the sward rotted amongst the earth: mix all well together before using."

Hogg says, "the primrose and polyanthus require a much greater portion of sandy loam than the auricula, a very small quantity of rotten dung, and a little leaf-mould or heath or peat earth, mixed with them: in this they are found to grow extremely well."

Manner of Growing. Maddock says, they may be grown in the same sized pots as the auricula, and be treated in the same manner; but as they are more impatient of heat and drought, and partial to shade and moisture, they may, with equal propriety, be planted on cool and shady beds or borders. This is the general practice of almost all the growers of this flower.

General Culture. The polyanthus is very hardy, and seldom perishes in the coldest and wettest seasons; but during the heats of summer, they are frequently destroyed by snails and slugs, and by a small red spider. "This insect," Maddock observes, "seldom attacks such plants as are in a state of vigor, or when the weather is cold and wet; it generally commences its depredations in the early part of summer, and continues them as long as the heat and dryness of the weather favor its existence: the juices also of the plants being then more viscous and saccharine, afford it more suitable nourishment than at any other season. Such plants as appear infected should be immediately selected from the rest, taken out of the earth, and soaked for two or three hours in a strong infusion of tobacco water, and be replanted in a fresh soil or compost, and removed to another situation remote from the former. If the whole bed or border of polyanthuses is overrun with this insect, it is best to take up all the plants, serve them in the same manner, and plant them elsewhere. The bed, or border, from whence the plants have been taken, should be immediately dug up, or trenched, and suffered to remain fallow till the following season, or be occupied with some crop not liable to the same calamity." *Florist's Directory*, 228.

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1643. The *Primrose, P. vulgaris*, L. (*Eng. Bot.* 4.); *Primavere*, Fr.; *Shaftlose Primule*, Ger.; and *Primavera*, Ital. (*fig.* 450), has a perennial root, appearing as if bit off at the end, with a singular smell like that of the anise. It is a native of most parts of Europe, in woods, coppices, and sheltered lanes, particularly in a clayey soil. The flowers of the wild plant are almost always of a brimstone color, but sometimes of a purple hue; they appear in March and April.

Varieties. The double varieties produced by culture are in most esteem, of which there are:

The stemless white.
Crimson.
Hose-in-hose.
Purple.
Lilac.
Scotch.
White.
Yellow.
Brimstone.

1644. The *Cowslip, P. veris*, (*Eng. Bot.* 5.); *Primel*, Fr.; and *Schlusselblume*, Ger.; (*fig.* 451), is distinguished from the primrose, by smelling more strongly of anise, by shorter leaves, and by an umbel, with a leafy involucrum. It is a native plant, and found in moist pastures, in open situations, flowering in May.

Varieties. Both double and single varieties are in esteem; but the plant has not been so much cultivated as the primrose. T. Gibbs, nurseryman, Brompton, has lately raised a great many very beautiful varieties from seed, differing in color, magnitude of the umbel, and in some being double, and in the hose-in-hose form.

"May 19th, 1818, T. Gibbs sent a large collection of flowers of varieties of the common cowslip, from his garden at Brompton. He had raised them from the seed of plants, originally derived from the wild cowslip, which had sported into varieties, and by frequent reproduction had attained their present excellence. The changes that have taken place are in the magnitude of the trusses, and the size and color of the flowers; the selection appearing to have been from the darker hues, though some paler flowers were in the collection. However great the variation was in the points alluded to, yet none of the specimens appeared to have lost the general character and appearance of cowslip, not running either into the oxlip or the primrose; but some of them had become what florists term hose-in-hose, which appears to be the conversion, more or less, of the calyx, into the appearance of the corolla."

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1645. The *Oxlip, P. elatior,* (*Eng. Bot.* 518.) *Bavillon,* Fr.; *Gartenprimel,* Ger. (*fig.* 452), is distinguished from the primrose by its many flowered scape, and from the cowslip, by the flat border of the corolla. It is found in woods, thickets, hedges, and sometimes in pastures; but is by no means so common as the primrose and cowslip. It flowers in April and May. Sir J. E. Smith is inclined to think that the oxlip is a hybrid production from a primrose, impregnated by a cowslip; its habit, the contraction towards the middle of the leaf, and the umbellate flower-stalk, indicating the father, whilst in the corolla, its form, color, and scent, it most resembles the mother. *Eng. Bot.* 513.

Varieties. There are a few; but the plant has not been much cultivated with a view to that object.

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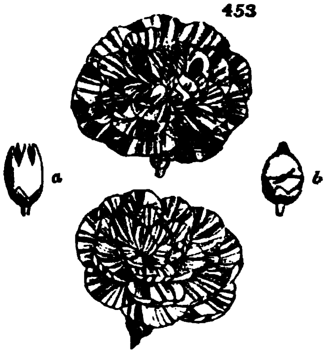
The *Propagation and Culture* of these three species is the same as for the polyanthus.

Subsect. 17. The *Carnation.* — *Dianthus Caryophyllus,* L. (*Bot. Mag.* 39.); *Decan. Trig.* L.; and *Caryophylleæ,* J. *L'oeillet des Fleuristes,* Fr.; *Gartennelke,* Ger.; and *Garafano ortense,* Ital. (*fig.* 453.)

1646. This plant is little known in its wild state, though it is said to have been found in England on rocks and walls. It was unknown to the ancients; but has been a favorite flower in Europe from time immemorial. It is generally supposed to have been introduced from Germany or Italy, in which countries it is more cultivated than in England; Gerarde, in 1597, received it from Poland. "Of all the flowers that adorn the garden," Hogg observes, "whether they charm the eye by their beauty, or regale the sense of smelling by their fragrance, the carnation may be justly said to hold the first rank. The stateliness of its growth, the brilliancy and diversity of its colors, and the sweetness of its perfume, never fail to attract our regard and admiration. The tulip, though styled the queen of the garden, cannot boast of more admirers: they may with propriety be considered the two master-pieces of nature; and though rival beauties, may be said to share the sovereignty of the garden equally between them. Yet it must be admitted, that the carnation, independent of its fragrance, has this advantage over its rival, that it continues longer in bloom; and that when planted in pots, it can be removed to decorate the greenhouse, the conservatory, or the drawing-room."



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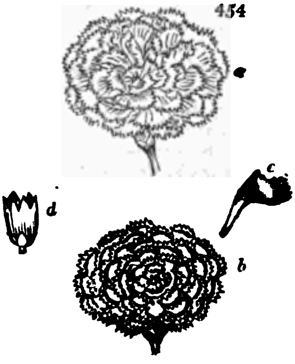
Varieties. "Parkinson, (in 1629,) has forty-nine sorts, which he divides into carnations, or 'the greatest sorts in leaf and flower,' and gillyflowers, or such as are smaller in both respects. One Ralph Tuggre, in Westminster, was the most remarkable man at that time for the culture of these flowers. Rea, (in 1702,) has 360 good sorts of carnation; a number scarcely exceeded by the catalogues of modern British florists."

The varieties of this flower are now arranged in three classes: flakes, bizarres, and picotées. *Flakes* have two colors only, and their stripes large, going quite through the leaves; *Bizarres* (*Fr. odd. irreg*). are variegated in irregular spots and stripes, and with not less than three colors: *Picotées* (*Fr. piquetté*, pricked or spotted), have a white ground, spotted or pounced with scarlet, red, purple, or other colors. Of each class there are numerous varieties, arranged under the farther subdivisions of scarlet flake, pink flake, purple flake, yellow flake, &c. scarlet bizarre, crimson bizarre, &c. and purple picotée, yellow picotée, &c. Hogg gives a catalogue of nearly 350 sorts, so arranged, named after great personages, all of which were in his possession at the time he published his Treatise on the Carnation in 1820. Only double varieties are in esteem.

Criterion of a fine Double-Carnation (*fig.* ..., *a* and *b.*) "The stem should be strong, tall, and straight; not less than thirty, or more than forty-five inches high; the footstalks, supporting the flowers, should be strong, elastic, and of a proportionate length. The flower, or corolla, should be at least three inches in diameter, consisting of a great number of large well-formed petals; but neither so many as to give it too full and crowded an appearance, nor so few as to make it appear too thin and empty. The petals should be long, broad, and substantial, particularly those of the lower or outer circle, commonly called the guard leaves; these should rise perpendicularly, about half an inch above the calyx, and then turn off gracefully, in a horizontal direction, supporting the interior petals, and altogether forming a convex, and nearly hemispherical corolla. The interior petals should rather decrease in size, as they approach the centre of the flower, which should be well filled with them. The petals should be regularly disposed alike on every side, imbricating each other in such a manner as that both their respective and united beauties may captivate the eye at the same instant: they should be nearly flat, however a small degree of concavity, or inflection, at the lamina, or broad end, is allowable; but their edges should be perfectly entire, that is to say, free from notch, fringe, or indenture. The calyx should be at least one inch in length, terminating with broad points, sufficiently strong to hold the narrow bases of the petals, in a close and circular body. Whatever colors the flower may be possessed of, they should be perfectly distinct, and disposed in long regular stripes, broadest at the edge of the lamina, and gradually becoming narrower as they approach the unguis, or base of the petal, there terminating in a fine point. Each petal should have a due proportion of white, i. e. one half, or nearly so, which should be perfectly clear, and free from spots. Bizarres, or such as contain two colors upon a white ground, are esteemed rather preferable to flakes, which have but one, especially when their colors are remarkably rich, and very regularly distributed. Scarlet, purple, and pink, are the three colors most predominant in the carnation; the two first are seldom to be met with in the same flower, but the two last are very frequently. When the scarlet predominates, and is united with a paler color, or, as it sometimes happens, with a very deep purple upon a white ground, it constitutes a scarlet bizarre, of which there are many shades and varieties, some richer and others paler in their colors, as is the case with all the rest. Pink bizarres are so called when the pink abounds. Purple bizarres, when the purple abounds. Crimson bizarres consist of a deep purple and rich pink. When the pink flake is very high in color, it is distinguished by the appellation of rose flake; but some there are so nearly in the medium betwixt a pink and scarlet, that it can scarcely be defined to which class they belong. In addition to the foregoing varieties, there is a sort held in great esteem by cultivators, called picotee, (*fig.* 454. *a*); many of which are very beautiful: and being hardier than the other sorts, are in considerable request. The colors are principally yellow, and white spotted; their properties are the same as the other kinds, except that the edges of the petals are serrated or jagged, and the color is disposed in spots, where the others are striped. It is propagated in the same manner as the others,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fore the shoots get hard and woody; he begins about the first of July. Plants raised from pipings, he considers as sounder, and more likely to encounter the rigors of a sharp winter than layers; but still as laying is the surest mode, he only makes pipings of such shoots as appear crowded, or too short or two high up the stalk to be laid easily. He plants them on a bed of dung of blood warmth, in a compost of one-third maiden-earth, one-third leaf-mould, one-third rotten horse-dung, and one-sixth sand, finely sifted, that " the cuttings when stuck in, may enter easily and without injury." " The piping should be cut with a sharp pen or budding-knife, at the second or third joint, according to the condition of the shoot; but the shorter the better. The cut must take place horizontally, close below the joint, and the sheath or part that covers the joint, must be carefully removed and peeled off.

" When the pipings are cut, the surface of the bed made flat and level, and gently watered through a fine rose, they may be stuck in three-quarters of an inch deep, in rows not too near together. Then let them be watered again, which will help to fix the earth close round them; the glasses on no account are to be shut down close till they are dry, or they will inevitably fog, rot, and perish. The best glasses for piping are those made of the common window-glass, eight inches square and six inches deep, and the less air they contain the sooner will the cuttings strike root. The striking-glasses in common use, which are blown for the purpose, too often contain such a thick body of glass as to concentrate the sun's rays, and scorch the pipings. They require shading, only when the sun is out, and then with a net or old mat, to admit the glimmering of his rays. If the weather continues dry and hot, they will require to be watered occasionally with a fine rose, early in a morning, over the glasses, which, for one fortnight at least, need not be removed if they are doing well. After, you may take them off from time to time as you see occasion, for half an hour or so in a morning, to give fresh air, and dry the glasses; and if any of the pipings appear mildewed or rotten, pull them up. At the end of six weeks they will be sufficiently rooted to be transplanted into small pots or a prepared bed, over which it would be adviseable to place a frame and lights for a week or ten days, till they take root again. There they may be allowed to remain till the middle or so of September. In taking them up, if you find any not rooted, but sound, and their ends hard and callow, do not let them remain upon the same spot, but remove them to another bed, with a little temporary heat, and cover them with glasses as before; this will not fail to start them and hasten their fibring." *Treatise, &c.* 52.

By Seed. Carnation seed is rather difficult to raise or ripen in this country, owing to the moisture and cold of the autumnal months. It is generally procured from Vienna and different towns of Switzerland; and if put in vials and well corked, will keep for years. To raise it in this country, Maddock gives the following directions: " Those flowers which have but few petals, or, as it is more commonly expressed, are thin of leaf, generally produce most seed, and therefore are most to be depended on for a supply; but they should be possessed of the best properties in other respects, viz. their petals should be large, broad, substantial, and perfectly entire at the edge, and their colours rich and regularly distributed, and in due proportion, throughout the whole blossom. The plants should be selected from the rest, and their pots should stand upon a stage, defended against earwigs, in an open part of the garden, in which situation they should remain during bloom, and until the seed is perfectly matured; their blossoms should be defended from rain, by having glass, paper, or tin covers (*fig.* 455. *d*), suspended over them, in such manner as to admit a free circulation of air; the pots should neither be kept very wet or very dry; nor will it be proper to cut and mutilate the plants, either for their layers or pipings, till the seed becomes ripe, because it would certainly weaken them, and consequently injure, if not destroy, their seed. When the bloom is over, and the petals become withered and dry, they should be carefully drawn out of the pod or calyx, being apt to retain a degree of moisture at their base, endangering a mouldiness and decay in that part which will destroy the seed.

" There is another mode of treatment adopted successfully in ripening the seed, which is, when the bloom is over, and the petals begin to decay, they are to be extracted as above, taking particular care to leave the two stiles, which appear like horns proceeding from the summit of the germen, or future pericarpium: the calyx (*fig.* 453. *a*), is then to be shortened to about one-half of its original length, and an aperture made on one side of the remainder, down to the base of the pericarpium, so that no water can possibly lodge there; but in doing this, great care is necessary not to wound or injure the pericarpium, or seed-vessel itself, because it might prove destructive to the seed. After the above is performed, the covers may remain or be taken away at pleasure; but in the latter case it is adviseable to loosen the upper part of the stems from the sticks, that the open end of the calyx may incline a little downwards, the more effectually to preserve it in a dry state; the stems should not be suffered to hang so loose as to be in danger of breaking off with every puff of wind.

"The seed ripens from the end of August to the beginning of October: the pericarpium becomes brown, dry, and hard, and the seed, when ripe, is of a black or very dark brown color; those who are not sufficiently attentive to the ripening of their seed, are apt to gather it too soon, before it is perfectly matured, in consequence of which the greatest part proves small, pale-coloured, and unproductive.

"When gathered it should remain in the pericarpium, in a dry room, till the beginning or middle of May; it is then to be sown in pots filled with the compost, and have a little fine mould sifted upon it, barely sufficient to cover the seed: at this season of the year, artificial heat is not required, the pots should therefore be placed in an airy part of the garden, be shaded from the heat of the sun, and kept moderately moist, but never very wet. As soon as the young plants appear with six leaves, and become about three inches high, they should be planted out on a bed of good rich garden mould, at about ten or twelve inches asunder, and be defended from excess of rain and severe frosts, by mats on hoops, placed over the bed in the usual manner: they will in general blow the following summer.

"Some persons have advanced an opinion, that the seed of run plants produces as great a proportion of variegated flowers as any other; but the validity of this assertion has not yet been sufficiently demonstrated by experiment." *Maddock.*

Hogg's directions differ in nothing of importance from those of Maddock. He says it often happens, that out of 200 blooming plants, you will not be able to get even two pods of perfect seed. More was saved in the dry summer of 1818 than in any seven preceding years. Seedlings require two years to bloom, and the chance of getting a good new flower, he reckons as 1 to 100. If a florist raises six new carnations in his lifetime, he is to be considered fortunate. Seed out of the same pod, he says, is reported to produce flowers of all the different varieties, flakes, bizarres, &c. Emmerton experienced that seed from a scarlet-flake will produce a scarlet-bizarre, and a rose or pink-flake.

Soil. The compost Maddock recommends is as follows: "one-half rotten horse-dung, one year old, or that has been used as a hot-bed for cucumbers, melons, &c.; one-third fresh sound loamy earth; one-sixth coarse sea or river sand. These ingredients are to be mixed together in autumn, laid in a heap about two feet thick, in an open exposure, and turned three or four times during winter; or, otherwise, the dung alone, after being used as a hot-bed, may be thrown together in a heap, in a conical form, in order to rot more perfectly; and, as its surface freezes in winter, it should be pared off, and laid on one side, till the whole mass has been thoroughly frozen throughout; this may be repeated as often as the season permits, and it will be completely fit for use the following spring: the earth and sand may be added to it in March, when wanted to fresh pot the plants for bloom: the whole should then be well mixed and incorporated together, and passed through a coarse skreen or sieve, to reduce its parts and take out stones, or any other extraneous substances which it may contain. In country places, where the air is more pure, experience has pointed out the propriety of using less dung and more loam; the proportions of which, for such situations, may be reversed, viz. one-half loamy earth and one-third dung, with the sand as before specified: the preparation of the compost, in other respects, is to be exactly the same in all situations." *Florists' Direct.*

Hogg takes "three barrows of loam, one and a half ditto of garden-mould, ten ditto of horse-dung, one ditto of coarse sand; let these be mixed and thrown together in a heap or ridge, and turned two or three times in the winter, particularly in frosty weather, that it may be well incorporated. On a dry day towards the end of November, I take a barrow of fresh lime, which, as soon as it is slacked, I strew it over while hot in turning the heap; this accelerates the rotting of the fibrous particles in the loam, lightens the soil, and destroys the grubs, worms, and slugs. Lime is too well known as a manure to say any thing further in its praise here.

"If there has been much rain during the winter, so that the strength of the compost is reduced, and the salts washed from it, I take about seven pounds of damaged salt and add them to it, either dissolved in water or strewed over with the hand. This, from an experience of three years, I have found to be attended with the most beneficial effect upon the future health and vigor of the plants. During very heavy rains, many florists cover their compost with tarpaulin or double mats, to prevent the nutritious particles from being washed out; this is also an excellent precaution.

"If any objection be started that the quantity of dung is too great in proportion to that of the loam, I answer, that such an objection might be well founded, if the compost were to be used immediately on its being mixed together; but as it has to lie six months before it is used, I am decidedly of opinion, that the quantity is not more that is necessary in order to insure a luxuriant growth and a generous bloom."

For flowers that are apt to sport in color, such as Humphrey's Duke of Clarence, Plummer's Lord Manners, &c., he lowers the compost, and uses "three barrows of sound staple loam, two ditto old rotten cow-dung, one ditto horse-dung, a half ditto sand, a half ditto lime rubbish, or old plaster; to be prepared, and well incorporated, as before." He also uses the same compost for yellow picotées. *Treatise, &c.* 45.

Justice says, "One article with respect to the soil for carnations you must certainly observe; never to use for it the ground wherein hyacinths have been planted; they, from certain experience, being a sure poison to the carnation, and *vice versâ.*" *Brit. Gard.* 427.

Manner of Growing. The commoner sorts are planted in beds or borders, but the select kinds always in pots.

Pots and Potting. Maddock uses pots for flowering plants, "at least twelve inches wide at the top, six inches at the bottom, and ten inches deep in the inside, with a circular aperture in the centre of the bottom, of about an inch in diameter; also three or four smaller holes round the sides of the pot, close to the bottom, to prevent the possibility of water lodging or remaining in that part." Hogg uses pots of twelve or sixteen to the cast, being smaller than those recommended by Maddock.

"The *operation of potting,*" according to Maddock, "should commence about the middle of March, if the weather is not extremely unfavourable; but it should not, on any account, be deferred later than the end of that month. The pot is, in the first place, to be half filled with compost, having an oyster-shell, with its hollow side downwards, placed over the hole in the centre of the bottom: this compost is to be higher at the sides than in the centre of the pot, and the plants intended for it, which are supposed to have been wintered in small pots, containing four plants each, are to be carefully turned out of their pots, with all the earth adhering to them, in a ball; and after rubbing off about half an inch of the surface of the old mould, round about the plants, above their fibres, cleaning them and cutting off the decayed points of their leaves, the ball is to be carefully placed in the centre of the pot, and the space between it and the sides filled up with the prepared compost.

"It is very necessary to be attentive in placing the plants, that they be neither planted deeper nor shallower than they were before; the compost should therefore be high enough to replace the old earth that was rubbed off on potting, exactly to the same height as before, *i. e.* half an inch higher than the ball of old earth and fibres: and the whole surface of the earth in the pot, when the operation is finished, should be nearly level or flat; but by no means higher at the centre than at the sides, because the plants would thereby be kept too dry; nor should the compost come nearer than within an inch of the top or rim of the pot, after it has been gently shaken, or struck against the ground on finishing, as an inconvenience will attend its being too full, when the operation of laying comes to be performed, which requires some additional mould on the surface, for the layers to strike into." Hogg considers the first week in April as the safest and best time to pot carnations, and he performs the operation in the same manner as Maddock.

General Culture. "When the plants are potted off for bloom, the pots should be placed in an open airy part of the garden, under an arch of hoops, that in case of cold drying winds, heavy rains, or frosty nights, mats may be thrown over, to preserve them from the effects of such unfavourable weather: in this situation they are to remain, always open to the air, except in the cases above mentioned, and be kept regularly watered, with soft water from a fine-rosed watering-pot.

"When their flower-stems are grown eight or ten inches high, it will be necessary to support them with sticks, forced into the earth in the centre of the pot, to which the stems are to be loosely tied with small pieces of bass mat: these sticks should be as high as the hoops will admit, in order that the pots may remain under them as long as possible; but when the stems are grown too high for this situation, the pots are to be removed to the stage, and remain there till the time of bloom; the small sticks should be replaced with others more suitable for the occasion; these should be about four feet or four feet six inches long, regularly tapering a little from the bottom to the top, and be painted green; they should be substantial and straight, and their lower ends are to be forced into the earth in the centre of the pot, sufficiently deep and firm, not to be shaken loose by the wind. As the stems continue to advance in height, the tying, as above, must also be continued at about every five or six inches: it is proper to look over and examine the plants for this purpose every three or four days, as the stems are rather brittle, and liable to be broken by the wind, if not supported in this manner.

"If any small, green, winged insects appear on the stems or foliage of the plants, particularly upon or underneath the flower-pods, they must be effectually extirpated or destroyed, either by the means of a small soft brush or feather, by the application of a strong infusion of tobacco-water, or some similar easy and safe expedient: even Scotch snuff dusted upon the infested parts early in the morning, while the plants are wet with the dew of the night, has been sometimes tried in this case with success.

"The calyx of many sorts contains a great number of petals, which, as they increase in bulk, will distend and burst it, if not timely prevented: this generally happens a few days previous to the proper time for the blossoms opening, and will, if neglected, soon manifest the effects of such neglect, by letting out the petals on one side, and thereby producing a loose irregular appearance, totally destroying that compact, graceful, circular form which a perfect flower ought to possess, and which is one of its greatest ornaments; but this disagreeable effect may be easily avoided, by fastening a small narrow slip of bladder round the middle of the pod, where it is most swelled, and appears to have the greatest inclination to burst. The slip of bladder should be rather longer than is required to go once round, so that one end of it may lay over the other a little, which, by the application of a little gum-water, will adhere firmly together, and answer the purpose completely. Small slips of wet bass mat may be substituted for those of bladder, and being tied with a single knot round the same part of the pod, will answer nearly as well. (*fig.* 453. *b.*)

" When any of the flowers begin to open and expand, such should be shaded, both from sun and rain, by means of strong caps, or paper covers, (*fig.* 455. *d.*), about twelve inches in diameter, painted white or green, and formed like an umbrella, to throw off rain; each should have a square tin tube on the summit, that will permit the stick, to which the stem is tied, to pass through it as far as is necessary. The tube should be about two inches long, and have a small hole bored through one of its sides, that it may be fixed by a nail to any part of the stick where required.

" But when the major part are in bloom, a cloth awning should be placed over the whole, and be drawn up or let down by means of lines and pulleys, exactly in the same manner, and on the same occasions, as for the bloom of hyacinths and tulips. The same frame that was used for the hyacinth (*fig.* 435.) will, without being removed or taken down, answer in every respect for carnations: nor can any other more suitable be contrived or adopted.

" In order that the flowers may appear to the greatest advantage, it is necessary that the pots should stand upon a stage or platform of boards raised about twelve or fifteen inches above the ground; this stage should be very strongly supported, in order to sustain the immense weight of the pots, without danger of giving way; the supporters of this platform should stand in shallow leaden or earthen vessels, filled with water, to prevent the access of earwigs, which are destructive enemies to the blossoms of carnations: they secrete themselves commonly during night, in the calyx (*fig.* 453. *a.*), and soon commence their depredations, by biting off and devouring the lower ends or claws of the petals, which of course will cause them to drop out, and thereby disfigure the flower.

" The stands, or reservoirs, should be broad enough to allow an intermediate space of water, three or four inches wide, between their sides and the supporters placed in the centre of each. Earwigs will nevertheless be frequently found amongst the flowers, having been brought upon the stage with the pots, where they remain concealed, or dormant, till the flowers are in bloom; or perhaps they may have gained access by having crept up the external frame, and from thence fallen down upon the pots; or they may possibly have flown upon them, as they are evidently provided with wings, though it does not appear that they often make use of them. At all events, it is necessary frequently to examine the plants, and the sticks which support the stems, as earwigs will be often found concealed there in the day-time, particularly at the part where the stems are tied, which affords them a more secure hiding place. If any of the petals hang loose, or drop out, it is a certain sign that an earwig is, or has been there: in the first case, blowing forcibly with the mouth, into the blossom, two or three times, will cause it to creep out; but if it has quitted the blossom previous to the discovery, it should be carefully sought after and destroyed, or it will continue its depredations the succeeding night; it will, however, most probably be found sculking somewhere about the same pot, but not farther distant than the next, or next but one, unless the search has been deferred too long.

" The flowers should be suspended from the sticks by small pieces of fine elastic brass wire (*fig.* 455. *e.*), of unequal lengths, (sold in the pin shops,) to support them in an easy graceful manner, neither too near together nor remote from each other: one end of the wire should be introduced into the stick by means of a small awl, and there be fixed sufficiently tight to prevent its dropping out by the weight of the blossom; the other end of the wire should be formed into a small ring, about a quarter of an inch in diameter, to enclose the stem below the calyx; this ring should be a little open on one side to admit the stem freely, without bruising it, which would materially injure the bloom.

" Those who are particularly curious in blowing their carnations, carefully extract such petals as are plain, or run from their true colours: they perform this by means of an instrument adapted to the purpose (*fig.* 455. *f.*), and with the same arrange the remaining petals, so as to supply the defect; in like manner they dispose the whole with such regularity that the flowers appear to have an equal distribution of beautiful petals, nearly alike on every side, without imbricating each other, so as to hide their respective beauties: and if the blossom consists of too great a number of petals, they extract the smallest, and thereby afford the others more room to expand, which takes off the confused effect always produced by redundancy. The pots must be kept regularly and constantly watered during bloom, in the manner before described, and no favorable opportunity should be neglected to afford them the full advantage of exposure to light and air, by drawing up the cloth covering, in the manner before described; but no rain must be admitted to the blossoms at any period of the bloom.

" Some place their stage, or platform, on one side, others in the centre; but a double row of pots on each side, with a commodious path in the middle, is preferable. If the pots contain only two plants each, they consequently are not required to be so large as for four or five; but the latter have much the best appearance in bloom, producing a greater number of blossoms: it is not however advisable to permit every pod to blow, especially of such sorts as are naturally possessed of but few petals; because it would render each blossom smaller and thinner than if only one or two were left on each plant: it is, therefore, proper in this case to cut off, or draw out the small lateral pods, close to the main stem, as soon as they can be ascertained, in order that the remainder may have time to reap due benefit by it; but those sorts that have remarkably large short pods, abounding with petals, must be suffered to bloom them all, or the greater part, although, in general, three or four pods are as many as ought to be suffered to blow on one plant. These rules, or remarks, admit of some few exceptions, but the instances seldom occur."

" Carnations are to be treated, during winter, much like auriculas: with respect to the weather, they are seldom injured by a moderate dry frost, though it is safer to defend them from too much of it; but it is very necessary to caution against covering them up close when the plants are wet, as they are, in that state, very liable to contract a destructive mildew, if they have not the benefit of a free circulation of air; this mildew makes its first appearance in purple spots on the foliage, which can only be cured or prevented from spreading amongst the adjacent plants, by cutting out the infected part, or removing the pot, as soon as discovered, it being not improbable but that the distemper is, in great measure, owing to a very minute insect, brought into existence by the warmth generated at such times. Plants thus infected have been frequently known to communicate the contagion to others which stand near them, therefore no time should be lost in cutting off the spotted leaves or removing the plants to a distant part of the garden.

" A repository, constructed in the manner already described, is less liable to the above effects than any close frame or situation can possibly be, because it has the advantage of a free circulation of air at all times, even when shut up, unless indeed when closely covered up with mats, &c. as in cases of severe frost; but at such times no such consequences are to be dreaded.

" The rains of autumn and winter are generally more than sufficient for carnations, as well as for auriculas, from an excess of which it is proper to defend them: of the two extremes, it is safer to keep them rather too dry than too wet at these seasons, especially during winter; but a moderate degree of moisture is always to be preferred, except when the weather is severely frosty. As too long a deprivation of light is at all times prejudicial to plants, therefore, whenever the winter repository is required to be closely covered up with mats, for several days and nights, with little intermission, no opportunity should be lost during the middle of the day, if the sun shines, to take off the mats in front of the glasses, in order to admit its light and warmth.

" Whenever the surface of the earth in the pots becomes green with moss, or too compact and adhesive, it will be proper to stir it up carefully, about half an inch deep, and to sprinkle a little coarse dry sand regularly upon it: this will prevent any great degree of tenacity in future, and be of great service; it may be repeated as often as required.

" In spring, the pots will probably require to be frequently watered, and by the middle of March the operation of potting is to commence, as already described. The blossoms of carnations, particularly the high-coloured sorts, are very apt to run from their striped or variegated colors to a plain one; they are then esteemed of little or no value: but when they have only partially run, they may sometimes be recovered to their former state, by being planted in a poor, dry soil, that will but just afford sufficient nourishment for their existence." *Florists' Direct.* 166.

Hogg having potted his blooming plants, supports them with green sticks, in the manner of Maddock, and top-dresses about the middle of June " with about half an inch of rotten horse-dung passed through a sieve, which he finds materially to assist the plants, and promote the growth of the layers, on which depends the preservation of the collection. Many, he says, top-dress with some of the hotter manures of night-soil, sugar-baker's scum, &c.; but, in my opinion, that is not necessary for carnations, and is attended with danger: for, if they are not reduced to a perfect mould, they will corrode, and burn the plants."

He waters freely while the pods are swelling, and during the whole time they continue in blossom. As soon as the side shoots appear, he places "a paper collar round the bottom of the blossom to support it. These collars are made of white card paper, in the form of a circle of three or four inches in diameter (*fig.* 455. *g*), with a hole in the centre just large enough to admit the calyx or pod, without much compressing, and with a cut extending from the centre to the outside or circumference, like the radius of a circle. On these cards the flower is preserved in shape and form a long time; on these the petals are also finely disposed, and the beauty of the carnation displayed to great advantage." We must confess, we think these collars a great deformity, and much prefer a tye of thread or bass mat, or the slip of bladder recommended by Maddock.

"When placed on the stage, they should have the benefit of the morning sun till about nine or ten o'clock, according to the intense heat of its rays; the same in the evening, with as much open exposure to the air at all times as you can give them, without injury to the bloom."

In winter Hogg preserves them in frames, in the same manner as he recommends for auriculas. When he has more plants than he can blow in pots, he plants them in beds of the same compost used for the others, protecting them from severe frosts and heavy rains, and in other respects treating them in the same manner as if in pots. *Treatise, &c.*

Subsect. 18. The *Pink.* — *Dianthus hortensis, Decan. Trig.* L.; and *Caryophylleæ*, J. *L'œillet*, Fr.; *Nelke*, Ger.; and *Garofano*, Ital. (*fig.* 454. *b*).

1647. The *Pink* is considered by many to be a sub-species of the *D. Caryophyllus*; and by others to have proceeded from *D. deltoides*, a British species, and the pheasant-eye pinks from *D. plumarius.* This flower, Professor Martyn observes, does not seem to have attracted any notice among our ancestors; and it is only within the latter half of the 18th century that pinks were much improved and varied, so as to be greatly valued among florists. It is now much cultivated in the manufacturing districts, but especially in the neighbourhood of Paisley. The pink is much hardier than the carnation, and less liable to the casualties incident to the latter.

Varieties. — Parkinson, in 1629, mentions six or eight sorts. Rea, in 1704, says, there are many sorts, but of little esteem. Hogg, in 1820, gives a list of nearly one hundred names, as containing the best sorts in England; but Davey, who has raised more fine varieties of this flower than any one else, has above double that number; and the Paisley growers reckon above three hundred sorts.

Criterion of a fine Double-Pink. "The stem should be strong, elastic, and erect, and not less than twelve inches high. The calyx rather smaller and shorter, but nearly similar in form and proportion to that of a carnation, as well as the formation of the flower, which should not be less than two inches and a half in diameter. The petals should be large, broad, and substantial, and have very fine fringed or serrated edges, free from large, coarse, deep notches or indentures; in short, they approach nearest to perfection when the fringe on the edge is so fine as scarcely to be discernible; but it would be considered a very desirable object to obtain them perfectly rose-leaved, *i. e.* without any fringe at all. The broadest part of the lamina, or broad end of the petals, (*fig.* 454. *c*), should be perfectly white and distinct from the eye, unless it be a laced pink, that is, ornamented by a continuation of the color of the eye round it (*fig.* 454. *b*), bold, clean, and distinct, leaving a considerable proportion of white in the centre, perfectly free from any tinge or spot. The eye should consist of a bright or dark rich crimson, or purple, resembling velvet; but the nearer it approaches to black, the more it is esteemed; its proportion should be about equal to that of the white, that it may neither appear too large nor too small." *Maddock.*

Propagation. Generally by pipings for ordinary purposes, sometimes by layers to preserve rare sorts, and by seed for new varieties.

By Pipings. The time to commence this operation is immediately previous to or during the bloom, or indeed as soon as ever the new shoots are grown of a sufficient length for that purpose. Hogg commences about the twenty-first of June. The operation is the same as in piping carnations; only some do not apply bottom heat. This, however, is the more certain mode, and the pipings are ready to remove sooner, and generally in a fortnight or three weeks.

By Seed. Proceed as directed for carnations.

Mode of Growing. The common sorts are introduced in borders, and the better varieties in prepared beds. Sometimes rare sorts are planted in pots, but in general they thrive better in the open ground.

Soil. Maddock says, "A good fresh loamy soil, dug and comminuted about two feet deep, and manured with a stratum of cow-dung, two years old, mixed with an equal proportion of earth: this stratum to be about six inches thick, and placed five or six inches below the surface, is all the preparation or compost that appears necessary for this flower."

General Culture. As soon as the pipings are struck and will bear removal, they are to be planted on a bed of common garden mould, where, in a few weeks, it will easily be discernible which are the strongest plants to remove to the blooming bed. "This bed should be raised three or four inches above the surrounding paths, and its sides may be supported with an edging of boards, to come up even with, or one inch higher than its surface; this last, more for the sake of neatness than any particular utility it will be of to the plants.

"The plants intended for the principal bed for bloom, should be placed upon it in August, or early in September, as they do not blow quite so well if removed later in the season; they should be planted at about the distance of nine inches from each other, and the bed should be laid rather convex, or rounding, to throw off excess of rain; but will require no other covering than a very slight one in case of severe frost. The bed should be kept free from weeds, and its surface stirred up a little if it inclines to bind, or, in other words, whenever it becomes too firm and adhesive.

"Larger strong plants will put up numerous flower stems, but it is proper to thin them out a month or six weeks before bloom; in doing which, the largest and strongest should be left, especially the principal leading stem, which proceeds from the heart or centre of the plant, together with all its best pods; but no plant, however strong, should be permitted to bloom more than ten or twelve blossoms, nor weakly plants more than four or five. In order to obtain them large and well colored, all the small lateral pods should be cut or pulled off, as they never produce any other than diminutive flowers, and at the same time rob the others of a certain part of their nourishment, which, of course, prevents their attaining the size and beauty they would otherwise arrive at.

"The largest and most bushy plants do not produce the finest flowers; they naturally put forth numerous small stems, which their roots are not able to support sufficiently to produce large blossoms. Strong healthy plants, not too large, and consisting of a capital leading stem in the centre, with but little surrounding increase, are most proper to select for the best bed; these will seldom put up more than one or two stems, which will, however, be very strong, grow tall, and produce three or four blossoms, as large and fine as the sort is capable of.

"Those pods that nearly at the time of blowing become much swelled, and appear in danger of bursting, should be tied in the same manner as directed for carnations under similar circumstances. Such sorts of pinks as are most inclined to burst their pods, often times produce larger and finer flowers than others which have smaller pods, because the latter generally consist of too few petals: it is, however, more desirable to have their pods large and long, than too short and round, as it is hardly possible to preserve the latter from bursting, whereby the beautiful circular form which the flower ought to possess is lost. When the calyx is so extremely short that it must inevitably burst, it is better to assist nature by what is called letting down the pod, that is, with a penknife to nick it down at the bottom of each of its indentures, as low as may be deemed necessary, in order to let out the petals regularly on every side, and preserve the circular form of the blossoms; for if it is left to nature, the calyx will burst only on one side, and its petals will consequently force their way through that aperture, and produce a loose, deformed flower; some kinds are possessed of such weak and short pods, that the calyx (*fig.* 58. *d.*) will entirely burst from top to bottom on one side, and open so very wide as to suffer almost all the petals to fall out and hang down when they have been in bloom but a short time; such indeed hardly deserve to be classed amongst the best sorts, let their properties, in other respects, be ever so desirable. When the flower stems are grown sufficiently long, they should be supported with small sticks, or wires, as the fancy of the cultivator may direct; but these ought to be disposed of in such a manner as to allow the blossoms to expand and blow perfectly distinct from each other, that the whole may have an easy, graceful appearance.

"Those who can bestow sufficient time and attention to their bloom of pinks, may contribute greatly to the effect, by placing upon the calyx the thin pieces of card, or stiff paper, cut circular (*fig.* 455. *g.*), already mentioned (1646); these are to be placed close underneath the guard leaves, so as to support them horizontally, and will, when they extend just as far as the extreme points of the petals, give the blossom a very circular and pleasing appearance; but they are apt to warp when long exposed to the weather, especially after being wet, and must either be taken off entirely, or exchanged for new ones, as they will no longer answer the intended purpose. Some kinds do not require any assistance of this sort, but the greater part not having their guard leaves sufficiently strong at the base to support themselves in a horizontal position, are considerably improved by this little contrivance, which, perhaps, by the foregoing description, will not be difficult to comprehend.

"At the time of bloom, which is towards the end of June, it is proper to defend the bed by a covering or awning, somewhat similar to that used for the bloom of tulips and carnations: they should, in like manner, enjoy the advantage of light and air, and the soil should be kept regularly moist by soft water, administered between the plants, carefully avoiding to wet the blossoms." *Florists' Direct.* 220.

Hogg observes, that "pinks moved and transplanted in the spring never do well, nor show half the beauty which those do that were planted in September; the laced pinks in particular appear almost plain, and without their distinguishing character: they should likewise never be suffered to remain longer than two years without either change of soil or situation."

Emmerton says, "your pink-bed should be top-dressed in the spring, if you have a desire to excel in blooms, with some old night-soil, or sugar-bakers' scum, finely sifted and sown over it." "Your strong-blowing plants should not be allowed to bloom more than eight or ten blooms, and those that are weaker, of a less size, not more than four." *Treatise on Auricula, &c.* 191.

Subsect. 19. The *Double Rocket.* — *Hesperis matronalis*, L.; (*Lam. ill. t.* 564. *f.* 1.) *Tetrad. Siliq.* L.; and *Cruciferæ*, J. *Julienne*, Fr.; *Nachtviolen*, Ger.; *Esperide*, Ital.

1648. This is a biennial or imperfect perennial; a native of Italy, and cultivated by Gerarde in 1597.

The *Varieties* are the white and purple, both very double, and forming a spike of about a foot long, of great beauty and fragrance, and considerable duration.

Propagation and Culture. The plant is extremely difficult to preserve, especially near large towns. It does not thrive either near London or Paris; and both capitals, especially the latter, are supplied with it from provincial growers. It is very much grown in the west of Scotland, and in the Netherlands; and between Calais and Abbeville it may be seen in great perfection in most cottagers' gardens. Van Mons (*Hort. Trans.* ii. 153.) says it prospers best in a clayey soil, but flowers best in one of a lighter texture, like the *Lobelia cardinalis*.

The best directions which we have met with for its culture are given by D. Robertson, (in *Caled. Mem.* ii. 245.) He says, "The double rocket is a beautiful plant, rather scarce in this part of the country, owing chiefly, I suppose, to florists not being acquainted with a successful way of encreasing it. I had a few plants of rocket under my care, and I did them all justice, as I thought, but all would not do; I lost them all. I tried to part their roots, but being small and weak, the slugs eat them all up in a short time; as slugs are very fond of them, especially of their leaves. I tried to encrease them by cuttings in the common way, with as little success. This led me to try another method, which I would recommend as a never-failing way of propagating this beautiful flower. If a person has but one plant of rocket, and is anxious for its flowers, the first thing is, after the flower is beginning to fade, to cut down the stalks and divide them into ordinary lengths of cuttings; next to cut off the leaves, and smooth the ends; then to make three slits with a knife in the bark or rind, longways, so as to separate or raise the bark for half an inch in length. When the cutting is inserted in the ground, the loose bark naturally curls up; and it is from this bark that the young roots proceed. The partial separation, and the turning up of the bark, seems to promote a tendency to throw out roots. The cuttings may be put into flower-pots, as they may thus be sheltered during winter with more ease; or they may be placed in the natural earth, provided the soil is light and fresh. Covering them with a hand-glass, will forward the rooting of the cuttings; or with the aid of a hot bed, they will succeed excellently. I have used this simple way for six years past, and never without success; not one in twenty having failed. This method, it may be remarked, will hold good in cuttings of stock-gilliflowers, and double wallflowers."

Subsect. 20. The *Cardinal Flower.* — *Lobelia*, L.; *Pent. Monog.* L.; and *Campanulaceæ*, B. P. *Lobelie*, Fr.; *Kardinalsblume*, Ger.; and *Fior Cardinale*, Ital. (*figs.* 456 and 457.)

There are three species of this genus which rank high as florists' flowers.

1649. The *Common Cardinal Flower*, L.; *Cardinalis*, (*Bot. Mag.* 320, and *fig.* 456.) has roots composed of many white fleshy fibres, oblong leaves, stalks erect, about a foot and a half high, terminated by a spike of flowers, "of an exceedingly beautiful scarlet color," appearing in the end of July and August. It is a native of Virginia; and it is found abundantly by the side of rivers and ditches: introduced in 1629. Justice is in raptures with it, describing it as "a flower of most handsome appearance, which should not be wanting in curious gardens, as it excels all other flowers I ever knew in the richness of its color."

There is a dwarf *variety*, but it is very liable to perish.

Propagation and Culture. By seeds, offsets, or cuttings; but the former method produces the strongest plants. Sow in pots of rich earth soon after the seed is ripe, and place them under the protection of a frame. The seeds will appear the following spring; and after they have two or three leaves, should be planted in separate small pots, and shifted into larger ones once or twice during the season. Place them in an eastern exposure, and supply them freely with water. Protect, during winter, by a frame; and the following spring, shift them into pots, six or eight inches diameter, in which they will flower. If not much exposed to the sun, they will continue long in beauty. The roots do not last above two or three years; and therefore a succession of young plants, from seed or slips, should be regularly provided. *Miller.*

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The *Fulgent Cardinal Flower*, L.; *Fulgens*, W. en. (*Bot. Rep.* 659, and *fig.* 457. *a*); is a native of Mexico, and was introduced into England in 1809: flowers in July and August. Though a native of a warm climate, it has been found to bear the severity of our winters, by being immersed in water, as an aquatic, and with this treatment has flowered well by the sides of ponds and in cisterns.

Propagation. By suckers or cuttings, which strike with remarkable facility in any shady situation; and by seed. According to Professor Van Mons, " the seed should be sown, as soon as it is ripe, in earthen pans; the earth should be moistened, and after it has imbibed the water, the seed must be spread over it without being covered. The pans should be sheltered from the frost, and the young plants may be transplanted in April and May. Very few of them remain, more than the second year, without flowering."

Culture. This plant has assumed a character of uncommon magnificence under the management of W. Hedges, which is thus detailed by J. Sabine. " In October, he takes off the suckers, which are thrown up from the roots of the old plants, and puts them into small pots, one in each pot, and keeps them in a cold frame till the middle of January: he then removes them into a cucumber frame, where the heat is kept up to 65 degrees of Fahrenheit's scale, by linings of hot dung; a pine succession stove of the same temperature will equally suit them. In the middle of February, they are shifted into pots a size larger; and at the end of March, or in the beginning of April, they are again moved into larger pots, and in the middle of May they are a third time shifted: the pots to be used for this last shifting, are twelves. As soon as the plants are well rooted, after the last removal, they are carried into a peach-house or green-house, in which they continue till they flower, and are hardy enough to bear the open air. When they are preparing to throw up their flowering stems, and during their growth, it is necessary that they be kept very moist, which is effected by putting pans under the pots, and keeping the pans constantly filled with water. The plants thus managed, begin to flower early in July, and the spikes continue to blow, and are covered with flowers through the autumn. The compost used in the pots, is formed of equal parts of brown or yellow loam, and of leaf or bog mould, to which is added sand, equal to one-fourth of the previous composition, the whole being well mixed together.

" The plant of *Lobelia fulgens*, which was exhibited to the society on the 19th of last month, by W. Hedges, had been managed as above directed; but as no notes of its size and height were made at the time, the following dimensions have been taken from another plant in the garden at Kenwood. The base of the stem was near six inches in circumference; the height of the centre spike was five feet and a half; the shoots from the bottom and sides of the main stem were in number seventeen, rising together round the principal stem, to the height of about four feet and a half. W. Hedges states, that his plants were in the two preceding years, much taller than that now described. Some few plants were observed to be rather shorter, and to have a more bushy appearance: this is produced by stopping the centre stem, after the last shifting, by which the side shoots become more vigorous and fuller of flower, and in this state they form handsome companions to the flowering plants of *Campanula pyramidalis*, whose beautiful spikes of blue flowers agreeably contrast with the brilliant scarlet of the *Lobelia*." *Hort. Trans.* ii. 400.

The *Splendid Cardinal Flower*, L.; *Splendens*, W. en.; (*Bot. Reg.* 60. and *fig.* 457. *b*); a native of Mexico, and introduced in 1814: may be treated like *L. fulgens*; and the *Blue Cardinal Flower*: *L. siphilitica* (*Jac.* ic. iii. t. 597.); a native of Virginia, and introduced in 1665: may be treated like *L. cardinalis*.

Subsect. 21. The *Pyramidal Bellflower*. — *Campanula Pyramidalis*, L. (*Park. parad.* 354.); *Pent. Monog.* L.; and *Campanulaceæ*, B. P. *Campanule Pyramidale*, Fr. *Pyramidenglocken*, Ger.; and *Campanule*, Ital.

1650. This plant, in its cultivated state, has thick ramose roots, which are milky, oblong leaves and strong stalks, four feet high, from the sides of which the flowers are produced for more than half their length, forming a sort of pyramid. The most common color is blue, but there is a variety with white flowers. It is a native of Istria and Savoy, and was cultivated by Gerarde in 1596. Formerly it was in demand as an ornament to halls, and for placing before chimneys in summer, being planted in large pots, and trained in the fan manner, so as to cover a large surface. In the shade it continues in flower for two months or more.

Propagation and Culture. By seed, cuttings from the stem, or by dividing the roots; the last method makes the strongest plants in the shortest time. The season for this operation is after the bloom has faded in September; the sections are to be planted in pots, and protected by a frame during winter. In spring they may be transplanted into large pots, and in the beginning of summer into still larger ones, in which they are to flower the summer following.

By Seeds. The plants so raised, Miller says, are always stronger, and the stalks rise higher, and produce a greater number of flowers. Good seeds are to be obtained by placing a strong flowering plant in a warm situation against a wall or under a glass case. They are to be sown in pots of light earth soon after being gathered, protected by a frame during winter, and will come up in spring. When the leaves decay in October, they are to be transplanted to beds of "light sandy earth, without any mixture of dung, which is a great enemy to this plant. Here they are to remain two years, being protected in winter by rotten tan; they are then to be removed to their final destination in September or October, and the year following, being the third from sowing, they will flower. The plants, Miller observes, of this species, as of many others which have been long propagated by roots, offsets, or cuttings, do not so readily bear seed as those which have been raised from seed.

The *C. Carpatica*, *grandiflora*, and several other very shewy species, may be similarly treated.

Subsect. 22. The *Chrysanthemum*. — *Chrysanthemum Indicum*, L.; *Anthemis Artemisiæfolia*, W., *Syng. Polyg. Super.* L.; and *Corymbiferea*, J. *Chrysantème*, Fr.; *Goldblume*, Ger.; and *Crisanteruo*, Ital.

1651. This is a fibrous rooted half hardy perennial, with pinnate, gashed, serrated leaves, leafy stems, from three to four feet high, and flowers generally on solitary peduncles. It is a native of China, where it is highly prized and extensively cultivated as an ornamental plant, and was introduced in 1764. Here it contributes greatly to the beauty of the flower-garden in a fine autumn, and of our conservatories in November and December, when scarcely any other plants are in flower.

Varieties. The Chinese are supposed from good authority to have fifty varieties or upwards: there are fourteen described by J. Sabine, as having flowered in this country, and as many more of recent introduction, which have not yet flowered. Through the exertions of the Horticultural Society, and some nurserymen, and private individuals, it is expected all the Chinese sorts will soon be imported. J. Sabine describes as having flowered in the garden of the Horticultural Society, and as to be procured in the nurseries, the following:

The purple
Changeable white
Quilled white
Superb white
Tasselled white
Quilled yellow
Sulphur yellow
Golden yellow
Large lilac
Rose or pink
Buff or orange
Spanish brown
Quilled flamed yellow, and
Quilled pink, flowered sorts.

Propagation and Culture. By dividing the root, by suckers, and by cuttings: the latter is the best mode, as producing plants less likely to throw up suckers. The cuttings are usually taken from the side branches in August, planted in shallow pots, placed in a warm shaded spot, and covered with a hand-glass. In a month or six weeks, they will have struck, and are then put into pots of the smallest size, and put a half ditto lime rubbish, or old plaster; to be prepared, and well incorporated, as before." He also uses the same compost for yellow picotées. *Treatise, &c.* 45.

Justice says, " One article with respect to the soil for carnations you must certainly observe; never to use for it the ground wherein hyacinths have been planted; they, from certain experience, being a sure poison to the carnation, and *vice versâ*." *Brit. Gard.* 427.

Manner of Growing. The commoner sorts are planted in beds or borders, but the select kinds always in pots.

Pots and Potting. Maddock uses pots for flowering plants, " at least twelve inches wide at the top, six inches at the bottom, and ten inches deep in the inside, with a circular aperture in the centre of the bottom, of about an inch in diameter; also three or four smaller holes round the sides of the pot, close to the bottom, to prevent the possibility of water lodging or remaining in that part." Hogg uses pots of twelve or sixteen to the cast, being smaller than those recommended by Maddock.

" The *operation of potting*," according to Maddock, " should commence about the middle of March, if the weather is not extremely unfavourable; but it should not, on any account, be deferred later than the end of that month. The pot is, in the first place, to be half filled with compost, having an oyster-shell, with its hollow side downwards, placed over the hole in the centre of the bottom: this compost is to be higher at the sides than in the centre of the pot, and the plants intended for it, which are supposed to have been wintered in small pots, containing four plants each, are to be carefully turned out of their pots, with all the earth adhering to them, in a ball; and after rubbing off about half an inch of the surface of the old mould, round about the plants, above their fibres, cleaning them and cutting off the decayed points of their leaves, the ball is to be carefully placed in the centre of the pot, and the space between it and the sides filled up with the prepared compost.

" It is very necessary to be attentive in placing the plants, that they be neither planted deeper nor shallower than they were before; the compost should therefore be high enough to replace the old earth that was rubbed off on potting, exactly to the same height as before, *i. e.* half an inch higher than the ball of old earth and fibres: and the whole surface of the earth in the pot, when the operation is finished, should be nearly level or flat; but by no means higher at the centre than at the sides, because the plants would thereby be kept too dry; nor should the compost come nearer than within an inch of the top or rim of the pot, after it has been gently shaken, or struck against the ground on finishing, as an inconvenience will attend its being too full, when the operation of laying comes to be performed, which requires some additional mould on the surface, for the layers to strike into." Hogg considers the first week in April as the safest and best time to pot carnations, and he performs the operation in the same manner as Maddock.

General Culture. " When the plants are potted off for bloom, the pots should be placed in an open airy part of the garden, under an arch of hoops, that in case of cold drying winds, heavy rains, or frosty nights, mats may be thrown over, to preserve them from the effects of such unfavourable weather: in this situation they are to remain, always open to the air, except in the cases above mentioned, and be kept regularly watered, with soft water from a fine-rosed watering-pot.

" When their flower-stems are grown eight or ten inches high, it will be necessary to support them with sticks, forced into the earth in the centre of the pot, to which the stems are to be loosely tied with small pieces of bass mat: these sticks should be as high as the hoops will admit, in order that the pots may remain under them as long as possible; but when the stems are grown too high for this situation, the pots are to be removed to the stage, and remain there till the time of bloom; the small sticks should be replaced with others more suitable for the occasion; these should be about four feet or four feet six inches long, regularly tapering a little from the bottom to the top, and be painted green; they should be substantial and straight, and their lower ends are to be forced into the earth in the centre of the pot, sufficiently deep and firm, not to be shaken loose by the wind. As the stems continue to advance in height, the tying, as above, must also be continued at about every five or six inches: it is proper to look over and examine the plants for this purpose every three or four days, as the stems are rather brittle, and liable to be broken by the wind, if not supported in this manner.

" If any small, green, winged insects appear on the stems or foliage of the plants, particularly upon or underneath the flower-pods, they must be effectually extirpated or destroyed, either by the means of a small soft brush or feather, by the application of a strong infusion of tobacco-water, or some similar easy and safe expedient: even Scotch snuff dusted upon the infested parts early in the morning, while the plants are wet with the dew of the night, has been sometimes tried in this case with success.

" The calyx of many sorts contains a great number of petals, which, as they increase in bulk, will distend and burst it, if not timely prevented: this generally happens a few days previous to the proper time for the blossoms opening, and will, if neglected, soon manifest the effects of such neglect, by letting out the petals on one side, and thereby producing a loose irregular appearance, totally destroying that compact, graceful, circular form which a perfect flower ought to possess, and which is one of its greatest ornaments; but this disagreeable effect may be easily avoided, by fastening a small narrow slip of bladder round the middle of the pod, where it is most swelled, and appears to have the greatest inclination to burst. The slip of bladder should be rather longer than is required to go once round, so that one end of it may lay over the other a little, which, by the application of a little gum-water, will adhere firmly together, and answer the purpose completely. Small slips of wet bass mat may be substituted for those of bladder, and being tied with a single knot round the same part of the pod, will answer nearly as well. (*fig.* 453. *b.*)

" When any of the flowers begin to open and expand, such should be shaded, both from sun and rain, by means of strong caps, or paper covers, (*fig.* 455. *d.*), about twelve inches in diameter, painted white or green, and formed like an umbrella, to throw off rain; each should have a square tin tube on the summit, that will permit the stick, to which the stem is tied, to pass through it as far as is necessary. The tube should be about two inches long, and have a small hole bored through one of its sides, that it may be fixed by a nail to any part of the stick where required.

" But when the major part are in bloom, a cloth awning should be placed over the whole, and be drawn up or let down by means of lines and pulleys, exactly in the same manner, and on the same occasions, as for the bloom of hyacinths and tulips. The same frame that was used for the hyacinth (*fig.* 435.) will, without being removed or taken down, answer in every respect for carnations: nor can any other more suitable be contrived or adopted.

" In order that the flowers may appear to the greatest advantage, it is necessary that the pots should stand upon a stage or platform of boards raised about twelve or fifteen inches above the ground; this stage should be very strongly supported, in order to sustain the immense weight of the pots, without danger of giving way; the supporters of this platform should stand in shallow leaden or earthen vessels, filled with water, to prevent the access of earwigs, which are destructive enemies to the blossoms of carnations: they secrete themselves commonly during night, in the calyx (*fig.* 453. *a.*), and soon commence their depredations, by biting off and devouring the lower ends or claws of the petals, which of course will cause them to drop out, and thereby disfigure the flower.

" The stands, or reservoirs, should be broad enough to allow an intermediate space of water, three or four inches wide, between their sides and the supporters placed in the centre of each. Earwigs will nevertheless be frequently found amongst the flowers, having been brought upon the stage with the pots, where they remain concealed, or dormant, till the flowers are in bloom; or perhaps they may have gained access by having crept up the external frame, and from thence fallen down upon the pots; or they may possibly have flown upon them, as they are evidently provided with wings, though it does not appear that they often make use of them. At all events, it is necessary frequently to examine the plants, and the sticks which support the stems, as earwigs will be often found concealed there in the day-time, particularly at the part where the stems are tied, which affords them a more secure hiding place. If any of the petals hang loose, or drop out, it is a certain sign that an earwig is, or has been there: in the first case, blowing forcibly with the mouth, into the blossom, two or three times, will cause it to creep out; but if it has quitted the blossom previous to the discovery, it should be carefully sought after and destroyed, or it will continue its depredations the succeeding night; it will, however, most probably be found sculking somewhere about the same pot, but not farther distant than the next, or next but one, unless the search has been deferred too long.

" The flowers should be suspended from the sticks by small pieces of fine elastic brass wire (*fig.* 455. *e.*), of unequal lengths, (sold in the pin shops,) to support them in an easy graceful manner, neither too near together nor remote from each other: one end of the wire should be introduced into the stick by means of a small awl, and there be fixed sufficiently tight to prevent its dropping out by the weight of the blossom; the other end of the wire should be formed into a small ring, about a quarter of an inch in diameter, to enclose the stem below the calyx; this ring should be a little open on one side to admit the stem freely, without bruising it, which would materially injure the bloom.

" Those who are particularly curious in blowing their carnations, carefully extract such petals as are plain, or run from their true colours: they perform this by means of an instrument adapted to the purpose (*fig.* 455. *f.*), and with the same arrange the remaining petals, so as to supply the defect; in like manner they dispose the whole with such regularity that the flowers appear to have an equal distribution of beautiful petals, nearly alike on every side, without imbricating each other, so as to hide their respective beauties: and if the blossom consists of too great a number of petals, they extract the smallest, and thereby afford the others more room to expand, which takes off the confused effect always produced by redundancy. The pots must be kept regularly and constantly watered during bloom, in the manner before described, and no favorable opportunity should be neglected to afford them the full advantage of exposure to light and air, by drawing up the cloth covering, in the manner before described; but no rain must be admitted to the blossoms at any period of the bloom.

"Some place their stage, or platform, on one side, others in the centre; but a double row of pots on each side, with a commodious path in the middle, is preferable. If the pots contain only two plants each, they consequently are not required to be so large as for four or five; but the latter have much the best appearance in bloom, producing a greater number of blossoms: it is not however advisable to permit every pod to blow, especially of such sorts as are naturally possessed of but few petals; because it would render each blossom smaller and thinner than if only one or two were left on each plant: it is, therefore, proper in this case to cut off, or draw out the small lateral pods, close to the main stem, as soon as they can be ascertained, in order that the remainder may have time to reap due benefit by it; but those sorts that have remarkably large short pods, abounding with petals, must be suffered to bloom them all, or the greater part, although, in general, three or four pods are as many as ought to be suffered to blow on one plant. These rules, or remarks, admit of some few exceptions, but the instances seldom occur."

"Carnations are to be treated, during winter, much like auriculas: with respect to the weather, they are seldom injured by a moderate dry frost, though it is safer to defend them from too much of it; but it is very necessary to caution against covering them up close when the plants are wet, as they are, in that state, very liable to contract a destructive mildew, if they have not the benefit of a free circulation of air; this mildew makes its first appearance in purple spots on the foliage, which can only be cured or prevented from spreading amongst the adjacent plants, by cutting out the infected part, or removing the pot, as soon as discovered, it being not improbable but that the distemper is, in great measure, owing to a very minute insect, brought into existence by the warmth generated at such times. Plants thus infected have been frequently known to communicate the contagion to others which stand near them, therefore no time should be lost in cutting off the spotted leaves or removing the plants to a distant part of the garden.

"A repository, constructed in the manner already described, is less liable to the above effects than any close frame or situation can possibly be, because it has the advantage of a free circulation of air at all times, even when shut up, unless indeed when closely covered up with mats, &c. as in cases of severe frost; but at such times no such consequences are to be dreaded.

"The rains of autumn and winter are generally more than sufficient for carnations, as well as for auriculas, from an excess of which it is proper to defend them: of the two extremes, it is safer to keep them rather too dry than too wet at these seasons, especially during winter; but a moderate degree of moisture is always to be preferred, except when the weather is severely frosty. As too long a deprivation of light is at all times prejudicial to plants, therefore, whenever the winter repository is required to be closely covered up with mats, for several days and nights, with little intermission, no opportunity should be lost during the middle of the day, if the sun shines, to take off the mats in front of the glasses, in order to admit its light and warmth.

"Whenever the surface of the earth in the pots becomes green with moss, or too compact and adhesive, it will be proper to stir it up carefully, about half an inch deep, and to sprinkle a little coarse dry sand regularly upon it: this will prevent any great degree of tenacity in future, and be of great service; it may be repeated as often as required.

"In spring, the pots will probably require to be frequently watered, and by the middle of March the operation of potting is to commence, as already described. The blossoms of carnations, particularly the high-coloured sorts, are very apt to run from their striped or variegated colors to a plain one; they are then esteemed of little or no value: but when they have only partially run, they may sometimes be recovered to their former state, by being planted in a poor, dry soil, that will but just afford sufficient nourishment for their existence." *Florists' Direct.* 166.

Hogg having potted his blooming plants, supports them with green sticks, in the manner of Maddock, and top-dresses about the middle of June "with about half an inch of rotten horse-dung passed through a sieve, which he finds materially to assist the plants, and promote the growth of the layers, on which depends the preservation of the collection. Many, he says, top-dress with some of the hotter manures of night-soil, sugar-baker's scum, &c.; but, in my opinion, that is not necessary for carnations, and is attended with danger: for, if they are not reduced to a perfect mould, they will corrode, and burn the plants."

He waters freely while the pods are swelling, and during the whole time they continue in blossom. As soon as the side shoots appear, he places "a paper collar round the bottom of the blossom to support it. These collars are made of white card paper, in the form of a circle of three or four inches in diameter (*fig.* 455. *g*), with a hole in the centre just large enough to admit the calyx or pod, without much compressing, and with a cut extending from the centre to the outside or circumference, like the radius of a circle. On these cards the flower is preserved in shape and form a long time; on these the petals are also finely disposed, and the beauty of the carnation displayed to great advantage." We must confess, we think these collars a great deformity, and much prefer a tye of thread or bass mat, or the slip of bladder recommended by Maddock.

"When placed on the stage, they should have the benefit of the morning sun till about nine or ten o'clock, according to the intense heat of its rays; the same in the evening, with as much open exposure to the air at all times as you can give them, without injury to the bloom."

In winter Hogg preserves them in frames, in the same manner as he recommends for auriculas. When he has more plants than he can blow in pots, he plants them in beds of the same compost used for the others, protecting them from severe frosts and heavy rains, and in other respects treating them in the same manner as if in pots. *Treatise, &c.*

Subsect. 18. The *Pink.* — *Dianthus hortensis, Decan. Trig.* L.; and *Caryophylleæ,* J. *L'œillet,* Fr.; *Nelke,* Ger.; and *Garofano,* Ital. (*fig.* 454. *b*).

1647. The *Pink* is considered by many to be a sub-species of the *D. Caryophyllus*; and by others to have proceeded from *D. deltoides*, a British species, and the pheasant-eye pinks from *D. plumarius.* This flower, Professor Martyn observes, does not seem to have attracted any notice among our ancestors; and it is only within the latter half of the 18th century that pinks were much improved and varied, so as to be greatly valued among florists. It is now much cultivated in the manufacturing districts, but especially in the neighbourhood of Paisley. The pink is much hardier than the carnation, and less liable to the casualties incident to the latter.

Varieties. — Parkinson, in 1629, mentions six or eight sorts. Rea, in 1704, says, there are many sorts, but of little esteem. Hogg, in 1820, gives a list of nearly one hundred names, as containing the best sorts in England; but Davey, who has raised more fine varieties of this flower than any one else, has above double that number; and the Paisley growers reckon above three hundred sorts.

Criterion of a fine Double-Pink. "The stem should be strong, elastic, and erect, and not less than twelve inches high. The calyx rather smaller and shorter, but nearly similar in form and proportion to that of a carnation, as well as the formation of the flower, which should not be less than two inches and a half in diameter. The petals should be large, broad, and substantial, and have very fine fringed or serrated edges, free from large, coarse, deep notches or indentures; in short, they approach nearest to perfection when the fringe on the edge is so fine as scarcely to be discernible; but it would be considered a very desirable object to obtain them perfectly rose-leaved, *i. e.* without any fringe at all. The broadest part of the lamina, or broad end of the petals, (*fig.* 454. *c*), should be perfectly white and distinct from the eye, unless it be a laced pink, that is, ornamented by a continuation of the color of the eye round it (*fig.* 454. *b*), bold, clean, and distinct, leaving a considerable proportion of white in the centre, perfectly free from any tinge or spot. The eye should consist of a bright or dark rich crimson, or purple, resembling velvet; but the nearer it approaches to black, the more it is esteemed; its proportion should be about equal to that of the white, that it may neither appear too large nor too small." *Maddock.*

Propagation. Generally by pipings for ordinary purposes, sometimes by layers to preserve rare sorts, and by seed for new varieties.

By Pipings. The time to commence this operation is immediately previous to or during the bloom, or indeed as soon as ever the new shoots are grown of a sufficient length for that purpose. Hogg commences about the twenty-first of June. The operation is the same as in piping carnations; only some do not apply bottom heat. This, however, is the more certain mode, and the pipings are ready to remove sooner, and generally in a fortnight or three weeks.

By Seed. Proceed as directed for carnations.

Mode of Growing. The common sorts are introduced in borders, and the better varieties in prepared beds. Sometimes rare sorts are planted in pots, but in general they thrive better in the open ground.

Soil. Maddock says, "A good fresh loamy soil, dug and comminuted about two feet deep, and manured with a stratum of cow-dung, two years old, mixed with an equal proportion of earth: this stratum to be about six inches thick, and placed five or

PERENNIAL BORDER-FLOWERS. — MAY — *continued.*

Height from 0 to ¾ of a foot.	*From ¾ of a foot to 1½ foot.*	*From 1½ foot to 2½ feet.*	*From 2½ feet to 3½ feet.*	*From 3½ feet and upwards.*
WHITE.	**WHITE.** Lamium molle Lepidium alpinum Lynchnis 4 dent. fl. albo Peltaria alliacea	**WHITE.**	**WHITE.**	**WHITE.**
YELLOW. Ranunculus thora Alyssum creticum — olympicum Andryala lanata Cheiranthus alpinus, *p.* Geum montanum — minor Hieracium aureum 3 Lysimachia nemorum — nummularia Primula acaulis, yell. dble. — — — sin. — — hose in hose *s.* — auricula — veris — — elatior Tormentilla reptans Vesicaria utriculata Viola biflora, *p.*	**YELLOW.** Arum arisarum Cineraria campestris Draba aizoides Galium cruciatum Geum strictum Gnaphali. olympic. *s.* 3 *p.* Lithospermum orientale — officinale Tormentilla erecta Onosma echoides Papaver cambricum Potentilla sericea Uvularia sessilifolia Ranunculus auricomus	**YELLOW.** Chelidonium majus — laciniatum — flo. pleno Chrysanthemum multifol. Cineraria longifolia Doronicum plantagineum	**YELLOW.** Bunias orientalis Doronicum pardalianches Smyrnium perfoliatum	**YELLOW.**
BLUE. Asarum virginicum, *p.* Iris tuberosa, *p.* Gentiana verna, *p.* Phaca australis Primula farinosa, *p.* — helvetica, *p.* — integrifolia, *p.* — marginata Statice coriacea, *p.* Veronica officinalis Viola hirta, *p.* — cornuta — obliqua — pedata — pubescens	**BLUE.** Linaria alpina Iris sanguinea — siberica Phlox divaricata 3, *p.* Polemonium reptans Pulmonaria virginica, *p.*	**BLUE.** Iris lusitanica — tenuifolia Polemonium cœruleum Symphytum orientale Veronica gentianoides — spuria,	**BLUE.**	**BLUE.**
PURPLE. Pulmonaria angustifol. *p.* Anemone pratensis, *p.* Gentiana acaulis, *p.* Iris pumila Primula acaulis lilac, dbl. 3 Mitella diphylla, *p.*	**PURPLE.** Geum rivale Helonias bullata, *p.* Iris biflorens Ranunculus gramineus Saxifraga cuneifolia Verbascum pinnatifidu. *p.* Cardamine pratensis — flo. pleno Penstemon campanulata Lamium lævigatum Orobus vernus *s.* Primula villosa, *p.* Vicia dumetorum Viola hastata Verbascum pennatifidu. *p.*	**PURPLE.** Hyoscyamus scopalia, *p.* Lamium orvala Pæonia humilis, *p.*	**PURPLE.** Orobus niger 3. *p.* Pæonia byzantina 3. — daurica 3. — fimbriata 3.	**PURPLE.**
VARIEGATED. Anemone hortensis, *p.* Iris pumila variegata, *p.* Viola striata	**VARIEGATED.** Cerastium alpinum Iris prismatica, *p.* Aristolochia clematitis	**VARIEGATED.**	**VARIEGATED.**	**VARIEGATED.**
GREEN. Paris quadrifolia	**GREEN.** Aquilegia alpina — viridiflora, *p.* Saxifraga palmata	**GREEN.**	**GREEN.**	**GREEN.**
BROWN. Primula veris, flo. ple. *s.* — polyanthos	**BROWN.**	**BROWN.** Mercurialis perennis	**BROWN.**	**BROWN.**

JUNE.

RED. Ancistrum lucidum, *t. p.* Dianthus deltoides — alpinus 3 — cæsius rub. 3 — glaucus Saponaria ocymoides 3, *p.* Saxifraga sarmentosa Semperv. arachnoideum, *p* Statice cordifolia, *p.* Anthyllis vulnerar. flo. coc. Valeriana dioica Betonica incana Sempervivum cuspidat. *p.* — globiferum,	**RED.** Aphilanthes monspeliensis Echium rubrum Hedysarum onobrychis Anthyllis vul. coc. Dianthus atro. rubens Asperula taurina Phlox setacea, *p.* — subulata Sempervivum arachn. Veronica urticifolia Ononis repens — rotundifolia Phlox pilosa, *p.* Ononis hircina Orobus varius, *p.* Polygonum bistortum, *s.* Rubus arcticus, *p.* Saxifraga rotundifolia Statice cephalotes, *t. p.* Symphytum carmosina Teucrium multiflorum	**RED.** Achillea millifol, fl. ru. *s. p.* Pæonia sinensis, rub. pl. Sanguisorba officinalis Valeriana rubra Fumaria spectabilis Aquilegia rosea. multi. Orobus sylvaticus, *p.* Pæonia anamola	**RED.** Papaver orientalis Thalictrum atropurpur. Pæonia peregr. fl. incar. pl. *s* Valeriana officinalis .. pyrenaica Pæonia peregrina, fl. ros. pl.	**RED.** Coronilla, varia flo. carnea Aconitum napellus, fl. ros.
WHITE. Asperula crassifolium Illicebrum capitatum, *p.* Achillea clavenna, *s.* Ajuga reptans, flo. albo, *p.* Androsace lactea Arabis lucida, *p.* — albiica Bellium bellidioides, *p.* Campanu. rotundifo. fl. al. *p.* Cornus suecia, *p.* Iris pumila alba, *p.* Polygonum viviparum	**WHITE.** Anchusa angustifol. fl. alb. Anemone pensylvanica *s. p.* Anthemis pyrethrum Anthericum liliago — liliastrum Arenaria laricifolia, *p.* — montana Arum maculatum Chrysanthemum argente. — aratrum — monspeliense Cochlearia saxatilis	**WHITE.** Valeriana rubra, var. alba Achillea ligustica — moschata — nobilis Apocynum hypericifolium — venetum, *t.* Asclepias vincetoxicum Betonica glomerata Chrysant. ceratophylloides Dorycnium herbaceum Hesperis, mat. flo. pl. albo Imperatoria ostruthium	**WHITE.** Actea spicata — bacc. albidis — bacc. rubris Anthericum ramosum Apocynum cannabinum Athamanta sicula Clematis recta, *p.* Laserpitium trilobum Mentha cervina Pæonia albiflora — sibirica Plantago alpina	**WHITE.** Aconitum napellus, fl. alb. Asphodelus ramosus Convolvulus sepium, alb. Coronilla varia, fl. albo Cynanchum acutum, 3. Galega officinalis, fl. albo Laserpitium aquilegifolia Spiræa aruncus, *p.*

PERENNIAL BORDER-FLOWERS. — JUNE — *continued.*

Height from 0 to ½ of a foot.	*From ½ of a foot to 1½ foot.*	*From 1½ foot to 2½ feet.*	*From 2½ feet to 3½ feet.*	*From 3½ feet and upwards.*
WHITE. Saxifraga adscendens — cæsia — cernua — nivalis — rivularis Scrophularia altaica Sisymbrium sagittatum Stellaria cerastium, *p.* — scapularina, *p.* Thalictrum fœtidum Thesium alpinum — linophyllum Trientalis europea, *p.* Valeriana celtica Veronica alpina Viola blanda — lanceolata	WHITE. Convallaria latifolia Cypripedium album *s.* Dianthus cæsius, flo. albo — virginicus Doronicum bellidiastrum Galium glaucum Erodium chamædryoides Geum virginianum, *p.* Helonias asphodeloides Hydrophyllum virginicum Iris flexuosa, *p.* Lithospermum virginiano. Lychnis, flo. albo Melissa officinalis Physalis alkekengi Pimpinella saxifraga Potentilla rupestris Ranunculus alpestris Rubus chamæmorus, *p.* — saxatilis Sanicula europæa Saxifraga ajugifolia — aizoon Sempervivum hirtum, *p.* Sesili aristatum Silene amœna, *p.* Stellaria cerastoides, *p.* — scapigera, *p.* Teucrium pyrenaicum, *p.* Trifolia canescens Trifolium pannonicum — repens maculatum	WHITE. Lepidium latifolium Ligusticum austriacum Lychnis vespertina — — flo. pleno Marrubium vulgare Pimpinella peregrina Rubus rosæfolius, *p.* Saururus cernuus, *t. p.* Sophora alba, *p.* Spiræa trifoliata Thalictrum rugosum	WHITE. Salvia indica Sambucus ebulus Sanguisorba canadensis Thalictrum angustifolium — aquilegifolium — — contortum — cornuti Valeriana Phu	WHITE.
YELLOW. Linum flavum, *p.* Medicago prostrata Aletris aurea — farinosa Alyssum alpestre — murale Anemone palmata, *s. p.* Anthyllis vulneraria Arabis bellidifolia, *p.* Cistus tuberaria, *t. p.*, Glaux maritima Gnaphal. Leontopod. *p.* Hippocrepis comosa Hypochœris Helvetica Saxifraga mutata Geum potentilloides, *p.* Hypoxis erecta, *p.* Sedum deficiens — virens Viola lutea	YELLOW. Achillea falcata — micrantha, *p.* — pubescens — santolina Agrimonia agrimonoides — nana Alyssum tortuosum Hieracium aurantiacum Trollius americanus — asiaticus — major Arnica montana, *p.* — scorpioides Bupthalmum grandiflo. Caltha palus, flo. pleno Cheiranthus helveticus, *p.* Crepis rigida Cypripedium calceolus, *t. p* Dracæna borealis, *p.* Erysimum barb. flo. pleno. Fumaria nobilis, 3. *p.* Galeobdolon luteum — urbanum Hemerocallis graminea Hypochœris maculata — radicata Inula hirta Medicago karstiensis — marina Ophiopogon japonicus, *p.* Orobus luteus Panax quinquefolia, *t. p.* Smyrnium aureum Thalictrum sibiricum Potentilla argentea — astracanica — aurea — obscura Ranunculus glacialis — lingua Rhodiola rosea Rubia tinctorum Trigonella ruthenica, *p.* Viola grandiflora lutea	YELLOW. Achillea tomentosa Astragulus alopecuroides Cineraria cordifolia Clematis ochroleuca, *p.* Convallaria multiflora — polygonatum — — flo. pleno Coreopsis angustifolia, *p.* Euphorbia Cyparissias Helonias luteus, *p.* Hemerocallis fulva — — flo. pleno Hypericum hirsutum, *p.* Iris pallida Mimulus luteus, *p.* Pæonia sinensis alb. ple. 3. Ranunculus acris flo. pleno Sophora tinctoria, *p.* Trollius europæus	YELLOW. Agrimonia eupatoria Asphodelus luteus, *s.* Astragalus glycyphyllis Centaurea phrygia Ferula assafœtida, *p.* — orientalis, *p.* Laserpetium gallicum Scabiosa alpina Sisymbrium strictissimum — tanacetifolium	YELLOW. Cineraria siberica Datisca cannabina Hedysarum alpinum Heracleum angustifolium Inula germanica Ligusticum levisticum Pastinaca opoponax Peucedanum alsaticum Thalictrum lucidum — majus — speciosum
BLUE. Arum triphyllum, *p.* Asarum canadense — europæum Gentiana adscendens, *t.* Ajuga alpina — pyramidalis — reptans Campanula rotundifolia *p.* Globularia vulgaris pumila Pulmonaria marit. 3. *p.* Statice tartarica, *p.* Veronica aphylla — bellidioides — chamædrys — saxatilis Viola calcarata — grandiflora — maculata	BLUE. Campanula azurea, 3. *p.* — alpina, 3. — barbata, 3. — betonicæfolia, 3. — saxatilis, 3. Dracocephalum austriac. Phyteuma spicata Pulmonaria paniculata Geranium pyrenaicum — sibericum Houstonia cœrulea, *p.* Iris virginica Orobus lathyroides, *p.* Statice limonium Veronica latifolia Viola montana — palustris	BLUE. Aconitum uncinatum Amsonia angustifolia, *p.* — latifolia Aquilegia vulgaris — flo. pleno Campanula laciniata, 3. *p.* — peregrina 3. Clematis integrifolia Geranium aconitifolium — angulatum Iris pensylvanica Lithospermum fruticos. Salvia phlomoides Symphytum cæruleum Veronica laciniata	BLUE. Iris germanica Lathyrus pisiformis Podalaria australis, *p.* Vicia cassubica	BLUE. Aconitum napellus — pyramidale Iris sambucina Podalaria lupinoides, *p.* Symphytum asperrimum
PURPLE. Anthemis montana, *p.* Aristolochia serpentaria, *p.* Astragalus hypoglottis Betonica hirsuta Geum reptans, *p.* Iris pumila Sedum villosum — hybridum Teucrium chamædrys Mœrhingia muscosa Thalictrum alpinum	PURPLE. Aquilegia viscosa Aristolochia longa Astragalus monspessulanus Dianthus plumarius Geranium phæum Lychnis flos cuculi — flo. pleno Phlomis alpina Phlox ovata, *p.* Scrophularia betonicifolia Stachys circinata, *p.*	PURPLE. Aristolochia rotundata Cnicus monspessulanus, *p.* Hesp. matron. flo. pl. pur. Lychnis diurna — flo. pleno Salvia viscosa Symphytum officinale Anchusa angustifolia Medicago sativa	PURPLE. Iris livida Pæonia peregrina, 3. Veratrum nigrum Lunaria rediviva Thalictrum purpurascens	PURPLE. Coronilla varia, 3. Galega officinalis, 3. Hesperis matronalis, *p.* Phlomis tuberosa

PERENNIAL BORDER-FLOWERS. — JUNE — *continued.*

Height from 0 to ¾ of a foot.	*From ¾ of a foot to 1½ feet.*	*From 1½ foot to 2½ feet.*	*From 2½ feet to 3½ feet.*	*From 3½ feet and upw*
PURPLE. Verbascum myconi, *p.* Linaria cymbalaria — fol. variegatis — pilosum — purpureum	**PURPLE.** Thymus vulgaris Vicia cracca Viola palmata, *p.*	**PURPLE.**	**PURPLE.**	**PURPLE.**
VARIEGATED. Asperula cynanchia Iris variegata — pumila variegata, *p.* Saxifraga androsacea Veronica montana	**VARIEGATED.** Dianthus barbatus — hortense Geranium pratense — striatum Iris fœtidissima, *p.* — fol. varig. — versicolor Lotus maritimus	**VARIEGATED.** Apocynum androsæmif. *p.* Heracleum austriacum Iris aphylla — squalens — susiana	**VARIEGATED.**	**VARIEGATED.** Asclepias variegata, 3, *p.*
GREEN. Androsace villosa, *p.*	**GREEN.** Astragalus virescens Euphorbia verrucosa Gundelia Tournefortii, *p.* Hydrastis canadensis	**GREEN.** Heracleum sibericum Saxifraga pensylvanica	**GREEN.**	**GREEN.** Humulus lupulus Smilax herbacea, *p.*
BROWN. Medeola virginica, *p.*	**BROWN.** Heleborous trifolius, *p.* Heuchera Americana	**BROWN.**	**BROWN.**	**BROWN.**

JULY.

RED. Epilobium alpinum Geranium sanguineum Anemone valdensis, *p.* Dianthus hyssopifolius Phlox stolonifera, *p.* Saxifraga autumnalis Silene saxatilis — saxifraga — vallesia Bartsia coccinea Satyrium repens, *p.* Androsace carnea, *p.* Circæa alpina Veronica fruticulosa Achillea asplenifolia, *p.* Phlox amœna, *t.*	**RED.** Arum virginicum Astragalus onobrychis Centaurea sibirica Dianthus hybridus Melittis melissophyllum Mentha odorata Nepeta nepetella Origanum hybridum Polygonum erectum Saxifraga geum Statice flexuosa, *p.* Spigelia marylandica Triosteum perfoliatum *p.* Circæa alpina — lutetiana Ononis spinosa rub. Sempervivum tectorum Achillea montana — rosea — tanacetifolia	**RED.** Betonica grandiflora Carduus cyanoides Dianthus superba flo-rubro Lathyrus tuberosus Phlomis herba venti Sanguisorba media Dianthus caryophyllus, *t.* Trifolium rubens Veronica flo. incarnato	**RED.** Arundo, donax fol. var. Asclepias amæna, 3. *p.* Dictamn. albus, flo.rubr. 3 Lychnis chalcedonica Monarda didyma Phlox glaberrima, *p.* — intermedia — paniculata	**RED.** Arundo donax Convolvulvus soldanell Delphinium puniceum, *p* Epilobium hirsutum — latifolium Phaca bœtica Phlox maculata, *p.* Eupatorium cannabinu
WHITE. Asperula tinctoria, 3. Dianthus collinus Dryas octopetala, *p.* Illicebrum paronychia, *p.* Rubia cordifolia Scuttellaria alpina Achillea decumbens — alpina — ptarmica — — flo. pleno. Alchemilla pentaphylla Anemone cernua, *p.* Anthemis nobilis, flo.plen. Arenaria ballarica, *t. p.* — peploides — saxatilis Galax cordifolia, *p.* Melanthium lætum Parnassia palustris Prunella grandiflora, *p.* Sedum album — dasyphyllum Sempervivum sediforme Silene alpestris — rupestris Tofieldia palustris	**WHITE.** Achillea se'acea, *p.* — pentaphylla — tomentosa Arnica bellidiastrum, *p.* Asperugo lævigata Athamanta cretensis Camp.rotundifol.fl.albo, *p.* Cucubalus stellatus Cyprepedium canad. *p.* Doronicum altaicum Galium boreale — rubioides Gypsophilla paniculata, *p.* Monarda rugosa, *p.* Nepeta italica Ononis spinosa alba Onosma simplicissima, *t.* Origanum creticum, *t.* Orobus albus — angustifolius, *t.* Salvia mollis Scuttellaria lupulina, *p.* Sedum populifolium Sium sisarum Spiræa ulmaria, flo. plen. Statice speciosa, *p.* Telephium imperati Teucrium montanum Tradesc.virginic.fl.albo, *p.* Trifolium montanum	**WHITE.** Achillea atrata — herborata — impatiens Cnicus tartaricus, *p.* Dianthus superbus Eryngium bourgati — campestre Eupatorium perfoliatum Laserpetium angustifol. Lepidum graminifolium Lychn. chalcedonic. fl.albo Nepeta cataria — melissæfolia, *p.* Polygonum divaricatum Sanicula canadensis Sedum telephium album — — major album Selinum austriacum Seseli montanum Sison canadense Solanum tuberosum Spiræa filipendula — lobata, *p.* — ulmaria — — flo. pleno. Stachys cretica Stipa pennata Veronica maritima fl. albo	**WHITE.** Acanthus mollis, p. — — lusitanicus Achillea magna Asclepias nivea, *p.* Campan. persicif. alb. pl. Dictamnus albus, 3. Laserpetium latifolium Lycopus europæus Lysimachia ephemerum Marrab. candidissim. *t. p.* Parthenium integrifol. *t. p.* Phlox paniculata, flo. alb. Podalyria alba Polygonum undulatum	**WHITE.** Aconitum album Clematis alpina, *p.* Eupatorium altissimum Galega orientalis, *p.* — virginiana, *p.* Kitaibelia vitifolia, *p.* Lathyrus palustris, *p.* Lycopus exaltatus Verbena carolineana
YELLOW. Inula ensifolia Senecio incanum, *p.* Achillea odorata Alchemilla alpina Alyssum montanum Linaria vulgaris — peloria Coronilla minima Erigeron tuberosum Hyoseris fœtida — lucida — radiata Œnothera pumila, 3. *p.* Potentilla tridentata Santolina anthemoides Saxifraga aizoides — moschata Sedum quadrifidum — rupestre — sexangulare Sibbaldia procumbens Solidago cambrica	**YELLOW.** Achillea aurea Aconitum anthora, *p.* Alyssum montanum Anemone patens, *p.* Anthemis tinctoria Arum italicum Astragulus microphyl. *p.* Betonica alopecurus Bupthalmum cordifol. *p.* Cnicus spinosus, *p.* Conyza bifrons Cyprep. calc. fol. glab. 3.*p.* Hedysarum saxatile Hyoseris fœtida — lucida — radiata Inula bubonium, *t.* — mariana — montana — suaveolens Lotus cytisoides Lysimachia bulbifera — thyrsiflora Peganum harmala, *t.* Penthorum sedoides Phaca rigida Physalis pensylvanica, *p.* Potentilla bifurca	**YELLOW.** Achillea abrotonæfolia, *p.* Antirrhinum genistifol. Astragulus cicer Coronilla coronata Crepis albida — sibirica Cucubalus otites Galium vernum Gentiana fulva, *p.* Gunnera perpensa, *t.* Hieracium lyratum — porrifolium Inula crythmifolia, *t.* Lysimachia ciliata — quadrifolia — quadriflora Œnothera undulata Phaca alpina Ranunculus cassubicus Rudbeckia hirta, *p.* Scorzonera graminifol. Senecio abrotanifolia Stachys maritima Iris fulva Thapsia asclepium — garganica — villosa	**YELLOW.** Aconitum lycoctonum — ochroleucum Astragulus christianus Erigeron carolinianum, *p.* — philadelphicum Ferula nodiflora Lysimachia vulgaris Salvia glutinosa Scorzonera hispanica Chelone formosa, *t. p.*	**YELLOW.** Aconitum pyrenaicum — septentrionale Agrimonia odorata Aralea nudicaulis, *p.* — racemosa Astragalus galegiformis Centaurea glastifolia Cimicifuga fœtida, *p.* Cineraria gigantea — glauca Cnicus cernuus — oleraceus Gentiana lutea, *p.* Helianthus pubescens — strumosus, *p.* Inula helenium Iris ochroleuca, *p.* Lupinus nootkatensis 3 *p.* Polymnia canadensis Senecio doria

PERENNIAL BORDER-FLOWERS. — JULY — *continued.*

Height from 0 to ¾ of a foot.	*From ¾ of a foot to 1½ foot.*	*From 1½ foot to 2½ feet.*	*From 2½ feet to 3½ feet.*	*From 3½ feet and upwards.*
YELLOW.	YELLOW. Potentilla pensylvanica — tridentata Salvia austriaca Santolina anthemoides Scuttellaria orientalis, *p.* Sedum reflexum Senecio doronicum Sisyrin. iridioides, fl. lut. *p.* Symphytum tuberosum Tagetes lucida, *p.* Thalictrum dioicum Valantia glabra Valeriana ruthenica Veratrum luteum Uvularia lanceolata, *p.*	YELLOW.	YELLOW.	YELLOW.
BLUE. Scabiosa columbaria, *p.* Linaria repens Campanula carpatica, *p.* — pumila, *t.* Frankinea hirsuta Gentiana punctata, *p.* — purpurea Globularia nudicaulis Prunella grandiflora, *p.* — hyssopifolia Sisymbrium anceps, *p.* Veronica multifida, *t.* — orientalis Viola cenesia, *p.* — cuculata	BLUE. Anchusa sempervirens Campanula alliariæfol. *p.* — carpatica — grandiflora — nitida, *p.* — patula Centaurea montana Cynoglossum pict. *t. p.* Delphinium grandiflor. Dracocephalum grandiflorum Erigeron alpinum Gentiana cruciata, 3. *p.* — macrophylla — septemfida Geranium ibericum — reflexum — sylvaticum — — flo. ple. Gratiola officinalis Hemerocallis cærulea, *p.* Linum alpinum Mimulus alatus, *p.* Monarda ciliata, *t.* Phyteuma campanuloid. *p.* — hemisphærica Scabiosa graminifolia Scutellaria galericulata Sisyrinchium berbud. *t. p.* — iridioides Statice latifolia, *p.* Tradescantia virginica Veronica austriaca — candida — hybrida — pinnata	BLUE. Astragalus uliginos. *p.* Delphinium grandi. fl. pl. 3. — urceolatum, 3. Eryngium alpinum Hyssopus officinalis Lychnis chalced. fl. pl., *p.* Nepeta violacea Salvia grandiflora — nemorosa Sonchus sibiricus Veronica incisa — maritima — spicata — teucrium Lobelia siphilitica, *t. p.*	BLUE. Asclepias sibirica, 3. Astragalus sulcatus Campanula persicifolia, *p.* — — cær. pleno — rapunculoides Catananche cærulea Delphinium exaltatum, 3. *p* Echinops ritro Eryngium amethystin. Iris halophylla Salvia verticillata Veronica sibirica Linum perenne	BLUE. Asclepias nigra, *p.* Aconitum volubile Delphinium alatum, 3. *p.* — azureum, 3. — — flo. pleno, 3. — intermed. *p.* Echinops sphærocephalus Glycirrhiza echinata, *p.* — glabra Sonchus plumieri Sophora australis — alopecuroides, *t.* Verbena hastata Vicia sylvatica
PURPLE. Aster alpinus 3. *p.* Geranium maculatum Anthyllis montana Linaria triornithophor. *p.* Dracocephal. pereg. *t. p.* Hedysarum obscurum Sedum teleph. purp. min. Serratula alpina, *p.* Thymus serpillum, *p.* — — cit. odore Trifolium alpinum Veronica allionii Astragalus uralensis, *p.* Statice reticulata	PURPLE. Anchusa officinalis — tinctoria Astragalus tenuifolius, *p.* Betonia stricta Carduus pycnocephalus Centaurea rhapontica — scabiosa Dodartia orientalis, *p.* Trifolium lupinaster Erigeron purpureum Geranium macrorhizum — palustre Melissa grandiflora Melittis grandiflora Pisum maritimum Sedum anacampseros — glaucum Teucrium hircanicum, *t.* Tradesc. virg. flo. pur. *p.* Trifolium alpestre Mimulus ringens, *p.* Mitella nuda Silene longiflora Statice reticulata Astragalus uralensis, *p.* Bartsia pallida, *p.* Betonica orientalis	PURPLE. Actæa racemosa Cacalia alpina Centaurea tartarica Cnicus caucasicus, *p.* — heterophyllus — carniolicus, *p.* Monarda clinopodia Salvia pratensis Scrophularia betonicifolia Scuttellaria altissima, *p.* Sedum telephi. pur. major Stachys alpina, *p.* Lycopus virginicus Penstemon lævigata, *p.* — pubescens Saponaria officinia. 3. — — flo. plen. 3. Scabiosa arvensis Verbena officinalis	PURPLE. Cnicus centauroides, *p.* Leonorus cardiaca Monarda fistulosa — purpurea Verbascum phœniceum, *p.*	PURPLE. Aconitum cammarum Cnicus canus, *p.* Eupatorium purpurea Lythrum salicaria Prenanthes purpurea Serratula coronata Phytolacca decandra, *p.*
VARIEGATED. Geranium lancastrense Geranium argenteum Iris graminea Gnaphalium alpinum — dioicum Gypsophilla paniculata — saxifraga	VARIEGATED.	VARIEGATED. Dianthus caryophyllus, *t.* 3. Iris spuria Seseli glaucum Sisyrinchum striatum, *p.* Stachys lanata, *p.*	VARIEGATED.	VARIEGATED. Cynanchum monspeliac.
GREEN. Thymus montanus Tofieldia pubens	GREEN. Melanthium virginic. *p.* Poterium sanguisorba	GREEN. Poterium hybridum	GREEN.	GREEN. Euphorbia palustris
BROWN.	BROWN. Arum atrorubens Geranium lividum	BROWN. Scrophularia auricul. *t.* — orientalis	BROWN. Arum dracunculus Verbascum ferrugin. *p.*	BROWN.

AUGUST.

RED. Sanseviera carnea, *p.*	RED. Artemisia cærulescens Nepeta pannonica Statice oleifolia, *t.* Athamanta condensata Veronica marit fl. incar.	RED. Dianthus carthusianorum Epilobium angustissimum Asclepias incarnata, 3. *p.* Athamanta siberica Gypsophilla perfoliata, *p.*	RED. Artemisia vulgaris Dioscoria verticillata, *t. p.* — villosa, *t.* Lobelia cardinalis, 3. Phlox undulata 3. *p.* Clematis crispa, *p.* Malva alcea — moschata	RED. Althæa narbonensis Carduus defloratus Centaurea centaurium Cnicus ciliatus, *p.* Glycine apios, *p.* Phlox decussata, 3. *p.* Tripsacum dactyloid, *t. p* Lathyrus heterophyllus

PERENNIAL BORDER-FLOWERS. — AUGUST — *continued.*

Height from 0 to ¾ of a foot.	*From ¾ of a foot to 1½ foot.*	*From 1½ foot to 2½ feet.*	*From 2½ feet to 3½ feet.*	*From 3½ feet and upwards.*
WHITE.	**WHITE.**	**WHITE.**	**WHITE.**	**WHITE.**
Nepeta incana, p. Silene maritima Achillea cristata Prenanthes alba Sedum forsterianum Sisymbrium barbarea Thymus marschalli, t. p.	Achillea cretica, p. — macrophylla — squarrosa, p. Arenaria grandiflora, p. Artemisia campestris — maritima — santonica — sericea Astrantia minor, p. Athamanta rigida Cacalia hastata Conyza linifolia, p. Erigeron uniflorum Eupatorium rotundifol. Gratiola virginica Gypsophilla prostrata Hemerocallis japonica, p. Melissa calamintha — nepeta Origanum heracleoticum Phlox suaveol. fol. var. p. Selinum chabraei Thymus zygis Gnaphalium margar. 3. p.	Artemisia dracunculus Aster linifolius — umbellatus Athamanta libanotis Leonorus crispus Phlox suaveolens, p. Scabiosa leucantha Scutellaria peregrina, t. Selinum curvifolium Sium rigidum, p.	Acanthus spinosus, p. Centaurea cineraria Eupatorium hyssopifol. Marrubium peregrinum Polygonum virginianum	Aconitum variegatum, p. Bocconia cordata Cacalia suaveolens Campan. latifol. flo. alb. p. — persicif. fl. alb. p. Chelone glabra Clematis angustifolia Epilobium angust. flo. alb. Eupatorium ageratoid. p. Napaea laevis — glabra Veratrum album, p. Veronica virginica
YELLOW.	**YELLOW.**	**YELLOW.**	**YELLOW.**	**YELLOW.**
Santolina maritima Prunella pensylvanica, p. Saxifraga caespitosa — hirculis Sisymbrium pyrenaicum.	Anthericum ossifragum Artemisia glacialis Bupthalmum maritimum — salicifolium Coreopsis minima, p. Inula oculus christi — provincialis — squarrosa Podalyria tinctoria, p. Rhexia virginica Sedum aizoon Sideritis scordioides Silene chloraefolia Solidago humilis Teucrium canadense — scorodonia	Achillea ageratum, p. — eupatorium Inula salicifolia Prenanthes altissima, p. Solanum quercifolium Solidago ambigua — bicolor — caesia — canadensis — integrifolia Asclepias tuberosa, t. 3.	Artemisia pontica Balsamita virgata — vulgaris Chrysocoma biflora Coreopsis aurea, p. — verticillata Erigeron carlinianum, p. Hieracium sabaudum — umbellatum Œnothera fruticosa, p. Solidago aspera — odora Tanacetum balsamita	Bupthalmum helianthoid. Cacalia saracenica Cassia marilandica, t. p. Clematis viorna, p. Coreopsis procera — tripteris Helianthus altissimus Œnothera missouriensis, p. Rudbeckia digitata — fulgida — laciniata Silphium asteriscus — connatum — laciniatum — perfoliatum Solidago arguta
BLUE.	**BLUE.**	**BLUE.**	**BLUE.**	**BLUE.**
Mentha pulegium Viola mirabilis	Artemisia austriaca Aster linarifolius, p. Conyza asteroides, p. Eryngium maritimum Gentiana asclepedia, p. — bavarica Phyteuma orbicularis, p. Salvia forskoehlii — lyrata Scabiosa caucasica, t. p. Veronica incana Viola mirabilis, p.	Aster acris — aestivus — cordifolius, p. — tardiflorus, p. Glycirrhiza asperima, p. Hedysarum violaceum Hyssopus lopanthus, p. Lupinus perennis Nepeta tuberosa Scabiosa sylvatica	Anchusa undulata Campanula verticillata, p. Clematis cylindrica Collinsonia canadensis Eryngium planum Salvia sylvestris Verbena urticifolia	Aconitum japonicum Asclepias syriaca Aster novi belgii Campanula latifol. caer. p. — pyramidalis 3. — trachelium — — fl. caer. pl. 3. Lavatera thuringiaca
PURPLE.	**PURPLE.**	**PURPLE.**	**PURPLE.**	**PURPLE.**
	Iris dichotoma, p. Phlox carolina, t. Saxifraga viscosa	Aster Amellus Lythrum triflorum, p. — verticillatum Mentha crispa, t. — piperita — viridis	Asclepias purpurasc. p. Aster rigidus Eupatorium maculatum Lathyrus sylvestris. Liatris squarrosa, p. Lythrum virgatum Scrophularia scorodonia d.	Aster concolor Chelone obliqua, p. — — major Clematis purpurea Epilobium angustifoli. 3. Hedysarum canadense, p. Lathyrus latifolius Liatris scariosa, p. Rudbeckia purpurea, 3. Cacalia atriplicifolia
VARIEGATED.	**VARIEGATED.**	**VARIEGATED.**	**VARIEGATED.**	**VARIEGATED.**
	Astrantia carniolica, t. p. Dracocephalum denticula. Gypsophilla altissima — repens		Antirrhinum monspessul. Astrantia major, p. Stachys germanica	Campanula versicolor, p. Erigeron canadense
BROWN.	**BROWN.**	**BROWN.**	**BROWN.**	**BROWN.**
	Artemisia rupestris — spicata Swertia perrenis	Achillea ochroleuca	Helianthus atro-rubens, p.	

SEPTEMBER AND OCTOBER.

RED.	**RED.**	**RED.**	**RED.**	**RED.**
		Lobelia splendens, t. 3. p. Boltonia asteroides	Lobelia fulgens, t. 3.	Ater Salicifolius Glycine monoica, p. Phlox pyramidalis
WHITE.	**WHITE.**	**WHITE.**	**WHITE.**	**WHITE.**
	Eupatorium sessilifolium	Aster corymbosus — diffusus — divaricatus — linifolius — macrophyllus — pendulus Scabiosa gramuntia, p.	Artemisia japonica Aster dumosus — multiflorus	Aster ericoides — tenuifolius Eupatorium aromaticum
YELLOW.	**YELLOW.**	**YELLOW.**	**YELLOW.**	**YELLOW.**
	Chrysocoma villosa, t. Solidago mexicana	Chrysocoma linosyris Euphorbia emarginata	Helianthus divaricatus, p. Scolymus hispanicus Solidago odora Tetragonotheca helianth. p	Coreopsis alternifolia — amplexicaulis Helenium autumnale, p. — pubescens Helianthus decapetalus — giganteus — multiflorus — — flo. pleno — tuberosus Polymnia Uvedalia Solidago laevigata — lanceolata — petiolaris — procera — sempervirens — serotina

PERENNIAL BORDER-FLOWERS. — SEPT. AND OCT. — *continued.*

Height from 0 to ¾ of a foot.	*From ¾ of a foot to 1½ feet*	*From 1½ feet to 2½ feet.*	*From 2½ feet to 3½ feet.*	*From 3½ feet and upwards*
BLUE.	BLUE.	BLUE.	BLUE.	BLUE.
Gentiana ciliata, *t.* — pneumonanthe	Gentiana catesbæi, *p.* Scabiosa succisa	Aster lævis — sibericus — spectabilis Gentiana saponaria, *p.* Plumbago europæa, *p.*	Aster paludosus — tradescanti — undulatus, *p.* Dracocephal. virginian. *p.*	Aster foliosus — fragilis — paniculatus — puniceus — — elatior
PURPLE.	PURPLE.	PURPLE.	PURPLE.	PURPLE.
	Aster hyssopifolius — latifolius Liatris pumila, *p.* Phlox suffruticosa	Salvia napifolia Serratula quinquefolia, *p.*	Aster grandiflorus — radula Hyssopus nepetoides, *p.* Liatris heterophylla, *p.* — pilosus — spicata	Aster altissimus — junceus — mutabilis — novæ angliæ — spurius Liatris elegans, *t.*

1656. *Propagation of Perennial Herbaceous Plants.* All the modes of propagation, excepting such as are applicable only to woody plants, may occasionally be adopted; but the most general practice is by dividing the root, by suckers or offsets, and by seed; the other modes are by cuttings of the stalks, shoots, or roots, and by layers.

By dividing the Root. This mode is applicable to nine-tenths of hardy herbaceous plants. The plant may either be taken up, divided with the knife, and a portion replanted to continue the species in the spot allotted to it; or, the earth may be partially removed, and part of the roots and crown cut off to make new plants. The sections may, if well rooted, be planted at once where they are to remain and flower, or, what is preferable, they may be planted for one season in nursing-beds in the reserve-garden, and prevented from flowering that season by pinching off the flower-buds as they appear. The common season for performing the operation is spring, when the plant is beginning to push, or in summer or autumn immediately after it has flowered. The latter is generally the preferable period, unless the plant flowers very late, in which case the sections will not have sufficient time to form roots for their support during winter.

By Suckers or Offsets. This mode is also applicable to nine-tenths of common herbaceous plants; the best time for removing them is in spring, or early in summer, after the plant has begun to grow. Plant them in the nursing department, and pinch off their flower-buds, that they may flower strongly next season when removed to their final destination.

By Seed. This mode is applicable to all the single flowering kinds, but is only adopted with a few species, which are otherwise difficultly multiplied. Collect the seed from the flowers which expanded first, as being generally the strongest. If it is ripe before August, it may be sown the same season, but if otherwise, it will be preferable to defer sowing till the following spring. Sow on beds of light earth, thinly covering according to the size of the seed, and prick out the plants once or twice according to their strength, size, or weakness, so as they may be fit to remove to their final destination in August or September. They will flower strongly the following year, and probably may shew some new varieties.

By Cuttings from the Side-shoots or Flower-stems. This mode is applicable to a number of the more delicate and double-flowering herbaceous plants, as to scarlet and pink lychnis, double rockets white and yellow, some hollyhocks, and a variety of others; but more to biennials and annuals than to perennials. The cuttings may be taken off at any time when the shoots are tender and properly prepared, and planted in sandy loam in a warm situation, but shaded and covered with a hand-glass. Afterwards transplant them in the nursery department, and again the same season where they are finally to remain. They will blow freely the summer following.

By Cuttings from the Root-shoots. This is applicable to some sorts which do not multiply fast at the root, or whose rooted stolones or suckers do not make handsome plants; as to some species of allysum, statice, silene, &c. The early part of summer is, in general, the most fitting season for performing the operation; plant in sandy loam under a hand-glass, and shade in the sunny part of the day; then transplant in the nursery department for a few weeks, when the strongest plants will show themselves, and may be removed in September to their final destination. They will blow strongly next year.

By Cuttings of jointed Root-shoots or Pipings. This is chiefly applicable to the dianthus tribe, saponaria, the striped grass, or any other grasses or reedy plants. Proceed as in piping pinks (1647.); but no bottom-heat will be required for the sorts that come under this section.

By Cuttings from the Roots. This is strictly applicable only to such plants as form buds on their roots, as to most of the rubiaceæ, to the mints, epilobiums, &c. About midsummer is the earliest period at which the creeping roots are generally fit for this purpose; but with some others, as gallium, osmunda, &c. it may be done in spring.

Plant the cuttings in the shade, and afterwards transplant and treat them like cuttings from the flower-stalks or root-shoots.

By Layers. Such plants as cannot easily be propagated by any of the foregoing modes may be increased by layers; such as the carnation, some species of salvia, sibbaldia, sibthorbia, some silenes, &c. Commence the operation when the plant begins to flower, and when the layers are rooted, treat them as directed for pipings.

General Culture of fibrous-rooted herbaceous Flowers. Autumn, after the plant has done flowering, or spring, when it has begun to grow, as has already been observed (1609.), are the seasons for planting, or transplanting. The general culture is, stirring the soil; renewing it according to the kind of plant (1608.); taking up overgrown plants, reducing them, and replanting (1610.); sticking, pruning, trimming, removing all useless, decayed, injured, or diseased parts; and supplying blanks (1616.) The general management consists in attending to order and neatness (1618.)

Subsect. 2. *Species and Varieties of Bulbous-rooted Border-Flowers.*

1657. BULBOUS-ROOTED BORDER-FLOWERS. — MARCH.

Height from 0 to ¾ of a foot.	*From ¾ of a foot to 1½ foot.*	*From 1½ foot to 2½ feet.*	*From 2½ feet to 3½ feet.*	*From 3½ feet and upwards.*
RED. Cyclamen coum, *s. p.*	RED. Hyacinthus orientalis	RED.	RED.	RED.
WHITE. Leucojum vernum Erythron. dens can.fl.al. *p.* Fumaria bulbosa — cava Galanthus nivalis, Febru. — flo. pleno.	WHITE. Scilla bifolia flo. albo. *p.*	WHITE.	WHITE.	WHITE.
YELLOW. Heleborous hyemalis, Jan. Tulipa suaveolens, *p.* — flo. pleno Crocus vernus	YELLOW. Helleborus hyemalis Narcissus pseudo narcissus Tulipa sylvestris	YELLOW.	YELLOW.	YELLOW.
BLUE.	BLUE. Scilla bifolia, *p.*	BLUE.	BLUE.	BLUE.
PURPLE. Erythronium dens-canis, *p.* Ixia bulbocodium	PURPLE.	PURPLE.	PURPLE.	PURPLE.
VARIEGATED.	VARIEGATED. Allium chamæ-moly	VARIEGATED.	VARIEGATED.	VARIEGATED.
APRIL.				
RED.	RED. Hyacinthus orient. fl.carn.	RED.	RED.	RED. Fritillaria latifolia — imperialis — — flo. pleno — — major
WHITE. Sanguinaria canadensis, *p.*	WHITE. Hyacinthus orient. flo.alb. Narcissus biflorus Sanguinaria canadensis, *p.*	WHITE.	WHITE.	WHITE.
YELLOW. Narcissus minor	YELLOW. Narcissus bicolor — — major	YELLOW. Onithogalum stachyoides	YELLOW.	YELLOW. Fritillaria lat. flo. lut. — — pleno — fol. variegatis —
BLUE. Bulbocodium vernum, *l.p.*	BLUE. Scilla noscripta — amœna, *p.* — verna	BLUE.	BLUE.	BLUE.
PURPLE.	PURPLE.	PURPLE. Allium inodorum	PURPLE.	PURPLE.
VARIEGATED. Frittilaria meleagris Iris persica	VARIEGATED.	VARIEGATED.	VARIEGATED.	VARIEGATED.
GREEN. Ornithogalum luteum Iris tuberosa	GREEN. Onithogalum nutans — umbellatum	GREEN.	GREEN.	GREEN.
MAY.				
RED. Muscari botryoides, fl.cœr.	RED. Lilium bulbifer. ardens, *p.*	RED. Lilium concolor, *t. p.*	RED.	RED.
WHITE. Narcissus tenuifolius — triandrus Muscari botryoides, fl. alb. Trillium grandiflorum	WHITE. Allium ursinum — romanus Narcissus angustifolius — orientalis — — flo. pleno — poeticus — — flo. pleno	WHITE.	WHITE.	WHITE.
YELLOW. Narcissus jonquilla — — pleno — bulbocodium, *t.*	YELLOW. Narcissus bulbocodium — compressus — incomparabilis — odorus — orientalis bicolor — tenuior — trilobus	YELLOW.	YELLOW.	YELLOW.

BULBOUS ROOTED BORDER-FLOWERS. — MAY — *continued.*

Height from 0 to ½ of a foot.	*From ½ of a foot to 1½ foot.*	*From 1½ foot to 2½ feet.*	*From 2½ feet to 3½ feet.*	*From 3½ feet and upwards.*
BLUE. Muscari botyroid. comos. — — monstrosu. — — racemosus Scilla italica	BLUE. Scilla campanulata, *p.* — lusitanica	BLUE. Hyacinthus botryoid. cær. — - flo. pallido, l.	BLUE.	BLUE.
PURPLE.	PURPLE. Fritillaria persica — racemosa — pyrenaica Allium angulosum	PURPLE.	PURPLE.	PURPLE.
VARIEGATED. Anemone coron. flo. pleno	VARIEGATED. Anemone coronaria Oxalis acetosella	VARIEGATED. Tulipa gesneriana	VARIEGATED.	VARIEGATED. Allium carinatum
GREEN. Muscari moschatum	GREEN. Ornithogalum striatum, *p.*	GREEN.	GREEN.	GREEN.
BROWN. Trillium cernuum, *p.* — erectum — sessile	BROWN.	BROWN.	BROWN.	BROWN.
JUNE.				
RED.	RED. Allium nutans Orchis conopsea	RED. Allium descendens — sphærocephalon Gladiolus communis, *p.* Lilium pomponium — — flo. coccineo Gladiolus byzantinus, *p.*	RED.	RED.
WHITE. Fumaria cucullaria, *p.* Amaryllis atamasco, *t.*	WHITE. Allium sativum — senescens Leucojum æstivum Orchis bifolia Pancratium illyricum, *p.* Scilla lilio hyacinth. fl. plen — lil. hyacinth, fl. albo	WHITE. Allium canadense Gladiolus byzant. flo. al. *p.* — communis Ornithogalum pyramidale	WHITE.	WHITE.
YELLOW. Erythroni. den can. fl. fla. *p.*	YELLOW.	YELLOW. Allium moly Lilium pomponium. fl. lut. — bulbiferum, *t. p.*	YELLOW.	YELLOW.
BLUE. Scilla sibirica	BLUE. Hyacinthus serotinus Iris xiphium Scilla lilio-hyacinthus — peruviana	BLUE. Iris xyphioides	BLUE.	BLUE.
PURPLE. Allium ascalonicum — schænoprasum Oxalis violacea, *t. p.*	PURPLE. Allium roseum Orchis militaris — pyramidalis Oxalis violacea, *p.*	PURPLE.	PURPLE.	PURPLE.
VARIEGATED. Ranunculus asiaticus	VARIEGATED. Orchis maculata	VARIEGATED. Ornithogalum pyrenaicum	VARIEGATED.	VARIEGATED.
GREEN.	GREEN. Allium victorialis Ophrys ovata.	GREEN.	GREEN.	GREEN.
BROWN. Ophrys apifera — muscifera Ornithagalum uniflor. *t.*	BROWN.	BROWN.	BROWN.	BROWN.
JULY.				
RED.	RED.	RED. Amaryllis belladonna, *p.*	RED.	RED.
WHITE. Allium tartaricum — tricoccum Ornithogalum comos. *p.*	WHITE. Allium ampeloprasium	WHITE. Allium nigrum Pancratium maritimum, *p.*	WHITE. Lilium candidum — — flo. pleno — — flo. variegat. — martagon, flo. alb.	WHITE.
YELLOW. Oxalis corniculata, *p.* — stricta	YELLOW. Allium flavum	YELLOW. Allium obliqunm	YELLOW.	YELLOW. Lilium tigrinum
PURPLE.	PURPLE. Allium lineare	PURPLE. Allium paniculatum	PURPLE. Lilium martagon — — flo. pleno Allium scorodoprasum	PURPLE.
VARIEGATED.	VARIEGATED.	VARIEGATED.	VARIEGATED. Lilium candidum, fl. stria. — martagon, fl. macul.	VARIEGATED.
AUGUST, SEPTEMBER, OCTOBER.				
RED. Colchicam autumn. ru. *p.* — — flo. pleno — — fol. varieg. Cyclamen europæum, *p.*	RED. Cyclamen europæum	RED.	RED.	RED.
WHITE. Colchicum autumn. fl. al. *p.* Cyclamen europæ. fl. alb. *p.* Leucojum autumnale	WHITE. Cyclamen europæu. fl. al. *p.* Leucojum autumnale	WHITE.	WHITE.	WHITE.
YELLOW. Narcissus autumnalis Amaryllis lutea	YELLOW. Lilium catesbæi, *p.* — uniflorum	YELLOW.	YELLOW.	YELLOW. Lilium canadense, *p.* — — penduliflor. — superbum — pensylvanicum — philadelphicum
BLUE. Crocus autumnalis — sativus	BLUE. Crocus autumnalis — sativus	BLUE.	BLUE.	BLUE.
VARIEGATED. Colchium autum. fl. var. *p.* Scilla autumnalis	VARIEGATED.	VARIEGATED.	VARIEGATED.	VARIEGATED.

1658. *Propagation of bulbous-rooted Flowers.* By offsets or by seed; the whole, with the exception of the cyclamen, and one or two others, are propagated by offsets, which are to be taken off when the plant is in a state of rest, which happens in most sorts after it has done flowering; afterwards they are to be planted in a nursery-bed for one year, and where they are finally to remain the year following. Autumnal flowering bulbs are not in a state of rest till the beginning of the following summer: as the colchicum, autumnal flowering crocuses, amaryllis lutea, and a few others. These, therefore, are to be taken up when their leaves begin to decay early in summer, their offsets separated and planted in the nursery department, and the parent bulbs replaced in a month or six weeks, in order that they may have time to establish themselves and flower before winter.

General Culture and Management. Bulbous-rooted flowers differ from others in requiring in their cultivated state to be frequently taken up and replanted. Fibrous-rooted plants which grow much at the root, require this occasionally; but almost all bulbs frequently. The reasons are, that in deeply comminuted rich ground, most sorts, but especially those which form their new bulbs *beside* the others, multiply so fast that the bulbs become crowded, small, and unfit to send up strong flowers; that many sorts, as in narcissus, tulip, &c. which form their new bulbs *under* the old one, send down their bulbs at last so deep that they at first come up weakly, and afterwards cease to appear at all, as in the bulbous-rooted irises, colchicum, &c.; and that some, on the contrary, which form their new bulbs over the old ones, send them up at last above the surface, as in crocus, gladiolus, &c.; and are consequently killed by the frost or drought. Hence the finer bulbs of florists require to be taken up every year, and all the border-bulbs at least every three or four years. The time to do this is, when the plant has flowered, and the leaves have begun to decay. No bulb should be taken up for any purpose, or injured in its growth in any way while the leaves are green; for it should ever be remembered by gardeners, that it is the leaves which bring the root to maturity and prepare it for flowering the following year. If these are injured or cut off; for if the plant is transplanted, unless with such a ball as not to touch any of its fibres while in a growing state, the bulb will not recover so as to be able to flower for at least one year, and probably two or three. The time for keeping bulbs out of ground depends on their habits as to flowering. The object is to heal the wounds made by removing the offsets, and perhaps by setting the bulb more completely in a state of rest, to render it more excitable when planted. A month will in general be sufficient for this purpose, and more cannot be allowed with safety to the autumn flowering bulbs: more than three months is more likely to be injurious than useful to most sorts, though hyacinths and other bulbs which form articles of general commerce, are frequently kept out of the soil half the year: when planted so late, however, they seldom flower well the first season, and commonly not at all for a year or two afterwards.

The taking up, drying, and replanting of border-bulbs must be attended to by the flower-gardener with equal regularity, though not with equal frequency as the finer, select, or florists' bulbs: the offsets may be planted in beds in the reserve-garden, if wanted for stock; and the soil of the spot where the plants stood in the border renewed according to its kind, and the flowering bulbs replaced.

Some bulbs multiply so fast by throwing out off-sets, that they soon cease to send up flower stems. Of these may be mentioned the Ornithogalum umbellatum, luteum, and some other species; some species of scilla, muscari, iris, allium, oxalis, and others. These should either be annually taken up, their off-sets removed, and the parent bulb replanted; or the off-sets, as soon as they send up leaves, should be destroyed. Indeed, whenever strong blowing bulbs is the principal object, the offsets should never be allowed to attain any size, but as soon as they indicate their existence by showing leaves above ground, they should be removed with a blunt stick, or in any way least injurious to the parent. By this practice a great accession of strength is given to the main plant, both for the display of blossom during the current season, and for invigorating the leaves to prepare and deposit nutriment in the bulb for the next year. In pursuance of the same objects, every flower should be pinched off as soon as it begins to decay, but the flower-stalk may remain till it begins to change color with the leaves.

Some bulbs are greedily sought after by vermin, as the crocus and tulip, by the mouse and water-rat; the snow-drop and some of the narcissi, by the snail and slug; and the hyacinth by a particular sort of grub-worm. We know of no method of mitigating these evils but by catching the mice and rats, gathering the snails, and taking up, drying, and re-planting in fresh soil, the roots attacked by worms or insects. The snail is perhaps the worst of these vermin, and, fortunately, it may be most effectually kept under, by scattering leaves of the brasica tribe (of any variety) over the ground, and picking from them, every morning, the snails which have fixed on them during the night.

Most bulbs force well; to expedite this, retard the bulbs by keeping them in an ice-house till the autumn of the second summer; put them in water-glasses, or pots, in September, and they will be in full blow by Christmas.

Subsect. 3. *Species and Varieties of Biennial Border-Flowers.*

1659. BIENNIAL BORDER-FLOWERS. — MAY, JUNE.

Height from 0 to ¾ of a foot.	*From ¾ of a foot to 1½ foot.*	*From 1½ foot to 2½ feet.*	*From 2½ feet to 3½ feet.*	*From 3½ feet and upwards.*
RED.	**RED.**	**RED.**	**RED.**	**RED.**
Thymus alpinus Hesperis tristis Thlapsi saxitile	Agrost. coron. flo. pl. rub. — — flos. jovis Silene muscipula, *p.* Œnothera rosea Thymus grandiflorus	Hedysarum coronarium Antirrhinum maj. flo. ple. — — fol. var.	Agrostemma coronaria Antirrhin. maj. flo. rubr.	
WHITE.	**WHITE.**	**WHITE.**	**WHITE.**	**WHITE.**
	Cochlearea glastifolia Hesper. matron. flo. alb. pl. Thlapsi hirtum Trigonella platycarpos	Hedysar coronar. flo. albo.	Agrost. coronar. flo. albo. Antirrhin. maj. flo. albo.	
YELLOW.	**YELLOW.**	**YELLOW.**	**YELLOW.**	**YELLOW.**
Alyssum sinuatum	Alyssum clypeatum Linum strictum, *p.* Papaver nudicaule Ranunculus pennsylv. *p.* Scorzonera resedifolia Tragopogon crocifolius	Antirrhin. maj. flo. luteo Ligusticum peregrinum Œnothera sinuata Scorzonera laciniata Scrophularia trifoliata — vernalis Tragopogon dalechampi — pratensis	Verbascum lychnitis	Œnothera biennis Scabiosa tartarica Scorzonera hispanica Tragopogon villosus Verbascum phlomoides
BLUE.	**BLUE.**	**BLUE.**	**BLUE.**	**BLUE.**
	Phyteuma comosa Scabiosa columbaria	Anchusa paniculata, *p.* Delphinium staphisagr. *t.*	Cynoglossum sylvaticum	
PURPLE.	**PURPLE.**	**PURPLE.**	**PURPLE.**	**PURPLE.**
Alyssum deltoideum	Hesper. matr. flo. pur. ple.	Centaurea pullata Scorphularia peregrina Silene bupleuroides, *p.*	Antirrhinum majus Cynoglossum officinale	Tragopogon porrifolius Hesperis matronalis Lunaria annua
VARIEGATED.	**VARIEGATED.**	**VARIEGATED.**	**VARIEGATED.**	**VARIEGATED.**
	Cynoglossum cherifol. *t.* Hyoscyamus niger			
GREEN.	**GREEN.**	**GREEN.**	**GREEN.**	**GREEN.**
	Delphinium aconiti, *t.*	Euphorbia verrucosus	Euphorbia lathyris	

JULY.

Height from 0 to ¾ of a foot.	*From ¾ of a foot to 1½ foot.*	*From 1½ foot to 2½ feet.*	*From 2½ feet to 3½ feet.*	*From 3½ feet and upwards.*
RED.	**RED.**	**RED.**	**RED.**	**RED.**
Thymus patavinus, *t.*	Dianthus monspeliacus, *p.* Œnothera rosea	Cheiranthus incan. red Leonorus sibiricus	Cheiranthus incanus Digitalis erubescens	Fumaria spicata
WHITE.	**WHITE.**	**WHITE.**	**WHITE.**	**WHITE.**
Onopordium acaulon Teucrium montanum, *p.*	Alyssum maritim. *p.* — — fol. var. Iberis linifolia, *p.* Teucrium campanulat. *t.*	Campanula thyrsoides, *p.* Cheiranthus incan. white	Cheiranth. incanus white Reseda alba Verbena urticifolia, *p.*	Campan. medium, flo. alb. Conium maculatum Digitalis purpurea, fl. albo Dipsacus silvestris Verbasc. blattaria, fl. alb.
YELLOW.	**YELLOW.**	**YELLOW.**	**YELLOW.**	**YELLOW.**
Alyssum sinuatum	Crepis fœtida Gnaphalium luteo album Papaver nudicaule Reseda undulata Trigonella ruthenica	Cerinthe minor Ligusticum scoticum Œnothera mollissima — nocturna	Digitalis ambigua — lutea Fumaria fungosa Œnothera grandiflora Verbascum pulverulent. — sinuatum — thapsoides	Isatis tinctoria Œnothera sinuata Pastinaca lucida — sativa Verbascum thapsus
BLUE.	**BLUE.**	**BLUE.**	**BLUE.**	**BLUE.**
	Antirrhinum bellidifol. Campanula siberica, *p.* Lobelia urens		Campanula cervicaria, *p.* — rapunculus	Campanula medium Vicia biennis
PURPLE.	**PURPLE.**	**PURPLE.**	**PURPLE.**	**PURPLE.**
	Carlina vulgaris Digitalis minor — thapsi Marrubium alysson Salvia pinnata Trachelium cæruleum Trichostema brachiata, *p.*	Verbena officinalis Conyza squarrosa	Centaurea salmonitica — splendens Cheiranth. incanus purple — — Twicken.	Anchusa italica Carduus marianus Digitalis purpurea Onopordum arabicum — illyricum Verbascum blattaria
VARIEGATED.	**VARIEGATED.**	**VARIEGATED.**	**VARIEGATED.**	**VARIEGATED.**
	Dianthus armeria, *p.*			Althæa sinensis pleno
BROWN.	**BROWN.**	**BROWN.**	**BROWN.**	**BROWN.**
	Dianthus ferrugineus	Monarda punctata, *p.*		Scabiosa atropurpurea

AUGUST.

Height from 0 to ¾ of a foot.	*From ¾ of a foot to 1½ foot.*	*From 1½ foot to 2½ feet.*	*From 2½ feet to 3½ feet.*	*From 3½ feet and upwards.*
RED.	**RED.**	**RED.**	**RED.**	**RED.**
Gypsophilla muralis		Leonurus tartaricus Sison segetum	Centaurea romana	Althæa rosea — — lake col. double .. .. flesh col. double Echium creticum
WHITE.	**WHITE.**	**WHITE.**	**WHITE.**	**WHITE.**
		Digitalis leucophæa, *t.* Salvia ceratophylla	Dipsacus laciniatus Sison amomum	Althæa rosea, white, dou. Echium italicum Gaura biennis Lavatera arborea
YELLOW.	**YELLOW.**	**YELLOW.**	**YELLOW.**	**YELLOW.**
	Gnaphalium sylvaticum Scabiosa ucranica			Althæa ros. straw-col. dou. — — yellow — — orange, double — ficifolia Crepis biennis
BLUE.	**BLUE.**	**BLUE.**	**BLUE.**	**BLUE.**
	Erigeron acre	Echium vulgare		Michauxia campan. *t. p.* Verbena bonarien. *t.* Sept.
PURPLE.	**PURPLE.**	**PURPLE.**	**PURPLE.**	**PURPLE.**
		Carduus eriophorus		Verbascum virgatum
BROWN.	**BROWN.**	**BROWN.**	**BROWN.**	**BROWN.**
				Althæa rosea, brown, dou. Digitalis ferruginea

1660. *Propagation and Culture of biennial Border-Flowers.* They are all raised from seed, but some of the finest double varieties are continued by cuttings. The seed of such sorts as ripen by August may be sown immediately after it is gathered; but the seed of those sorts which ripen later should be preserved till the following spring, and sown in May or the beginning of June. Sow thinly in beds in the reserve-garden, transplant into other beds when the plants are a few inches high, and in September or October remove the plants to their final destination. If this be, as it most generally will, in the mingled flower-border to provide a succession of the same sorts, then it can only be done in the case of those sorts which are done flowering by September or the first of October, and the others must be removed early in March with balls. Great care is requisite in removing some sorts which have large tap roots, as œnothera, hollyhock, lavatera, &c., for if materially checked, they will not flower strongly. The best mode is to nurse these sorts in large pots, and transplant them in October or February, with their balls entire.

The sorts continued by cuttings are chiefly fine double varieties of wallflowers, stocks, rose-campions, &c. The cuttings may be taken from the flower-stalks, or the root-shoots, early in summer, put under hand-glasses, and otherwise treated as cuttings of perennials. If the cuttings of some sorts, as dahlia, chrysanthemum, lobelia, &c. are taken off early in the season, they will flower in the autumn. The plants once placed where they are to remain, their general culture and management is the same as for the perennial border-flowers (1656.)

Subsect. 4. *Species and Varieties of Hardy Annual Border-Flowers.*

1661. HARDY ANNUAL BORDER-FLOWERS. — JUNE.

Height from 0 to ¾ of a foot.	*From ¾ of a foot to 1½ foot.*	*From 1½ foot to 2½ feet.*	*From 2½ feet to 3½ feet.*	*From 3½ feet and upwards.*
RED. Cherianthus maritimus	RED. Silene pendula, Jan. — rubella	RED.	RED. Knautia orientalis Centaurea crupina Convolvulus sibiricus	RED.
WHITE. Biscutella coronopifolia Cherianthus mariti. fl. alb. Lychnis quadridentata	WHITE. Cucubalus italicus Silene quinquevulnera	WHITE.	WHITE,	WHITE.
YELLOW.	YELLOW. Centaurea suaveolens	YELLOW.	YELLOW.	YELLOW.
BLUE.	BLUE. Cleonia lusitanica Convolvulus siculus	BLUE.	BLUE.	BLUE.
PURPLE.	PURPLE. Crepis rubra	PURPLE.	PURPLE.	PURPLE.
JULY.				
RED. Dianthus prolifer, *p.* Lychnis læta Silene acteon	RED. Chelidonium corniculatu. Geranium gruinum Silene conoidea rub. Agrostemma cœlirosa Antirrhinum viscosum Delphinum ajacis peach, *t.* Hedysarum crista-galli Trifolium incarnatum Silene Ægyptiaca	RED. Adonis miniati Blitum capitatum Silene armeria rub. Papaver rhœas flo. pleno Saponaria vaccaria	RED. Echium orientalis Delphinium ajacis, peach *t.* Malva mauritiana, *p.*	RED. Amaranthus caudatus Malva moschata Amaranthus hypocondria. — lividus Malva americana Lathyrus odorat. fl. incar.
WHITE. Bellium bellidioides — minutum	WHITE. Anthemis maritima Anthyllis cornicina — tetraphylla Antirrhinum chalepense, *t* — macrocarpon, *t.* Artemisia pectinata Briza maxima Calendula hybrida, *t.* Campanula specul. fl. alb. Crucianella angustifolia Cucubalus viscosus. Cynoglossum linifolium — lusitanicum Delphinium ajacis, white Silene conoidea alb.	WHITE. Crucianella latifolia Silene armeria flo. alb. — behen	WHITE. Agrostemma nicæensis Delphinium ajacis, white Echium violaceum, flo. alb. Lupinus albus — angustifolius — varius	WHITE. Lathyrus articulatus — odoratus, fl. alb. — — fl. varie. Malva crispa — limensis
YELLOW. Anthericum annuum, *p.* Arctotis tristis, *t.* — anthemoides, *G*	YELLOW. Alyssum campestre, *p.* Anthemis valentina Antirrhinum bipunctat. — orontium — speciosa flavum — versicolor, *p.* Arototis anthemoides Astragalus trimestris Catananche lutea, *t.* Chlora perfoliata Coronilla securidaca Hippocrepis unisiliquosa Reseda odorata	YELLOW. Calendula arvensis Fumaria capnoides Impatiens noli tangere, *p.* Lupinus luteus — — flo. pallido Scorpiurus muricata — subvillosa — vermiculata Calendula stellata Trifolium polonicum	YELLOW. Crepis barbata flo. pallida Calendula officin. fl. pl.	YELLOW. Amaranthus flavus — hybridus Lathyrus annuus Momordica elaterium

HARDY ANNUAL BORDER-FLOWERS. — JULY — *continued.*

Height from 0 to ½ of a foot.	*From ½ of a foot to 1½ foot.*	*From 1½ foot to 2½ feet.*	*From 2½ feet to 3½ feet.*	*From 3½ feet and upwards.*
PURPLE. Campanula erinus	PURPLE. Antirrhinum hirtum — speciosum — triphyllum Calendula nudicaulis — pluvialis — perfoliata — speculum Chelidonium hybridum Delphinium ajacis dwf. *p.*	PURPLE. Cerinthe aspera — major	PURPLE. Crepis barbata Delphinium ajacis — — purple	PURPLE. Lathyus odorat. fl. purp. — — — obscura
BLUE.	BLUE. Delphinum ajacis lead col. Antirrhinum pelisserianu. — sparteum Delphin. ajacis, striped Linum hirsutum — usitatissimum	BLUE. Lupinus hirsutus	BLUE. Centaurea cyanus [illegible] Delphinium ajacis [illegible] lead co. Echium violace[illegible] Trifolium cæ[illegible]ruleum	BLUE. [illegible]
VARIEGATED.	VARIEGATED. Delphinium ajacis, striped	VARIEGATED. Coronilla cretica Papaver rhœas flo. varieg.	VARIEGATED. Cent[illegible] Co[illegible]urea cyan. fl. striata D[illegible]phinium tricolor [illegible]molli.	VARIEGATED. Delphiniu[illegible]n consolida — — flo. pleno Lathyrus o[illegible]ratus fl. striat.
GREEN.	GREEN. Chenopodium ambrosioid. — aristatum Garidella nigellastrum, *t.*	GREEN.	GREEN.	[illegible]EN.
BROWN.	BROWN.	BROWN. Silene inaperta — nocturna	BROWN.	BROWN.
AUGUST.				
RED.	RED. Cheiran. annu. 10 week. red — wall-leaved red — 10w. peach-col. — wall-lea. pe. Hedysarum caput galli	RED. Lotus tetragonolobus Salvia hormium, coma rub.	RED. Blitum virgatum Echinum creticum Lupinus pilosus, flo. rosec.	RED. Papaver somn. dbl. red
WHITE. Artemesia annua	WHITE. Aster annus Cheira. annus, 10 we. white — — wall-leaved Iberis amara — — major — — umbellata alba Nigella hispanica, *t.* Œnothera tetraptera	WHITE. Antirrhinum medium Dracoce. moldavicum, fl. a. Lathrus sativus, flo. albo	WHITE. Datura ferox — stramonium Scabiosa stellata Xeranthemum annuu. 3.	WHITE.
YELLOW.	YELLOW. Alyssum calycinum, *p.* Anthemis arabica, *t.* Astragulus contortuplicat. — hamosus — uncatus Nigella orientalis, *t.* Scorzonera picroides — tingitana Medicago aculeato — circinnata — elegans — intertexta — muricata — minima — orbicularis — scutellata — tornata — turbinata Viola tricolor	YELLOW. Lotus tetragonolob. fl. luteo Tropæolum major nana	YELLOW.	YELLOW. Tropæolum major, *o.* — minor, *o.*
BLUE.	BLUE. Viola tricolor, mac. maj. — — minor Ageratum conyzoides, *p.* Cheiran. ann. 10 we. viole Nigella sativa	BLUE. Dracocephalum canescens — moldavicum Nigella damascena Salvia hormium, com. pur.	BLUE. Datura tatula Lathyrus sativus Lupinus pilosus	BLUE.
PURPLE. Cistus guttatus, *t.*	PURPLE. Iberis umbellata, rubra Œnothera purpurea Cheira. an. 10 we. cop. co. — purple — wall-leaved cop. — wall-leaved purple Iberis umbellata, purpur.	PURPLE.	PURPLE.	PURPLE. Lathyrus tingitanus Papav. somnif. dbl. bl. — — dbl. pur.
VARIEGATED.	VARIEGATED.	VARIEGATED. Silene picta	VARIEGATED.	VARIEGATED. Papav. somnif. d. tring. car. — — dbl. blush carna.
GREEN.	GREEN.	GREEN. Ambrosia artemesifolia Chenopodium botrys Nigella damascena, flo. ple. — — nana	GREEN. Ambrosia elatior Chenopodium scoparia	GREEN. Ambrosia trifida Nicotiana rustica

1662. *Propagation and Culture of Hardy Annual Flowers.* They are all raised from seed, though occasionally some fine varieties of cheiranthus, viola, &c. are preserved by cuttings. The seed is generally sown in March or April, in patches or rings in the borders where the plants are to flower. The ground is previously stirred and made fine; the patch is sown of a circular form of six or eight inches diameter, or a row only is sown in the circumference of the circle, the seeds covered according to their size, and the plants, when they are an inch high, thinned ut to one three, five, seven or more, according to their kind. This, and occasionally stirring the soil, with staking, &c. as in perennial flowers, is all the culture they require.

Sometimes the whole, or many of the sorts, are sown in the reserve-garden, and transplanted where they are finally to remain. This answers well for such sorts as the lupin, sunflower, and sweet-pea; but is rather precarious with such early flowering and short-lived sorts as annual stock, candy-tuft, Venus's looking-glass, &c.

Seed may be saved either from the top and first expanded blossoms of plants in the borders, or from patches sown in the reserve-garden. For the sake of neatness and beauty, no more flowers on each plant ought to be allowed to ripen their seeds than are wanted for the supply; but unless for varieties difficult to procure from the seedsmen, the sim[illegible]nd indeed the most economical mode, is to procure supplies yearly from them.

Subsect. 5. *Species and Varieties of half-hardy, annual Border flowers.*

1663. HALF HARDY ANNUAL BORDER-FLOWERS.—JULY, AUGUST, SEPTEMBER.

Height from 0 to ½ of a foot.	*From ½ of a foot to 1½ foot.*	*From 1½ foot to 2½ feet.*	*From 2½ feet to 3½ feet.*	*From 3½ feet and upwards.*
RED.	RED. Dianthus sinensis Lopezia racemosa, p. Stevia pedata — serrata	RED. Aster sinensis, red — — bonnet — — red quilled Mirabilis jalapa, flo rub. Zinnia multiflora, rub. — revoluta — verticillata	RED. Senecio elegans, fl. inca. pl.	RED. Polygonum orientale Ipomœa coccinea, p. Nicotiana glutinosa Convolvulus purpur. fl. car. Nicotiana tabac. fol. max.
WHITE. Cistus niloticus	WHITE. Ricinis inermis, p. — viridis	WHITE. Aster sinensis, white — — quilled Mirabilis jalapa, flo. albo Mirabilis longiflora Ricinis communis, p.	WHITE. Senecio elegans, fl. albo, pl.	WHITE. Convolvulus discolor — michauxii, pl. Chrysanthem. coron. flo. al. — pet. teret. alb. Polygonum orientale, fl. al. Trichosanthes anguina
YELLOW.	YELLOW. Spilanthes acmella, p. Cacalia coccinea, p. Tagetes lucida	YELLOW. Argemone mexicana. p. Bidens heterophylla Celsia orientalis Fumaria vesicaria Gnaphalium fœtidum — undulatum Mirabilis jalapa lutea Tagetes tenuifolia Zinnia multiflora lutea — pauciflora Tagetes patula simp. — — flo. pleno — nana, simp. — — pleno	YELLOW. Galinsoga parviflora — triloba Tagetes erecta lutea — — flor. teretibus — — aurantia — — teret. aur. Carthamus tinctorius	YELLOW. Chrysanthem. coronarium — coron. pet. teretibus Cucumis colocynthis — dudaim — flexuosus Helianthus annuus — — flo. pleno — — nanus — — flore pallido Momordica balsamina — luffa Rudbeckia amplexifolia Tricosanthes cucumerina Xeranthemum lucidum Ximensia encelioides Ipomœa phœnicea, p.
BLUE. Nolana prostrata	BLUE.	BLUE. Aster sinensis, light blue — — quilled	BLUE.	BLUE. Atropa physaloides Convolvul. purp. fl. cær. pal.
PURPLE. Monopsis scintillaris Ricotia ægyptiaca	PURPLE.	PURPLE. Aster sinensis chinese, pur. — — purp. quilled Chrysanthemum tricolor Datura metel Zinnia violacea	PURPLE. Datura ceratocaulis Senecio elegans, purp.	PURPLE. Convolvulus purpureus
VARIEGATED.	VARIEGATED.	VARIEGATED. Aster sinensis, purp.-strip. — — red — Mirabilis jalapa, flo. ru. str. — — flo. lut. striata	VARIEGATED.	VARIEGATED.
GREEN.	GREEN.	GREEN.	GREEN. Nicotiana paniculata	GREEN.

1664. *Propagation and Culture of half-hardy annual Flowers.* These are raised from seed, which is sown in March in a hot-bed; and the plants, when an inch or two high, are transplanted into another bed of very moderate temperature. Here they may remain till the middle of May, or till all danger from frosty nights is over, and be then transplanted to where they are to flower in the borders, and treated in all respects as hardy annuals.

To save Seed. In dry seasons, most sorts will ripen seeds, if permitted, but in wet seasons, unless the plants have been well forwarded in spring, and planted in a dry soil and warm situation, the seed will not be matured. In such cases, a hand-glass supported over the flower, is of use; or some may be removed with balls into large pots, and placed in an airy pit, frame, or green-house. In the northern and western counties, where the climate is cold and moist, half-hardy annuals never ripen their seeds in any year; and supplies are therefore annually obtained from the London seedsmen.

Sect. III. *Flowers for particular Purposes.*

These purposes may be either the concealment of local defects, or the production of local beauties. Among the former may be classed, Covering naked walls, posts, parts of ruins, or other upright objects. Concealing horizontal defects, as naked sub-barren spots, unsightly banks, &c.; producing vegetation under the shade and drip of trees; ornamenting water with flowering plants; ornamenting rocks, or assemblages of stones formed in imitation of rocks; preserving a green appearance on beds or borders during winter; forming edgings to beds or borders; furnishing odours: and presenting botanical, curious, and scientific assemblages.

Subsect. 1. *Flowers which reach from five to seven feet in height, for covering naked Walls, or other upright Deformities, and for shutting out distant Objects which it is desirous to exclude.*

1665. The flowers suited for this purpose are the climbers and twining plants: the former to be supported by spray, or trellis-work, or nailed in the manner of wall-trees, and the latter by rods. We shall select a few species of each from the plants already enumerated in the foregoing section, to which the botanist will easily be able to add others from the more extensive catalogues.

Climbers, perennial. Astragalus galegiformis, Clematis alpina, viorna, v. purpurea, Lathyrus latifolius, Vicia sylvatica, Bryonia dioica.

Climbers biennial. Vicia biennis, Fumaria spicata.

Climbers, annual. Lathyrus, or sweet pea, 9 sorts, Momordica elaterium, Tropæolum major.

Climbers, half-hardy Annuals. Cucumis colocynthis, dudaim, flexuosus.

Twining Plants, perennial. Convolvulus althæoides, arvensis, Humulus lupulus, Tamus communis, (10 feet.)

Twining Plants, Annuals. Convolvulus tricolor, Phaseolus multiflorus.

Twining Plants, half-hardy Annuals. Convolvulus discolor, Michauxii purpurea, p. flo. carneo, p. flo. cœr. pallideo. Ipomœa coccinea, & phœnicea.

Subsect. 2. *Flowers for concealing Defects on horizontal Surfaces: as naked sub-barren Spots, unsightly Banks, &c.*

1666. These are creepers and trailers, of which we shall here bring together the names of the most common sorts:

Creepers and Trailers which are Perennials. Ajuga reptans, r. flo. albo. Anthemis nobilis, n. flo. pleno. Arenaria montana, saxatilis, Asperula odorata, taurina, tinctoria, Cerastium latifolium, repens, Circæa alpina, lutetiana, Fragaria indica, vesca fol. var., v. monophylla, Galium boreale, cruciatum, rubioides, vernum, Geum reptans, Gypsophila prostrata, repens, Hedysarum obscurum, Hieracium aurantiacum, Lysimachia nummularia, Phaca australis, Polygala major, vulgaris, Potentilla astracanica, aurea, verna, Rubia cordifolia, tinctorum, Sagina procumbens, Satyrium repens, Saxifraga sarmentosa, Tormentilla reptans, Trifolium repens maculatum.

Creepers and Trailers, hardy Annuals. Medicago intertexta, orbicularis, scutellata, Momordica elaterium, Reseda, odorata, Tropæolum major, m. nana, minor.

Creepers and Trailers, half-hardy Annuals. Cucumis, the three species enumerated as climbers, Monopsis scintillaris, conspicua, Nolana prostrata.

Subsect. 3. *Flowers which will grow under the Shade and Drip of Trees.*

1667. In improving neglected flower-gardens and pleasure grounds, it is a common complaint that new things cannot be brought forward on account of the shade and drip of trees. This section, and the corresponding one of hardy shrubs, will, it is hoped, aid in removing that complaint, which can only have arisen from ignorance of the native habitations of plants. It is proper to observe, however, that there is scarcely any, indeed we may say no plant that will thrive under a dense evergreen fir-tree clothed with branches down to near the surface. Moss is all that can be there expected; or, if somewhat open, the pyrola, box, and juniper, will exist. Where trees are so dense, however, no plant or shrub can be desired under them.

Perennials. Anemone nemorosa, n. flo. pleno, pensylvanica, ranunculoides, Arum maculatum, Asarum europæum, Asperula lævigata, odorata. Atropa belladonna, Betonica officinalis, Chrysosplenium alternifolium, oppositifolium, Circæa alpina, lutetiana, Clematis recta, Convallaria multiflora, verticillata, Fragaria vesca, v. fol. var. v. monophylla, Geranium sylvaticum, s. flo. pleno, Geum urbanum, Heleborus viridis, Hypericum hirsutum, Imperatoria ostruthium, Lathyrus tuberosus, Lysimachia ciliata, vulgaris, Mercurialis perennis, Monarda didyma, fistulosa, Origanum vulgare, Orobus angustifolius, lathyroides tuberosus, niger, sylvaticus, vernus, Primula acaulis, veris, v. elatior, v. polyanthos, Ranunculus auricomus, Salvia sylvestris, Sambucus ebulus, Saponaria officinalis, Saxifraga umbrosa, Scabiosa sylvatica, Spiræa aruncus, Stellaria graminea, nemorum, Teucrium Scorodonia, Vicia dumetorum, sylvatica, Viola canina.

Bulbs. Allium lineare, Crocus vernus, Fritillaria imperialis, meleagris, Fumaria bulbosa, Galanthus nivalis, Helleborus hyemalis, Scilla nonscripta, Ophrys apifera, muscifera, ovata, Orchis bifolia, maculata, militaris, Oxalis acetosella, Sanguinaria canadensis.

Biennials. Cynoglossum officinale, sylvaticum, Digitalis purpurea, p. flo. albo, Monarda punctata.

Hardy Annuals. Antirrhinum orontium, Briza maxima, Impatiens noli tangere,

Subsect. 4. *Flowers for ornamenting Pieces of Water, or planting Aquariums.*

1668. These are of two kinds, *aquatics*, to plant in the water, and *marsh plants* to plant round the margin of the pond, stream, or aquarium. The shape and size of the aquarium (*fig.* 458.) must depend on the extent and style of the flower-garden, of

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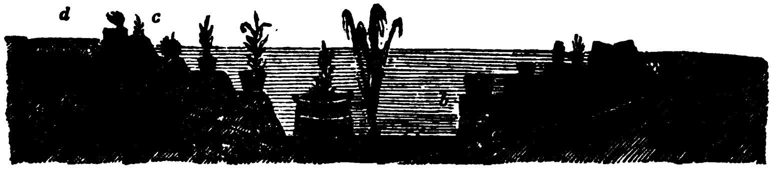


which it forms a part. In all cases the bottom, if not naturally retentive, must be rendered so by a stratum of tempered (or puddled) clay (*a*); the sides should be formed in terraces, or steps descending towards the centre (*b*), to hold pots of plants which grow in shallow water, while those that require deep water, as the bull-rush, typha, &c. may be planted in the ground, or in large tubs placed in deep water. The margin of the aquarium may either be finished with regular masonry or brickwork, or what, in some situations, has a better effect, with rough stones, conglomerated vitrified bricks, or flints (*c*), in the interstices of which marsh plants will thrive exceedingly. The whole may be surrounded by a drain and gravel walk (*d*), raised a few inches above the level of the water. Many of the aquatic plants, as nymphea, nuphar, menyanthes, villarsia, butomus, and hottonia, &c. are highly beautiful, and, considering that some exotic species, as amaryllis, lobelia, crinum, &c. (see 1636.) will thrive in water in our climate, the aquarium ought not to be wanting in any flower-garden.

Propagation and Culture. They are propagated by seeds or dividing the root: the seeds being sown and placed under water. In other respects they require the same general treatment as other herbaceous plants. Some useful remarks on the treatment of the more rare nymphæas and nuphars by N. Kent, will be found in the *Horticulturel Transactions*, vol. iii. p. 24.

1669. AQUATIC PLANTS WITH SHOWY FLOWERS.

MAY.	JUNE.	JULY.	AUGUST.
RED.	RED.	RED.	RED.
Equisetum fluviatile Hydrocotyle vulgaris	Equisetum palustre Butomus umbellatus	Anagallis tenella Hippurus vulgaris Polygonum amphibium	Hydropeltis purpurea Polygonum hydropiper
WHITE.	WHITE.	WHITE.	WHITE.
Nasturtium officinale Ranunculus aquatilis	Hydrocharis morsus-rana Phellandrium aquaticum	Alisma damasonium — natans — plantago Calla palustris Nymphæa alba — odorata Poa fluitans Stratiotes aloides	Cerastium aquaticum Poa aquatica
YELLOW.	YELLOW.	YELLOW.	YELLOW.
Ranunculus aquatilis hederace.		Iris pseudacorus Villarsia nymphæoides Nuphar advena — lutea Urticularia minor	Potamogeton natans
BLUE.	BLUE.	BLUE.	BLUE.
Veronica beccabunga	Myriophyllum spicatum — verticillatum Pontederia cordata Veronica anagallis		Alisma ranunculoides Lobelia dortmanna
PURPLE.	PURPLE.	PURPLE.	PURPLE.
		Urticularia vulgaris Trapa natans Sagittaria sagittifolia	
GREEN.	GREEN.	GREEN.	GREEN.
	Potamogeton densum	Ceratophyllum demersum Cicuta virosa	
BROWN.	BROWN.	BROWN.	BROWN.
	Potamogeton lucens — pectinatum		Potamogeton perfoliatum Scirpus fluitans — lacustris — triqueter

1670. *Marsh Plants.* Some of these have been given as border-flowers, and will grow in almost any situation; but others, as the acorus, comarum, littorella, &c. will not grow vigorously and flower unless their roots are in soil constantly saturated with water.

MARSH PLANTS WITH SHOWY FLOWERS. — MAY AND JUNE.

Height from 0 to ¾ of a foot.	*From ¾ of a foot to 1½ foot.*	*From 1½ foot to 2½ feet.*	*From 2½ feet to 3½ feet.*	*From 3½ feet and upwards.*
RED.	RED.	RED.	RED.	RED.
				Scrophularia aquatica
WHITE.	WHITE.	WHITE.	WHITE.	WHITE.
Pinguicula lusitanica	Œnanthe peucedanifol. *p.*	Œnanthe fistulosa, *p.*		Œnanthe crocata, *p.*
YELLOW.	YELLOW.	YELLOW.	YELLOW.	YELLOW.
Ranunculus ficaria	Carex flava Ranunculus flammula — repens			Senecio paludosus
BLUE.	BLUE.	BLUE.	BLUE.	BLUE.
Pinguicula vulgaris				
PURPLE.	PURPLE.	PURPLE.	PURPLE.	PURPLE.
		Comarum palustre, *p.*		
GREEN.	GREEN.	GREEN.	GREEN.	GREEN.
	Carex disticha — pulicaris — precox — stricta — muricata — elongata		Carex pseudo cyperus — vulpina Cyperus longus Juncus compressus	
BROWN.	BROWN.	BROWN.	BROWN.	BROWN.
Carex dioica.	Carex cæspitosa — digitata Schœnus nigricans	Carex paludosa, *p.* — riparia Juncus conglomeratus, *p.*		

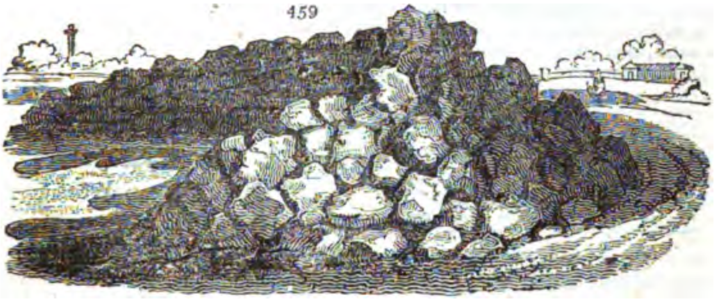
MARSH PLANTS. — JULY AND AUGUST.

Height fr. 0 to ¾ of a foot.	*From ¾ of a foot to 1½ foot.*	*From 1½ foot to 2½ feet.*	*From 2½ feet to 3½ feet.*	*From 3½ feet and upwards.*
RED. Teucrium scordium	**RED.** Menyanthes trifoliata, *p.*	**RED.**	**RED.**	**RED.** Malva sylvestris
WHITE. Littorella lacustris Samolus valerandi, *p.* Schœnus alba	**WHITE.** Galium palustre — uliginosum Pedicularis palustris	**WHITE.**	**WHITE.** Rumex obtusifolius	**WHITE.** Dipsacus pilosus Selinum palustre
YELLOW. Hypericum elodes, *p.*	**YELLOW.** Hottonia palustris, *p.* Rumex maritimus	**YELLOW.** Acorus calamus Myosotis palustris Rumex palustris	**YELLOW.** Cineraria palustris Senecio aquaticus	**YELLOW.** Sonchus palustre
BLUE. Schœnus mariscus	**BLUE.**	**BLUE.** Formium tenax, *p.*	**BLUE.**	**BLUE.**
PURPLE.	**PURPLE.** Pedicularis sylvatica Triglochin maritimum — palustre	**PURPLE.** Aster tripolium, *p.*	**PURPLE.**	**PURPLE.**
VARIEGATED. Scutellaria minor	**VARIEGATED.**	**VARIEGATED.**	**VARIEGATED.**	**VARIEGATED.** Angelica sylvestris
GREEN.	**GREEN.**	**GREEN.**	**GREEN.** Juncus effusus	**GREEN.**
BROWN. Schœnus compressus Scirpus acicularis — cæspitosus	**BROWN.** Juncus squarrosus, *p.* Schœnus nigricans Scirpus palustris — sylvaticus	**BROWN.** Scirpus maritimus Rumex crispus Juncus sylvaticus	**BROWN.** Scirpus holoschœnus	**BROWN.** Rumex aquaticus Cyperus longus, *p.* Juncus acutus, *p.* — maritimus

Propagation and Culture. The same as for herbaceous plants, taking into consideration the difference in the soil and site.

SUBSECT. 5. *Flowers for ornamenting Rocks, or Aggregations of Stones, Flints, Scoriæ formed in imitation of Rocky Surfaces, &c.*

1671. The ground-plan and figure of the elevation of the rock-work must, as in the case of the aquarium, be made to harmonize with surrounding objects. Simple outlines and surfaces, not too much broken, show the plants to most advantage, and are not so liable to ridicule as imitations of hills or mountains, or high narrow cones, or peaks of scoriæ in the Chinese manner, which are to be seen in some places. A ground-plan, in the form of a crescent, or of any wavy figure widest towards the middle part of its length, and with the surface not steeper than forty-five degrees (*fig.* 459.) will be found well suited to the less durable materials, such as bricks, pudding-stone, scoriæ, &c. which are found in flat countries. Sometimes one side of such rock-works may be nearly perpendicular, in which case, if facing the north, it affords an excellent situation for ferns and mosses.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In countries abounding with stone, massy and extensive pieces of rock-work may be formed, and shrubs introduced as well as plants, so as to produce a scene of considerable beauty and interest. Its base, and such parts as are near the eye, may be formed of masses of granite or bassalt; selecting such for the shady side as are already covered with mosses and lichens, especially the lichen atra-flavus, geographicus, ventosus, stellaris, &c. These vegetables will not grow on sand-stone, and but seldom on limestone therefore stones of these earths should be kept as much as possible in the more distant parts, where they will be partially covered with shrubs and plants, rooted in proper soil, introduced in the crevices. When works of this kind are extensive, a winding walk or stair may be led over them, and wells, or small reservoirs of water, introduced in some places for mountain-bog plants and aquatics, and for keeping the whole mass moist and cool.

In strict propriety, mountain or rock plants only, should be introduced on artificial rock-work; but natural mountains and rocks are always moist and cool, and the plants which have their habitations there would not always thrive on dry ridges of earth and stones. On a small scale, therefore, choice is generally made of such plants as are not tall and rampant, and as grow naturally in a dry soil. In the following list, as in the others, the most ornamental of them are distinguished by a letter (*s*), and those which flower the greater part of the summer by a figure (3), &c.

Perennials. Achillea alpina 3, montana, Ajuga alpina, pyramidalis 3, Alchemilla alpina, pentaphylla, Alyssum montanum, murale, saxatile, Anemone alpina, apennina, baldensis, pulsatilla 3, p. major 3, Anthemis montana, Anthyllis montana, Antirrhinum alpinum, Aquilegia alpina, Arabis alpina 3, bellidifolia 3, lucida 3, sibirica 3, Arenaria montana 3, saxatilis 3, Arnica montana 3, Artemisia rupestris, Astragalus alpinus, hypoglottis, montanus *s*, uralensis 3, Athamanta libanotis, Bartsia alpina 3, Betonica alopecurus, Campanula carpatica 3, collina 3, rapunculoides 3, rotundifolia, saxatilis 3 *s*, Cardamine petræa 3, Centaurea montana, Cerastium dioicum, Cheiranthus helveticus 3, Cherleria sedoides, Chrysanthemum montanum, Cochlearia saxatilis, Cucubalus behen, Dianthus collinus, hyssopifolius, plumarius, virginicus, Draba aizoides, ciliaris, stellata, Epilobium montanum, Epimedium alpinum 3, Geranium pyrenaicum, Geum montanum, m. minor, Gnaphalium margaritaceum 3, Hedysarum saxatile, Hypericum montanum 3, Illecebrum paronychia 3, Physalis alkekengi, Pimpinella saxifraga, Podalyria australis 3, Potentilla rupestris, Rubus arcticus 3, chamæmorus 3, rosæfolius 3, saxatilis 3, Saxifraga aizoides, nivalis, oppositifolia, pensylvanica, petræa, rotundifolia, sarmentosa, Sedum forsterianum, glaucum, hybridum, rupestre, sexangulare, villosum, Silene alpestris, rupestris, saxatilis, saxifraga, Telephium imperati, Teucrium montanum, Thlaspi alpestre, Thymus vulgaris, Tormentilla reptans, Trifolium alpestre, montanum, repens maculatum, Valeriana montana, pyrenaica, Veronica montana, saxatilis, Viola lutea, montana.

Bulbs. Allium carinatum, Fritillaria pyrenaica, Ornithogalum pyrenaicum, Oxalis acetosella, violacea 3 *s*.

Biennials. Alyssum deltoideum 3, Campanula, cervicaria 3, thyrsoidea 3, Carduus marianus, Carlina vulgaris, Cheiranthus cheiri, incanus, Cochlearia glastifolia, Digitalis purpurea, p. flo. albo, Echium vulgare, Gnaphalium luteo album, Hedysarum coronarium, Marrubium alysson, Teucrium montanum 3, Thlapsi saxatile, Verbena officinalis.

Hardy Annuals. Alyssum calycinum 3, Antirrhinum chalepense *s*, Campanula perfoliata, Geranium moschatum, Momordica elaterium, Reseda odorata, Scorzonera picroides, tingitana, Silene acteon, behen, Trifolium polonicum, Viola tricolor.

Subsect. 6. *Evergreen-leaved Flowers, or such as are adapted for preserving an Appearance of Vegetation on Beds and Borders during the Winter Months.*

1672. A due proportion of this description of flowers is very necessary for enlivening borders in the winter time, and more especially dug compartments on a surface of turf, which, without some evergreen plants, look dreary by contrast with the verdant surface.

Perennials. Achillea millefolium, m. flo. rubro, Alchemilla alpina, pentaphylla, vulgaris, v. pubescens, Anthemis nobilis, n. flo. pleno, Bellis perennis, hortensis, h. variegata, h. alba, h. fistulosa, h. prolifera, Campanula pumila 3*s*, Dianthus barbatus, b. atro-rubeus, hortensis, Gentiana acaulis 3, verna 3, Gnaphalium dioicum 3, Lychnis flos-cuculi, f. flo. pleno, f. flo. albo, viscaria, v. flo. pleno, v. flo. albo, Melissa officinalis, Melittis melissophyllum, Primula acaulis, auricula, veris, v. elatior, v. polyanthos, v. flo. pleno, Saxifraga cæspitosa, cuneifolia, geranoides, geum, hypnoides, mutata, nivalis, oppositifolia, petræa, umbrosa, Silene acaulis 3, Statice armeria, a. flo. albo, Stipa pennata, Teucrium chamædrys, montanum, Thymus montanus 3 *s*, serpilium 3, s. citri odoré, vulgaris, zygis *s*, Veronica hybrida, Viola grandiflora 3, g. flo. luteo 3, g. flo. maculato 3, odorata cœr. 3, o. flo. pleno cœr. 3, o. flo. albo 3, o. flo. pleno albo 3, o. flo. pl. purp. 3.

Bulbs. Amaryllis lutea, Allium canadense, Lillium candidum, Tulipa gesneriana, Heleborus hyemalis.

Biennials. Agrostemma coronaria, c. flo. albo, c. flo. pl. rub. Anchusa italica, paniculata 3, Dianthus armeria 3, ferrugineus 3, monspeliacus *s* 3, Hesperis matronalis, Iberis linifolia 3, Lavatera arborea, Silene viscosa.

Subsect. 7. *Flowers for Edgings to Beds or Borders.*

1673. The principal plants for this purpose, next to the dwarf-box, are the statice armeria, bellis perennis, gentiana acaulis, saxifraga umbrosa, oppositifolia, hypnoides, festuca ovina, and other low-growing evergreens; but all the following sorts may be used in extensive concerns requiring edgings of flowers.

Perennials. Achillea millefolium, m. flo. rubro, Alchemilla alpina, pentaphylla vulgaris, v. pubescens Anthemis nobilis, n. flo. pleno, Bellis perennis, hortensis, h. variegata, h. alba, h. fistulosa, h. prolifera, Campanula pumila 3 *s*, Dianthus barbat., b. atro-rubeus, hortensis, Gentiana acaulis 3, verna 3, Gnaphalium dioicum 3, Lychnis flos-cuculi, f. flo. pleno, f. flo. albo, viscaria, v. flo. pleno, v. flo. albo, Melissa officinalis, Melittis melissophyllum, Primula acaulis, auricula, veris, v. elatior, v. polyanthos, v. flo. pleno, Saxifraga cæspitosa, cuneifolia, geranoides, geum, hypnoides, mutata, nivalis, oppositifolia, petræa, umbrosa, Silene acaulis 3, Statice armeria, a. flo. albo, Stipa pennata, Teucrium, chamædrys montanum, Thymus montanus 3 *s*, serpilium 3, s. citri odoré, vulgaris, zygis *s*, Veronica hybrida, Viola grandiflora 3, g. flo. luteo 3, g. flo. maculato 3, odorata cœr. 3, o. flo. pleno cœr. 3, o. flo. albo 3, o. flo. pleno albo 3, o. flo. pl. purp. 3.

Annuals. Briza maxima, Calendula officinalis, o. flo. pleno, Cheiranthus annuus rub. maritimus, m. flo alb., Delphinium ajacis, Dianthus prolifer 3, Iberis amara, a. major, umbellata alba, u. purpurea, u. rubra, Reseda odorata, Silene armeria rub. a. flo. alb. rubella, Viola tricolor, t. mac. major, t. mac. minor.

Subsect. 8. *Highly odoriferous Flowers.*

1674. So little has hitherto been done in the nomenclature and classification of vegetable odours, whether fixed or volatile, that we can hardly submit any thing satisfactory on the subject. No small part, however, of the pleasure derived from flowers depends on their odours; and that these are very different, every one must have remarked who has walked in a wood or a garden after a warm shower, or in a dewy summer's evening. Perhaps the best mode to arrange the odours of plants in our present imperfect state of knowledge on the subject, would be to fix on some generally known smells, as those of the rose, lilly, thyme, &c. and group the others under these in the way of natural orders; and thus we should have rosodoreæ, lilliodoreæ, thymodoreæ, &c.; but in default of some such, or any system, we shall here bring together a few names under commonly received distinctions.

The entire Plant aromatic. Agrimonia eupatoria, Hyssopus officinalis, Salvia, numerous species, Thymus vulgaris, Acorus calamus.

The Flower mellifluous. Symphytum officinale, orientale, tuberosum, Iris persica, Lilium candidum, Hottonia palustris, Cerinthe minor.

The Flower aromatic and mellifluous. Balsamita vulgaris, Artemisia abrotanum.

Lilliaceous Smells. Convallaria majalis, Viola odorata, Hyacinthus orientalis, Narcissus, various species, Reseda odorata

Sweet aromatic Smells. Melissa officinalis, Monarda didyma, Origanum basilicum, Thymus citri odoré, Cheiranthus cheri, Calendula officinalis.

The Flower smelling like Hay. Asperula odorata, taurina, Gallium boreale, Stellaria graminea, Tussilago fragrans, Anthoxanthum odoratum, Heliotropium indicum.

Anise Smells. Primula veris, elatior, acaulis, Scandix odorata, Anethum graveolens, Angelica archangelica.

Sternutatory smells. Achillea ptarmica, vulgaris, Dictamnus albus.

Soporific Smells. Humulus lupulus, Atropa belladona, Nicotiana Tabacum.

Night-smelling Flowers. Hesperis matronalis, Œnothera fruticosa, pumila, Cheiranthus cheri, annuus, Tropæolum major, Reseda odorata.

Volatile Smells which perfume the surrounding Atmosphere. Lilium candidum, Cheiranthus cheri, Hesperis matronalis, Reseda odorata.

Stinks. Astrantia major, Cimicifuga fœtida, Ferula assafœtida, Helleborus fœtidus, Allium, various species, Scrophularia aquatica.

1675. Other *selections* will readily occur to the florist who is conversant with the ample store of plants at his command; such as double flowers, flowers that continue in bloom the greater part of the year, flowers for peat soils, &c. all which he may select from the indications in the tables already given. He may also select, according to the Linnæan or natural orders, by referring to the tables (277. and 278.), in which the genera are so arranged; or according to the native habitation, native country, year of introduction, or rarity, which circumstances he will find noted in the excellent catalogues of Sweet and Page.

Subsect. 9. *Botanical and other Assemblages of Plants.* — *Dial Plants. Parasites, Ferns, and Mosses, Alpines; and a Selection for a small Garden.*

1676. In many private establishments, there is a taste for scientific botany; in which case all the hardy plants of the vegetable kingdom, as far as they are introduced into this country, are arranged according to some system; and either in narrow beds, in which one species follows another; or in groups, on lawn, or gravel, in which the species most nearly allied according to the system adopted, are placed together, each group containing an order (*figs.* 430, 431.), and all the orders of a class forming a constellation of groups, connected at one point with the preceding order, and at another with that which follows. Sometimes a different arrangement is adopted, and all the plants that can be considered as ornamental, are assembled in beds or borders, and all those that are merely curious, as the ferns, mosses, fungi, &c.; or useful in agriculture or the arts, as the grasses, garden plants, plants used in dyeing, tanning, &c., are arranged in beds or groups in compartments by themselves. This is in general the most suitable mode for a private garden. With respect to the species to be introduced in these groups, the gardener will have recourse to the tables already referred to, in which, in the Jussieuean table (277.), under Gramineæ, Cyperaceæ, Junceæ, Restiaceæ, he will find all the grasses; under Filices, all the ferns; under Lycopodinæ, the plant mosses; under Equisetaceæ, the equisetums, &c. The economical plants he will find under general heads in our view of the distribution of the British Flora (527.), and the species he will find enumerated, and to a certain extent classed, in Page's *Prodromus* and W. Salisbury's *Botanist's Companion*.

1677. Among curious collections, it may sometimes be desired to assemble the *dial plants*, or such as indicate the hours of the day. An ample list of these has been given by Linnæus in the *Philosophica Botanica*; but the following, being plants generally known and easily procured, may be deemed sufficient to complete a florist's dial in Britain.

	Opens in the morning.		*Shuts from noon to night.*			*Opens in the morning.*		*Shuts from noon to night.*	
	Hou.	Min.	Hou.	Min.		Hou.	Min.	Hou.	Min.
Tragopogon luteum -	3	5	9	10	Hypochæris maculata -	6	7	4	5
Leontodon serotinum	4	0	12	1	Nymphæa alba -	7	0	5	0
Picris echioides -	4	5	12	0	Lactuca sativa -	7	0	10	0
Crepis alpina - -	4	5	12	0	Tagetes erecta -	7	0	3	4
Cichorium intybus -	4	5	8	9	Anagallis arvensis -	7	8	2	8
Papaver nudicaule -	5	0	7	0	Hieracium pilosella -	8	0	2	0
Hemerocallis fulva -	5	0	7	8	Dianthus proliferus -	8	0	1	0
Sonchus lævis -	5	0	11	12	Calendula arvensis -	9	0	3	0
——— alpinus - -	5	0	12	0	Arenaria purpurea -	9	10	2	3
Convolvulus arvensis -	5	6	4	5	Portulaca hortensis -	9	10	11	12
Lapsana communis -	5	6	10	0	Malva caroliniana -	9	10	12	1
Leontodon taraxacum -	5	6	8	9	Stellaria media - -	9	10	9	10

1678. In *botanical collections*, some peculiarities of culture may be required for parasites, ferns, mosses, fungi, and marine vegetables. The only hardy herbaceous *parasite* is the cuscuta, or dodder, a twining plant found in hedges, and on hops, furze, thistles, and many weeds, with thread-like reddish stems, a few small membranaceous scales, and balls of white or purplish flowers, which appear in July and August. They propagate themselves by seed, which germinates in the soil, and at first draws its nourishment from thence; but the original root withers away as soon as the young stem has twined round any other plant. In cultivating the cuscuta, it is easy to imitate nature by sowing the seeds at the root of a thistle or whin.

In raising *ferns* and *mosses* from seed, these being very small, should be sown on the surface of peat-earth, ground to the finest powder; the seed need not be covered, but the pots should be placed in the shade, or in a vault; and a moist close atmosphere produced by covering with a bell-glass, rendered semi-opaque by a wash of mud. When they come up, they may be transplanted into pots of the smallest size, and placed in situations formed in imitation of their natural sites.

The more hardy ferns and mosses, and also some of the fungi, will come up very well, if the entire plants, covered with ripe seed, are strewed over a bed or border of peat soil, completely shaded from the sun. The parent vegetables in rotting will afford shelter, and congenial nourishment to their infant offspring.

Some of the *Fungi*, *Hepaticæ*, *Algæ*, and *Lichenes* (277.) may be sown in pots of fine earth, like the mosses; but many require to be sown on pieces of decaying bark or wood, or on stones or pieces of lime, or on walls, &c. Portions of these, or of whatever substances are requisite, should be procured and neatly fitted to pots of six or eight inches diameter; the seed should be sown immediately when gathered, one sort in a pot, and the pots set in a vault; some kept damp and close by means of other pots whelmed over them; and others allowed more air, according to their natures. If it is wished to multiply specimens, it may be done, after they come up, by dividing the masses on which they grow.

The culture of hardy marine productions, or submersed *algæ*, may be attempted by forming a cistern or basin of salt-water with shelves or terraces within, in the manner of the common aquarium (*fig.* 458.) Their pots or receptacles, in the form of rough cones or square blocks, may be formed from bassalt or compact limestone, and a specimen of the sea-weed in which the seeds are supposed to be ripe, attached to each receptacle; or some of the receptacles may be placed in the sea near the fuci, which it is desired to introduce to the marine aquarium; and when the young fuci appear, the stones may be removed to the cistern, and placed on a higher or lower terrace, according to the depth of water supposed to be requisite. It has not been proved, that the motion and alternate immersion and exposure to air produced by the tides is essential to the growth of marine vegetables; but if it is, these circumstances can be imitated by pumping the marine aquarium dry once a day into a cistern above its level, and then allowing the water to return gradually; or the same thing might be effected without the labour of pumping, by two moderate sized cisterns fixed like scales on the ends of a moving beam, for weights, &c. The lichenes of fresh water are of easy cultivation.

1679. A very general assemblage of plants is formed by gardeners under the title of *alpines*. These ought properly to consist only of such plants as grow on high mountains; but the gardener adds to them all very dwarf small plants that are difficult to preserve in a state of cultivation. Some of these, instead of being alpine, are arenarious, sea-side, or bog plants. Alpine plants are universally very low, bushy, and evergreen. In their native sites, they are covered by snow great part of the year, and consequently never experience either violent cold, violent heat, or intense light. The atmosphere which surrounds them is of light or thin air, almost always highly charged with vapor, and the soil in which they grow is generally soft, black, and peat-like, forming a thin stratum on rock, or filling up the chinks of rocks or stones, and always moist. Art imitates these circumstances, by putting such plants in small pots of peat or bog-earth, well drained by gravel, or scarcely drained at all, or mixed with stones, or with sand, according to the habitation to be imitated. The pots are kept, during winter, under glass in frames, in a situation exposed only to the morning sun; and in summer they are removed to a full northern exposure, or screens placed so as to produce this effect in their winter situation. Care is taken to water three or four times a-day during summer, and to keep the ground around the pots constantly moist; and in winter to protect by mats, in addition to the glass, when the cold is likely to be greater than 25° or 30°. Perhaps an improvement in the management of alpine plants would be to set the pots, in the summer season, on a grating or frame of cast-iron, placed a few inches distance above a cistern or pond of water, by which means a constant evaporation would take place, and a moist cool atmosphere be produced. In winter they might remain in the same situation, protected by frames; or they might be removed to their usual site; or the pots might be arranged in beds, and a pipe, finely pierced with holes, in Loddige's manner, might pass along the centre of each bed, at such a distance above it as that the shower would just cover the bed. A shower might thus be applied at pleasure, and the plants kept moist by prolonged and gentle rains, instead of being deluged by sudden and heavy rains from the watering-pot. Whatever plan be adopted, it is essential that the site be open to the morning sun only during winter, and to only one or two hour's sun during summer, and that it should not be shaded by trees. Professor Thouin arranged a bank for alpine plants in the Paris garden, and has given an account of it, accompanied by some very judicious reasoning, in the *Annales de Musée*, (see a translation in *Hort. Trans.* vol. i. App.); but experience shows, that plants of this description never thrive long on beds or banks of any kind; those planted by Professor Thouin never did much good, and in the course of two years, as we were informed on the spot, many of them died off, and the rest became too luxuriant for the situation. Potting is by far the best mode, as each individual plant may then be examined at the root as well as the top, and its soil or situation changed at pleasure.

From the rarity of this class of plants, the difficulty of keeping them, their vivid green, neat shapes, small size, and many of them flowering early in spring, they are much prized, and collections made in most flower-gardens of note; we shall, therefore, give a list of the leading species of alpines, most of which will be found in a former table, (1654.), as plants for the front row of the border.

Perennials. — Achillea alpina 3, Aconitum pyrenaicum, Adoxa moschatellina 3, Ajuga alpina, genevensis, Alchemilla alpina, Alyssum alpestre, Anemone alpina, apennina, baldensis, Antirrhinum triornithophorum 3, Aquilegia alpina, Arabis alpina 3, bellidifolia 3, lucida 3, sibirica 3, Aretia alpina 3, helvetica 3, vitaliana 3, Arnica bellidiastrum 3, montana 3, scorpioides 3, Astragalus alpinus, Bellium bellidioides 3 *s*, Cacalia alpina, Campanula alpina 3, carpatica 3, Cerastium alpinum, Cheiranthus alpinus 3, helveticus 3, Cherleria sedoides, Chrysosplenium alternifolium, oppositifolium, Cistus tuberaria 3 *s*, Cnicus, spinosissimus 3, Convolvulus soldanella *s*, Cortusa mathioli *s*, Cotyledon lutea, umbilicus, Crepis rigida, sibirica, Cypripedium acaule 3, album 3, calceolus 3, c. fol. glabris 3, canadense 3, Dianthus alpinus, glaucus, Draba aizoides, ciliaris, stellata, Dryas octopetala 3, Erigeron alpinum, Erinus alpinus *s*, Frankenia hirsuta, laevis, Gentiana adscendens 3 *s*, ciliata 3 *s*, pneumonanthe 3, punctata 3, purpurea 3, saponaria 3, septemfida 3, verna 3, Glaux maritima, Gnaphalium alpinum 3, Gundelia tournefortii 3 *s*, Gunnera perpensa *s*, Hypochoeris helvetica, Hypoxis, erecta *s* 3, Isopyrum thalictroides *s*, lychnis flos-cuculi, quadridentata 3, vespertina, Moehringia muscosa, Orontium japonicum 3 *s*, Panax, quinquefolium 3 *s*, Parnassia palustris, Peganum harmala *s*, Penthorum sedoides, Phlox pilosa 3, setacea 3 *s*, subulata 3 *s*, Primula cortusoides 3, farinosa 3, helvetica 3, integrifolia 3, longifolia 3, marginata, nivalis, Ranunculus alpestris, glacialis, parnassifolius, Rubus arcticus 3, chamæmorus 3, rosæfolius 3, saxatilis 3, Sansevieria carnea 3 *s*, Saxifraga aizoides, aizoon, androsacea, autumnalis, cæsia, cæspitosa, cernua, cordifolia, cotyledon, crassifolia, cuneifolia, geranoides, geum, granulata, g. flo. pleno, moschata, nivalis, palmata, rivularis, stellaris, viscosa, Sedum aizoon, album, dasyphyllum, difficiens, forsterianum, glaucum, hybridum, quadrifidum, sexangulare, villosum, virens, Sempervivum arachnoideum 3, cuspidatum 3, globiferum 3, hirtum 3, sediforme 3, tectorum 3, Sibbaldia procumbens 3, Sibthorpia europæa 3, Silene acaulis 3, vallesia, Sisyrinchium bermudiana 3 *s*, Thlaspi salpestre, Tiarella cordifolia 3, trifolia 3, Valeriana tuberosa, Veronica alpina, aphylla, Veronica pinnata, Viola cenesia 3, pedata 3 *s*.

Bulbs. — Bulbocodium vernum 3 *s*, Cyclamen coum 3, europæum 3, e. flo. albo, Ixia bulbocodium 3 *s*, Ophrys apifera, muscifera, ovata, Orchis bifolia, conopsia, maculata, militaris, pyramidalis, Scilla amœna 3, autumnalis 3, bifolia 3, b. flo. albo 3, campanulata 3, italica 3, lilio-hyacinthus, l. flo. pleno, lusitanica 3 *s*, præcox 3, sibirica 3, verna. [*This is a most beautiful tribe of little early blue flowering plants, deserving a place in every flower garden.*] Trillium erectum 3.

Biennials. — Campanula sibirica, virgata, Delphinium aconiti, Dianthus armeria, monspeliacus, Digitalis lutea, Gnaphalium luteo album, sylvaticum, Gypsophila muralis, Linum striatum, Monarda rosea, Phyteuma comosa, Ranunculus pensylvanicus, Scabiosa columbaria, ucranica, Scorzonera resedifolia, Teucrium campanulatum, Thlaspi hirtum, saxatile, Thymus alpinus, grandiflorus, patavinus, Tragopogon crucifolius, Trichostema brachiata, Trigonella platycarpos.

Hardy Annuals. Arctotis anthemoides *s*, tristis *s*, Artemisia annua, pectinata. Bellis annua, Bellium bellidioides, minutum, Biscutella coronopifolia, Campanula erinus, hybrida, Cheiranthus maritimus, m. flo. alb. Cistus guttatus *s*, Claytonia perfoliata 33, Dianthus prolifer 3, Geranium gruinum *s*, Lychnis læta, quadridentata, Silene acteon, rubella, Viola tricolor, viol. tri. mac. major, v. tri. mac. minor.

1680. Having given a selection of the most rare plants, and such as are the most difficult to preserve in a state of cultivation; we shall conclude with a list of *flowers*, the *most common*, *hardy*, and *showy*, which flower great part of the year, will thrive in almost any soil and situation, and which are recommended as fit for the commonest description of flower-borders, shrubberies, or parterres.

Flowering from February to May.

Red. Hepatica triloba. Anemone hortensis. Alyssum deltoideum. Bellis perennis. Erinus alpinus. Erythronium dens canis. Fritillaria imperialis, meleagris. Fumaria solida. Hyacinthus orientale. Orobus vernus. Phlox subulata, setacea. Primula vulgaris, villosa, longiflora, farinosa.

Blue. Hepatica trilob. Anemo. pulsatilla, apennina. Cynoglossum omphalodes. Crocus vernus. Muscari botryoides, comosum. Iris pumila. Primula auricula. Pulmonaria officinalis, virginica. Scilla præcox, bifolia, verna. Viola.

Yellow. Adonis vernalis. Alyssum saxatile, minimum. Crocus vernus, sulphureus, susianus. Erythronium Americanum. Fritillaria imperialis. Helleborus hyemalis. Narcissus angustissimus, minor, bulbocodium, triandrus. Narcissus jonquilla. Pseudo-narcissus, bicolor, tazetta. Primula veris.

White. Anemone nemorosa, hepatica. Arabis alpina. Bellis perennis. Cardamine pratensis. Crocus biflorus. Erythronium dens-canis. Galanthus nivalis. Helleborus niger. Leucojum vernum. Primula nivalis, vulgaris. Ranunculus amplexicaulis. Sanguinaria canadensis. Tiarella cordifolia.

Flowering from May to August.

Red. Antirrhinum majus. Astrantia major, minor. Aquilegia vulgaris, canadensis. Anemone hortensis. Bellis prolifera. Cistus helianthemum. Cheiranthus cheiri, annuus, incanus. Chelone barbata, obliqua. Dianthus barbatus, superbus, cæsius. Dictamnus alb. rub. Dodecatheon meadia. Epilobium angustissimum. Fumaria formosa. Geranium macrorhizum, sylvaticum, sanguineum, Lancastriense. Gladiolus communis. Iris versicolor. Lathyrus latifolius. Lilium chalcedonicum. Lychnis viscaria, flos-cuculi, chalcedonica. Lythrum salicaria, virgatum. Monarda didyma. Orobus varius. Orchis mascula. Papaver orientale. Pæonia officinalis, tenuifolia. Phlox glaberrima, stolonifera, ovata, amœna, intermedia, pilosa, maculata. Rudbeckia purpurea. Scilla nutans. Tulipa gesneriana, suaveolens suav. fl. pl. Thalictrum aquilegifolium. Valeriana rubra. Veronica carnea.

Blue. Anemone hortensis. Aster alpinus. Aconitum napellus. Campanula persicifolia, pumila, carpatica. Catananche cœrulea. Cheiranthus incanus annuus. Centaurea cyanus. Delphinium grandiflorum, elatum, azureum. Gentiana saponaria, septemfida, asclepiadea, acaulis. Geranium palustre. Hemerocallis cerulea. Iris cristata, sambucina, germanica, xiphium xiphioides. Linum perenne, pumila. Lupinus perennis, polemonium cœruleum. Phyteuma orbiculare. Scilla campanulata, nutans. Sophora australis. Veronica prostrata, chamædrys, incana, spicata, gentianoides. Vinca major.

Yellow. Allium moly. Antirrhinum spartium. Caltha palustris. Cheiranthus cheri. Cistus helianthemum. Coreopsis tenuifolia, senea, verticillata. Hemerocallis flava, fulva. Lilium canadense, bulbiferum, tigrinum. Œnothera pumila, fruticosa. Papaver cambricum. Tulipa sylvestris gesneriana. Trollius europæus, asiaticus. Viola tricolor, gandiflora, lutea.

White. Antirrhinum majus. Anthericum liliago, liliastrum. Actæa racemosa. Anemone dichotoma. Bellis perennis. Campanula persicifolia, pumilum. Cheiranthus incanus, annuus. Convallaria polygonatum. Dictamnus albus. Hesperis matronalis. Iris xiphioides. Lilium candidum. Narcissus poeticus. Ornithogalum pyramidale. Phlox suaveolens. Pancratium maritimum. Polygonum viviparum. Ranunculus aconitifolius. Saxifraga granulata. Scilla campanulata, nutans. Stipa pennata. Spiræa aruncus, filipendula, ulmaria, trifoliata. Thalictrum aquilegifolium. Tulipa gesneriana. Veronica spicata, pinnata. Vinca minor.

Chap. IX.

Catalogue of Hardy Trees, with showy Flowers.

All trees may be considered as ornamental by adding to the beauty of landscape; but we mean here to confine ourselves to such as are ornamental, by the conspicuousness of their flowers. These are not numerous; they are all of the deciduous kind, and their time of inflorescence is limited to two or three months. The principal are the horse-chestnut, acacia, the fruit-trees in their wild state, some species of mespilus, sorbus, cytissus, robinia, &c.; these, with some others, we have arranged according to their height and time of flowering, in order to admit of a selection for the back rows of the shrubbery. None of the few evergreen trees which we possess, have showy flowers, but we have added the names of these, with their heights, to facilitate a selection for mixing with the deciduous sorts in the mingled or grouped shrubbery. We have omitted all those showy flowering and evergreen trees which do not usually attain the height of twenty feet, deeming it more suitable for our purpose to include them among the shrubs of that size. All the useful and curious species of trees will be found in the Catalogue of Arboriculture, variously arranged, both with regard to their effect in landscape and their use and culture.

Sect. I. *Deciduous Trees with showy Flowers.*

1681. DECIDUOUS TREES. — MARCH AND APRIL.

Height from 20 feet to 28 ft.	*From 28 feet to 36 feet.*	*From 36 feet to 44 feet.*	*From 44 feet to 52 feet.*	*From 52 feet and upwards.*
RED. Pyrus angustifolia, s. Mespilus oxycant. præc. s.	RED.	RED. Pyrus aria, s. — — dentata, s.	RED.	RED.
WHITE. Prunus cerasus, s. — domestica, s. — nigra, s. Pyrus coronaria, s. — communis, s. — — flo.plen. s. — — fol. var. s.	WHITE. Prunus padus, s. — — rubra, s. — pensylvanica, s. Salix amygdalina, s. — caprea — triandra	WHITE.	WHITE. Prunus avium, S.	WHITE.
YELLOW. Salisburia adiantifolia	YELLOW.	YELLOW. Ulmus americana — — alba — — pendula — campestris sativa	YELLOW.	YELLOW. Ulmus campestris — — fol. var.
GREEN. Taxus baccifera	GREEN.	GREEN. Quercus robur fruc. sessile — rubra — — montana — tinctoria	GREEN.	GREEN. Quercus robur
BROWN. Populus candicans — heterophylla — pendula — trefida	BROWN. Pinus larix microcarpa — — pendula Populus lævigata — nigra	BROWN. Populus græca Ulmus montana — nemoralis — suberosa	BROWN. Populus alba — balsamifera — tremula	BROWN. Populus dilatata
		MAY.		
RED. Acer tartaricum Cercis siliquastrum, s. Mespilus coccinea, s. — oxyacantha rosea, s. — — fol. var. s. Pyrus spectabilis, s. — prunifolia, s. — salicifolia, s.	RED.	RED.	RED.	RED.
WHITE. Acer campestre — — fol. arg. Celtis occidentalis Cercis siliquastr. fl. albo, s. Mespilus acerifolia, s. — apiifolia, s. — azarolus, s. — cordifolia, s. — crus galli, s. — — pyracant. s. — — salicifolia, s. — — eliptica — — fissa — — grossularifo. — — hybrida — — incisa — — nigra — oxycantha — — aurea — — pleno — tanacetifolia	WHITE. Betula daurica Juglans alba — angustifolia — cinerea — compressa — nigra — olivæformis	WHITE. Celtis australis Æsculus hippocastanum, s. — — fol. aur. s. — — — arg. s.	WHITE. Pyrus terminalis Juglans regia — — major Platanus orientalis — cuniata	WHITE. Betula excelsa Platanus occidentalis — — acerifol.
YELLOW. Acer montanum — dasycarpum — hybridum — lobatum — negundo — pennsylvanicum Mespilus flava, s. Carpinus americana — betulus Crus galli Fraxinus americana — — pubescens — — rubra	YELLOW. Cupressus disticha Fagus sylvatica fol. aur. — — — arg. — purpurea — — cuprea Fraxi. excelsior simplicifo. — — stricta — — variegata	YELLOW. Quercus alba — aquatica — — attenuata — — heterophyl. — — indivisa — — longifolia — candida	YELLOW. Acer opulus Quercus exoniensis — — latifolius — — turneri — coccinea — — montana	YELLOW. Fagus sylvatica Fraxinus excelsior — — altissima — — pendula
GREEN.	GREEN.	GREEN. Quercus coccinea elongata — — foliata	GREEN.	GREEN. Quercus palustris — prinus — latifolia — longifolia
BROWN. Alnus glutinosa — — laciniata — — quercifolia — — spinulosa — oblongata — — eliptica	BROWN. Populus monolifera	BROWN. Populus angulata	BROWN. Pinus larix	BROWN.

DECIDUOUS TREES.—JUNE.

Height from 20 feet to 28 ft.	From 28 feet to 36 feet.	From 36 feet to 44 feet.	From 44 feet to 52 feet.	From 52 feet and upwards.
RED. Æsculus pavia — — rosea	RED.	RED. Acer sacharinum	RED.	RED.
WHITE. Mespilus odoratissima, s. Magnolia cordifolia, s. Castanea vesca, fol. aur. — — — arg. — — heteroph. — — fol. lucidis Diospyrus lotus — virginiana	WHITE. Magnolia tripetala, s. Prunus serotina, s. Pyrus aucuparia, s. Morus alba — nigra	WHITE. Pyrus hybrida, s.	WHITE. Castanea vesca	WHITE. Prunus domestica, s.
YELLOW. Æsculus flava Catalpa syringæfolia; p.	YELLOW. Cytisus laburnum, s. Acer platanoides laciniat. — pseudoplat. fol. arg. — — — aur.	YELLOW.	YELLOW. Acer platanoides — pseudoplatanus	YELLOW.
BLUE. Acer rubrum	BLUE.	BLUE.	BLUE.	BLUE.
GREEN. Magnolia acuminata, s.	GREEN.	GREEN.	GREEN. Tilia europæa, s. — carolina	GREEN.
BROWN.	BROWN.	BROWN.	BROWN.	BROWN. Betula nigra
		JULY.		
RED.	RED. Gleditschia triacanthos Robina viscosa	RED.	RED.	RED.
WHITE.	WHITE.	WHITE.	WHITE.	WHITE. Liriodendron tulipifera — integrifolia
YELLOW. Gymnocladus canadensis Ailanthus glandulosa	YELLOW. Tilia alba — americana Betula populifolia	YELLOW.	YELLOW.	YELLOW.

Sect. II. *Evergreen Trees.*

1682. All of these flower in March, April, and May.

Height from 20 to 28 feet.	From 28 to 36 feet.	From 36 to 44 feet.	From 44 to 52 feet.	From 52 feet and upwards.
Cupressus sempervivens Pinus abies alba — cembra — lanceolata — palustris — pumila Quercus gramuntia — suber	Pinus tæda — picea — abies nigra — — rubra — canadensis — cedrus Juniperus virginiana, p. Prunus caroliniana	Pinus pinea — variabilis — sylvest. marit. — — pungens Quercus esculus — phellos — — virens	Pinus abies — inops — resinosa — balsamea	Pinus pinaster — rigida — sylvestris — strobus

Most of the trees enumerated in both the foregoing sections are highly ornamental as single objects on a lawn; and form curious chamber plants when dwarfed and potted in the Chinese manner. *Hort. Trans.* iv. 289.

Propagation and Culture. See *Arboriculture.*

Chap. X.

Ornamental Shrubs.

These are a much more numerous tribe than the trees; — we shall first notice the more select sorts, as the rose, rhododendron, althæa, &c. and afterwards in succession, the deciduous kinds, evergreens, creepers, and sorts for particular purposes.

Sect. I. *Select Shrubs.*

We shall apply this term, as in the case of select flowers, to such shrubs as have been much cultivated, and of which numerous varieties are recognized as beautiful.

Subsect. 1. The *Rose.* *Rosa,* L.; *Icos. Polyg.* L.; and *Rosaceæ,* J. *Rosier,* Fr.; *Rosenstock,* Ger.; and *Rosajo,* Ital.

1683. The rose is known by every body at first sight, and has been a favorite flower from time immemorial among the civilized nations of Europe and Asia. The shrub varies in size in different species, from one foot to six or eight, and the colors are red, white, yellow, purple, black, striped; simple, or in almost numberless shades and mixtures; and single, semi-double, and double. It is cultivated in every garden, from that of the most humble cottager upwards; some species as *R. centifolia damascena,* &c. are also cultivated by commercial gardeners on a large scale for distilling rose-water, and for making *attar,* or essential oil of roses. Six pounds of rose leaves will impregnate by distillation a gallon of water strongly with their odour; but a hundred pounds afford scarcely half an ounce of *attar*. The rose is also used in medicine.

Botanists are not agreed as to the number of original species of this genus, some regard all the European species as originated from one source; others, and especially the moderns, divide them into species, sub-species, and varieties. The most scientific work which has appeared on the roses in England, is the "*Rosarum Monographia*" of J. Lindley, 1819, in which above a hundred species or sub-species are described, and some of them figured; and Miss Laurence has published ninety plates of "A Collection of Roses from Nature," 1810. In France, Guillemeau has published "*Histoire Naturelle de la Rose*," 1800; and P. J. Redouté and C. A. Thory are engaged in a splendid work, in folio, entitled "*Les Roses*," containing plates of all the known species and varieties of this flower. C. A. Thory has published a separate tract on their culture, entitled "*Prodrome de la Monographie du Genre Rosier, &c.*" 1820; M. A. Pronville, a "*Nomenclature Raisonée*," in 1818; and J. P. Vibert, *Observations, &c.* in 1820. A copious and intelligent account of the Scotch roses has been lately given by J. Sabine (*Hort. Trans.* iv. 231.), and some hundreds of new varieties have flowered from seedling plants, in the nursery of J. Lee, during the present year, and will be found in his catalogue for 1822.

Species and Varieties. The lists of the London and Paris nurserymen contain upwards of 350 names. The greater part of these have been raised from seed on the continent, where it ripens better than in this country, within the last thirty years. A number of varieties have also been raised in this country, especially of the *R. spinosissima*, or Scotch rose, of which twenty-six sorts are enumerated by J. Sabine, as having been raised within the last twenty years. New varieties are raised in France and Italy annually; L. Villaresi, royal gardener at Monza has raised upwards of fifty varieties of *Rosa indica*; not one of which have, as far as we know, reached this country. Some of them are quite black, others shaped like a ranunculus, and many of them highly odoriferous. The following table contains nearly 150 species and varieties of single roses, of longest standing, arranged according to their time of flowering, heights, and colours; and of the greater number of which, there are double and semi-double varieties of the same colors. The names are chiefly taken from *Page's Catalogue*, and the plants are known by them in the Hammersmith nursery. Ample lists, as already observed, may be had from all the principal nurserymen, and the best mode of making a selection is to view the plants while in flower.

1684. ROSES. — MAY.

Height from 0 to 1 foot.	*From 1 foot to 2 feet.*	*From 2 feet to 3 feet.*	*From 3 feet to 5 feet.*	*From 5 feet to 8 feet.*
RED.	RED.	RED.	RED.	RED.
—	Rosa spinosissima rub. p — præcox		Rosa pimpinellifolia	
WHITE.	WHITE.	WHITE.	WHITE.	WHITE.
	Rosa spinosissima alb. p. — — stricta			
PURPLE.	PURPLE.	PURPLE.	PURPLE.	PURPLE.
	Rosa spinosiss. marm. p.			
VARIEGATED.	VARIEGATED.	VARIEGATED.	VARIEGATED.	VARIEGATED.
	Rosa spinosiss. pennic. p.			
		— JUNE.		
RED.	RED.	RED.	RED.	RED.
Rosa pumila	Rosa alpina rubra — gallica — hibernica — procera — provincialis	Rosa centifolia — rubiginosa coccinea — damascena — rubiginosa apiifolia	Rosa caucasica — ferox — pendulina — cinnamonia — rubiginosa	Rosa olympica — villosa
WHITE.	WHITE.	WHITE.	WHITE.	WHITE.
Rosa pilosa, p. — pyrenaica — roxburghii, p. — sibirica	Rosa alpina		Rosa alba — muscosa — teneriffensis	
YELLOW.	YELLOW.	YELLOW.	YELLOW.	YELLOW.
Rosa prostrata, p.		Rosa lutea — — bicolor		
		JULY.		
RED.	RED.	RED.	RED.	RED.
	Rosa bland. spinis rubr. p. — indica resplendens — diversiflora, p. — indica salicifolia, p.	Rosa blanda, p.	Rosa turbinata — lyonii, p. — rubifolia, p.	Rosa indica, p.
WHITE.	WHITE.	WHITE.	WHITE.	WHITE.
	Rosa lucida		Rosa kamschatica	
YELLOW.	YELLOW.	YELLOW.	YELLOW.	YELLOW.
			Rosa americana lutea, p. — — stricta — carolineana	
PURPLE.	PURPLE.	PURPLE.	PURPLE.	PURPLE.
	Rosa minuta, d.	Rosa minuta, d.		
		AUGUST.		
YELLOW.	RED.	RED.	RED.	WHITE.
Rosea bracteata, p.	Rosa pennsylvanica, p.			Rosa moschata

1685. *Propagation.* By seed for new varieties, and chiefly by layers for continuing approved sorts. They are also multiplied by budding, cuttings, and suckers.

By Seed. Ripe hips containing the seeds are obtained from semi-double and single flowers, and to increase the chance of new varieties, these should be taken from plants that have been planted among, or near to the sorts of which a cross is desired. We are not aware that Knight's mode of extracting the stamina from the one parent, and dusting the stigma with the anthers of the other, has been applied to the rose, but there can be no doubt it might be done in many instances. In France and Italy, the usual mode is to form a plantation of double and semi-double sorts mixed indiscriminately, and take the result of promiscuous impregnation. Guillemeau has given lists of such as are adopted for this purpose: and Villaresi raised most of his beautiful varieties of the *Rosa indica*, by planting them among as many varieties of the European roses as he could procure. Austin, nurseryman, at Glasgow, and Lee of Hammersmith, mix all the sorts of Scotch roses together in the same plantation. The other mode may be compared to cross-breeding at random; and this to random-in and in-breeding.

Few of the hips are ripe before October, but most sorts that come to maturity in this country, will be fit to gather by November. The seeds of the rose require to be one year in the soil before they vegetate; they may either be immediately rubbed or washed out, and preserved among sand or cinder-dust; or the hips entire may be so preserved a full year, when the husks will be perfectly rotten, and the seed being separated and sown in February, will come up in the May or June following. The best place to lay up the hips, is the floor of a cellar, such as that used for storing roots; but in whatever way they are preserved, care must be taken that they are not laid together in such masses as to produce fermentation; and that the heap be turned over frequently in course of the twelve months, to promote decay.

The seeds should be sown in a soft moist soil, such as that composed of equal parts of sand and vegetable mould, in a shady situation; it may be covered from a fourth to half an inch, according to the size of the seeds, and the surface should be kept moist by watering in the evenings, till the plants have come up and attained a few inches in height. Early in the second spring, they may be transplanted in rows a foot apart every way, and a year afterwards again transplanted to a distance more or less, according to the sorts. Here they are to remain till they flower, which varies in different sorts from the third to the fifth year, but most commonly they flower the fourth summer.

By Layers. The common mode is to lay down the young shoots of the preceding summer late in autumn, or early in the succeeding spring, and then, with the exception of the moss-rose, and one or two others, they form rooted plants by the next autumn. But it is now found, that if the same shoots are laid down when the plant is beginning to flower in July, they will, with a few exceptions, produce roots and be fit to remove the same autumn, by which a whole year is gained. Such sorts as do not root in one year must be left on the stools till the second autumn; but layers made when the shoot is in a growing state, and furnished with healthy leaves, root much more freely than shoots of ripe wood. After the plants are removed from the stools, they are planted in nursery rows, and in a year, the blossom-buds having been carefully pinched off from the first laying down, they will be fit for removal to their final destination. The stools are then to be pruned, and the soil stirred and enriched on the general principles already laid down. (887.)

By Suckers and dividing the Roots. Many of the commoner sorts admit of being rapidly multiplied in this way; and the plants obtained may be planted in their final destination at once.

By Cuttings. Most of the sorts might, no doubt, be propagated from cuttings of the young wood; cut at a joint where it is beginning to ripen, and planted in sand and vegetable mould under a hand-glass. But this mode is only adopted with such sorts as strike easily, as the *R. indica*, and other eastern species.

By Budding. This mode of propagating roses, is adopted only with the rare sorts, and such as are difficult to propagate by layers; for it is found, that plants so originated, even though on stocks of the hardier sorts, are less durable than such as are raised by any of the other modes. But the chief use of budding in the culture of the rose is to produce standard roses, or to produce several sorts from the same stock. Standard roses are a modern invention, it is generally supposed of the Dutch, first carried to Paris, and about twenty years ago to England. They are highly artificial objects, of great beauty, and form magnificent ornaments to parterres and borders. The stocks are either of the tree-rose (*R. villosa*, W.), or of any sorts of woody wild roses, as (*R. scabriuscula*, *heterophylla*, or *surculosa*, Sm.) They are budded at different heights from three to seven feet, but commonly between five and six feet from the ground. A stock in the Paris garden, which carries several sorts, has a naked stem of nearly fifteen feet, and there are others at Malmaison and the Grand Trianon, of equal height. These stocks are, both in France and England, procured from woods and copses, and after being planted in nursery lines are often budded the same summer, sometimes in spring by the scalope mode of budding (913), *l'œil poussant* of the French; and never later than the succeeding spring or summer by the common mode, *l'œil dormant*, Fr. Generally two buds are inserted on opposite sides of the stock, but often three or four, or a dozen, in alternate positions on the upper six, or twelve inches of the stem. Every stock is supported by a rod which, should reach a foot or eighteen inches higher than the situation of the bud; to this rod the stock is tied, and afterwards the shoots from the buds, which are otherwise liable to be blown out by high winds. The Paris nurserymen being supplied with stronger stocks than can readily be procured in England, and having a better climate, and more experience in the culture of roses, excel us in this department of rose propagation, and their standards afford an article of commerce with other countries. Their common plants, raised by layers, are also in extensive demand, but in these we equal, if not surpass them. Fine collections of standard roses from Paris, may be seen in the Hammersmith nursery, in the Count de Vandes' garden at Bayswater, in the Duchess of Dorset's at Knowle, and at various other places.

1686. *Final Situation.* No species of rose, wild or cultivated, thrives well in or near large towns, on account of the smoke and confined air. The yellow and Austrian roses (*R. lutea* and *L. bicolor*) are difficult to flower in any situation, but seldom or never blow in the suburbs of London: even the monthly rose does not thrive so well there as at some miles distance in the country. Roses are generally planted in the front of shrubberies, and in borders; they are also planted by themselves in rose-gardens or rosaries (*fig.* 460.) in groups, on lawn or gravel, either with common box or other edgings, or with edgings of wire, in imitation of basket-work. These last are called baskets of roses; the ground inclosed in the basket-margin is made convex, so as to present a greater surface to the eye, and increase the allusion; the shoots of the stronger sorts are layered or kept down by pegs till they strike roots into the ground, so that the points of the shoots furnished with buds appear only above the soil, which is sometimes covered with moss or small shells. Under this treatment, the whole surface of the basket becomes, in two or three years, covered with rose-buds and leaves of one or of various sorts. Where one of the larger free-growing sorts is employed, as the moss, or any of the provence (*rose de cramoisie*, Fr.) varieties, one plant may be trained so as to cover a surface of many square yards. Where different sorts are introduced in the same basket, they should be as much as possible assimilated in size of leaves and flowers, and habits of growth, and as different as possible in the colors of their flowers. By mixing small flowered with large showy sorts, the beauty of the former is lost without adding to the effect of the latter.

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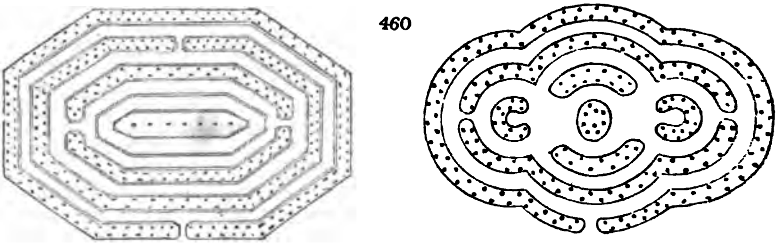

In rosaries commonly but one plant of a sort is introduced, and the varieties which most resemble each other are placed together, by which their distinctive difference is better seen. Particular compartments are often devoted to one species, as the Scotch, Chinese, yellow, burnet-leaved, &c. which has an excellent effect; sometimes a piece of rock-work in the centre is covered with the creeping roses, and on other occasions these are trained to trellis-work, which forms a fence or hedge of roses round the whole. In this hedge, standard-roses are sometimes introduced at regular distances; a grove of standards is also frequently formed in the centre of the rosary, and sometimes they are introduced here and there in the beds.

Standard-roses, however, have certainly the best effect in flower-borders, or when completely detached on a lawn; their sameness of form, and that form being compact and lumpish, prevents them from grouping well, either among themselves or with other objects. Their beauty consists in their singularity as rose plants, and in their flowers; and, therefore, to display these beauties to the best advantage, they require to be seen singly, or in succession. This is the case where they occur as single objects on a lawn, or in the centre in, or here and there among, groups of flowers; or in lines or avenues, along flower-walks. In the gardens of the Grand Trianon, they are planted profusely in large masses, like plantations of trees and shrubs, and there much of their individual beauty is lost, and no good general effect produced.

Soil. Most species of the rose in their wild state grow in sandy and rather poor soil, excepting such as are natives of woods, where the soil is richer, and comparatively moist. But all the cultivated roses, and especially the double-flowering kinds, require a rich loamy soil, inclining to clay rather than sand; and they require also, like most double flowers, plenty of moisture when in a growing state.

1687. *General Culture.* To produce strong flowers, roses require some attention to pruning; old wood should be yearly cut out, and the young shoots thinned and shortened according to their strength, and whether number or magnitude of flowers be wanted. Those sorts which throw up numerous suckers should be taken up every three or four years, reduced and replanted; and most sorts, excepting the standards, will be improved by the practice, provided attention be paid to remove a part of the old soil, and replace it by new. The points of the shoots of the more delicate sorts of roses are very apt to die when pruning is performed in winter or spring; to avoid the consequences of this evil, many give a second pruning in June, or do not prune the tender sorts at all till the beginning of that month. A very good time for performing the operation is immediately after the bloom is over, cutting out old exhausted wood; shortening shoots which have flowered, to a good bud accompanied with a healthy leaf, but leaving such shoots as are still in a growing state untouched till October. Where very large roses are wanted, all the buds but that on the extreme point of each shoot should be pinched off as soon as they make their appearance, and the plant liberally supplied with water. To lessen evaporation, and keep up a constant moisture at the roots of their roses, the Paris gardeners generally mulch them with half-rotten stable-dung, or partially rotten leaves.

Forwarding and retarding Roses. The earliest flowering rose is the monthly, which, in mild seasons, and planted against a wall, will sometimes flower in the beginning of April; the roses next in succession are the cinnamon, which flowers in May; the damask, in the end of May or beginning of June; the blush, York and Lancaster, Provence and Dutch hundred-leaved, in June, July, and August. The Virginia and musk roses are the latest European sorts; they flower in September, and in shaded situations will sometimes continue in bloom till the middle of October; but the earliest rose (the monthly) is also the latest, and generally continues flowering till interrupted by frost.

The earliest sorts may be materially forwarded by being planted against a south wall, and if portable sashes are placed before them, and the wall is either flued and heated by fires, or a lining of dung placed behind, the plants may be brought to flower in February or March. The monthly rose being protected by glass in autumn, or aided by artificial heat may be continued in bloom till Christmas. A very common mode of obtaining late roses, and one of the greatest antiquity (18), is by cutting all the flower-shoots off when the buds begin to appear, or by rubbing off all the rudiments of shoots, of every kind, early in spring; a second crop is in consequence produced, which will not be in a state to bloom before the autumn.

1688. *Forcing the Rose.* The best sorts for this purpose are the common and moss Provence; the Indian sorts force well, or rather, in stoves, continue in bloom all the year; but the commoner varieties not being fragrant, they are in less repute than the European roses. Rose plants should be a year in pots previously to the autumn when it is intended to force them; they should be planted in pots of six or eight inches diameter, in rich loam, and plunged in an open airy situation; their flower-buds pinched off as they appear; and the plants put early into a state of rest, by excluding the sun and rain, but not a free circulation of air. Abercrombie says, "There is no certainty of attaining a fine blow of roses in the depth of winter by the most expensive artifices of forcing; and yet fine flowers may be produced early in the spring by any ordinary stove put in operation in December. When the plants are first introduced, keep the air of the house at about 55°, never letting it fluctuate to more than two or three degrees below or above. In the second week, aim at 60° as the standard; in the third week, at 65°. When a month has nearly elapsed, begin to increase the heat gradually to 70°; having brought it to this standard, let it afterwards exceed it from three to five degrees, rather than sink below. A succession may be kept up by introducing some pots every eight or ten days."

Insects. All the species of rose are very liable to the attacks of insects, especially of the aphides; some, and especially the briar and Scotch rose, are attacked by the *Cynips rosæ*, which, by puncturing the bark, occasions the production of rose-galls, and of those mossy tufts often seen on wild roses, which were known formerly under the name of *Bedeguar*, and used in medicine. A great number of insects seem fond of the flowers of roses, from the appalling ear-wig (*Forficula auricularia*) to the seemingly harmless lady-bird (*Coccinella* 14 *guttata*, *fig.* 461.), which deposits its larvæ (*a*) in the leaves of various species, both wild and cultivated. There seems no remedy for insects on plants in the open air so simple and effectual as gathering them by hand, or removing the leaf, or that part of the shoot which is infested by them. Under cover, tobacco smoke will prove an effectual remedy for the aphides; but the larvæ of many others, and especially of tipula and the tenthredinidæ, which occasion the wrapping up and shrivelling of the leaves, can only be removed by hand.

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Subsect. 2. *Select American and other Peat Earth Plants, viz. of Magnoliaceæ, Magnolia; of Rhodoraceæ, Rhododendron, Azalea, Kalmia; of the genera Cistus, Arbutus, Vaccinium, Andromeda, Erica, Daphne, and various others.*

1689. Of each of these genera, there are numerous species and varieties, both deciduous and evergreen, which will be found arranged according to their heights and colors in the two succeeding tables, and those requiring a peat soil, distinguished by a letter (*p*). They are all highly valued for their flowers, which are large and magnificent in magnolia and rhododendron; odoriferous in azalea and daphne, and beautiful in andromeda, vaccinium, and erica: arbutus is valued both for its flowers and fruit. They are mostly natives of America, and introduced within the latter half of the last century.

Propagation. They are all propagated by seed or by layers; though grafting or innarching is resorted to in some cases as more expeditious. The seed is either procured from America, or saved in this country, and, being very small, is sown as early as possible in pans of peat-earth, and placed in the shade. In winter it is placed under a cold frame, or otherwise protected from the frost, and the plants come up in May or June. In the following autumn, or succeeding spring, they are pricked out into other pots, or into beds of peat-earth in a shady situation. Here they are protected by hoops and mats during winter; and in two years are again transplanted into a similar soil and situation, and at distances corresponding to the size of the leaves, or habits of the plants; here they remain till they flower, or till wanted to be removed to their final destination. They commonly flower from the fourth to the seventh year.

By Layers. The young shoots only are used for this purpose, either laid down in June and July, when in full growth, or in the following autumn; by the former plan a year is gained, as the shoots will be rooted, and may be removed by the succeeding winter or spring. Some sorts of magnolia, rhododendron, &c. require two years to form a sufficient number of roots. The plants, when removed, may be planted in nursery lines, in proper soil, and kept well watered during summer, and protected the first winter by mats; or, they may be planted in pots, and receive, during winter, the protection of a frame.

By Suckers, and by dividing the Root. Both these modes may occasionally, though but rarely, be resorted to. Some species of azalea and andromeda throw up numerous suckers, and the heaths may often be increased by dividing their roots.

By Cuttings. Some of the azaleas, heaths, &c. may be multiplied by cuttings of the young shoots, when in a growing state, taken off where the wood is beginning to ripen, and planted in sand and peat, and covered with a hand-glass. If this operation is performed in the end of June, they will be ready to remove into prepared beds, or to plant in small pots by the middle of September.

By grafting, budding, or innarching. This is practised with some sorts of magnolia, arbutus, daphne, &c. which are placed on stocks of hardier species of the same genus, as on m. purpurea, a. unedo, d. laureola, &c. The stocks are planted in pots a year before wanted, which admits of their being placed in any position with respect to the shoot to be innarched. The daphnes and arbutus andrachne, are generally grafted with detached scions.

1690. *Culture.* The culture requisite for American plants, Abercrombie observes, "principally consists in providing some imitation of the original soil, in order that they may flourish in full vigor; and, where there is no factitious soil provided, in making a compensation during the dry part of summer, by plentiful waterings. Most of the exotic shrubs brought from America, were originally found growing on tracts of ground resembling our beds of peat, except that the alluvial soil there extends along a greater surface, and the body of vegetable mould embedded in the swamp is richer and deeper, being on a scale corresponding with the magnitude of the rivers. The native plants found in these situations, vegetate with the highest vigor and luxuriance. The soil in many parts is so pervaded by vegetable substances, that where from any cause a section of the solid ground occurs, as in the bank of a river, or the shaft of a well, a layer of decayed logs, branches, and leaves of trees is uncovered to the spectator. The luxuriance of the vegetables may, however, partly be ascribed to the excessive moisture which is peculiar to the climate of America. In a few places, indeed, on the western coast, rain is not known; but the soil there is, in general, copiously watered by dew, so as to render it highly productive. In the season called *winter* by the natives of South America, lasting from May to November, a continued succession of impetuous rains give to the plains, in most places, the appearance of an ocean. When the rains have ceased, the humidity of the climate is kept up by a constant evaporation from swamps, rivers, and lakes, the largest in the world. As we cannot have the mitigated warmth of the climate of South America in plantations in the full ground; and as the temperature of our winter cannot be expected to coincide in its effects with the corresponding season even of North America, when so many local circumstances are different,—it is neither indispensable, nor perhaps advisable, to create an artificial swamp for the cultivation of *many* American plants. It is mostly safer to confine the efforts of imitation to the kind of *earth*, unless the water can be carried off at any time; for the lodgment of wet might cause some kinds of roots to perish in cold weather. Thus the *andromeda arborea* would be injured by being floated in winter, and must be protected from frost, though it requires a deal of water in summer. The great object is to imitate the American peat. This is a composition of the branches, twigs, leaves, and roots of trees, with small plants, grass, and weeds; by having lain immemorially in water, the whole is formed into a soft mass, and, when the materials are completely decayed and blended so as to be homogeneous in appearance, the compound is the finest vegetable mould: where this description of peat cannot be obtained, recourse must be had to the best that can be procured from marshes, bogs, or heathy commons, which must be well turned and sweetened, and mixed with sand and rotten leaves or dung."

The soil being procured, the next thing to be done is to form a stratum of it of sufficient thickness in the scite intended for the plants. When they are merely to remain a year or two, this need not be above a foot in depth; but where they are to remain permanently, it should be at least three feet thick. To encourage the roots to penetrate the native soil, the bottom of the excavation should be dug and mixed with peat; unless a bottom of rough gravel were substituted at the depth of four feet, and such an arrangement made, as that water could be introduced to, and withdrawn from, this layer of gravel at pleasure, so as to saturate the whole superstratum of peat. In level situations, and where water was abundant, this plan might be readily adopted, and none could more closely imitate nature, as, by keeping the surface of the peat a few inches below the level of the natural ground, the water might be allowed to rise a few inches above the peat, and inundate the whole surface of the American ground. In peat countries, and where the climate is moist, as in Lancashire and Cheshire, admirable contrivances of this kind might be adopted, and the American and bog-earth plants, herbaceous as well as shrubby, grown to the greatest perfection.

1691. *Final Situation.* American and peat-earth shrubs, requiring large masses of their peculiar soil, and frequent artificial waterings, cannot conveniently be introduced in mingled borders or shrubberies. They are therefore generally planted by themselves in beds or compartments of peat earth; or entire gardens or shrubberies are devoted exclusively to them. This last mode appears decidedly the best, as the general habits and appearance of American peat-earth plants, independently of their culture, do not harmonize remarkably well with European species. An American garden may have a northern or eastern exposure, and if it slopes considerably will be still less affected by the warm dry weather of summer. It may be laid out in any of the different styles of flower-garden (*figs.* 391. to 400.); herbaceous plants introduced as well as shrubs, and the whole surrounded by a sloping phalanx of American trees. The sorts may either be arranged in the mingled manner (406.), or grouped or classed according to some system (430. and 431.).

Many and indeed most of the American shrubs thrive under the partial shade of lofty, deciduous trees, and the leaves which fall from these protect their roots, both from the frosts of winter and the drought of summer, while they constantly decay into vegetable mould, and thus at the same time afford a supply of nourishment. Hence, in some cases, the hardier sorts of rhododendron, azalea, andromeda, &c. may be introduced as undergrowths in the margins of thin woods, placing under each plant a cubic yard or more of its proper soil. This mode of planting, it would appear (*Mason on Design*, art. *Pitt*), was first adopted by the great Earl of Chatham; but it has been carried to the greatest extent, not only with American plants, but with roses and other tender shrubs, in the extensive woods of Fonthill, where, as also at King's Weston near Bristol, Kenwood at Hampstead, &c. many of the plants shed their seeds, and young rhododendrons and azalias spring up in abundance.

In the nurseries, it is a general practice to keep American and other peat-earth plants in pots, and to protect them during winter in frames and pits for conveniency of deportation. At the Hammersmith nursery, one green-house is exclusively devoted to evergreen magnolias.

All the American and peat-earth shrubs may be selected from the three first tables in next section, by observing the indication of peat-soil (letter *p.*); and the herbaceous peat-earth plants may be selected from the tables of Border Flowers in a similar manner.

Sect. II. *General Catalogue of Shrubs.*

Under this section we have included several species, which, from their growing with single naked stems, and forming a spreading head at some height from the ground, are generally considered as low trees. Amygdalus communis, and various species of Cratægus, *L.* (now mespilus, *Sm.* and *W.*), may be referred to as examples. As our object is to form such arrangements as will afford most facility to the gardener in adjusting his plants as to height, color of the flower, and time of inflorescence, we have included all woody plants which do not exceed twenty feet in height, under shrubs; and all those that exceed that height (excepting the climbers and twiners), we have allowed to retain their places in the tables of trees. Here, as before, the most ornamental species, and those which continue longest in bloom, are distinguished by appropriate marks (*s* and 3).

Subsect. 1. *Deciduous Shrubs, arranged as to their Time of flowering, Height, and Color of the Flower.*

1692. DECIDUOUS SHRUBS. — MARCH.

Height from 0 to 2 feet.	*From 2 feet to 4 feet.*	*From 4 feet to 7 feet.*	*From 7 feet to 10 feet.*	*From 10 feet to 20 feet.*
RED.	RED. Daphne mezereum, *p.* Rhododendron dauricu. *p.*	RED.	RED. Calycanthus præc. Jan. 3. *p.*	RED.
WHITE.	WHITE. Daphne mezereu. fl. al. *p.*	WHITE.	WHITE. Calycanthus præcox flo. albo, Jan. 3. *p.*	WHITE. Prunus spinosa, 3. Hamamelis virginica, *p.*
YELLOW.	YELLOW. Lonicera nigra	YELLOW.	YELLOW.	YELLOW.
GREEN.	GREEN. Comptonia asplenifolia, *p.*	GREEN. Dirca palustris	GREEN.	GREEN.
		APRIL.		
RED. Zanthorhiza apiifolia	RED. Rhodora canadensis, *p.* Lonicera tartarica	RED.	RED.	RED.
WHITE. Pyrus pumila	WHITE. Pyrus scorpius	WHITE. Pyrus botryapium, 3. — præcox, 3.	WHITE.	WHITE.
YELLOW. Robinia pygmæa, *p.*	YELLOW. Lonicera cærulea Robinia altagana	YELLOW. Robinia spinosa, *p.*	YELLOW.	YELLOW.
GREEN.	GREEN. Salix sibirica	GREEN. Salix arenaria — argentea	GREEN. Salix nigricans	GREEN.
		MAY.		
RED. Vaccinium erythorocar. *p.* — parviflorum Rosa, various sorts, 3. *s.* Amygdalus persica nana Syringa persica incisa Vaccinium venustum, *p.*	RED. Spiræa crenata, *p.* Vaccini. amœn. flo. rub. *p.* — arboreum Rosa, various sorts, 3 *s.* Amygdalus nana — pumilo pl.	RED. Colutea pocokii Spiræa hypericifolia Amygdalus orientalis, 3. — sibirica, 3. — sinensis, 3. Lonicera alpigena	RED. Robinia hispida — arborea Amygdalus communis pl. — persica flo. pleno, 3.	RED. Cercis canadensis Mespilus parvifolia, 3. — punctata, 3. — sanguinea, 3. Amygdalus communis, 3. — — amara, 3. — Persica — — flo. pleno. 3. — — fruc. glab. 3.
WHITE. Vaccinium album, *p.* — angustifolium — corymbosum — fuscatum — glabrum — glaucum — halleriæfolium — latifolium — ligustrinum — mucronatum — pallidum — rugosum, *p.* — salicinum — tomentosum — villosum — virgatum — viride	WHITE. Cornus florida Fothergilla alnifolia, *p.* — glauca — speciosa Mespilus cotoneaster Pyrus depressa, 3. — maritima, 3. — montana, 3. — arbutifolia, 3. — fruc. luteo, 3. — — nigro, 3. Vaccinium amœnum, *p.* — arboreum, *p.*	WHITE. Azalea pontica glauca, 3. *p.* — precox, 3. Halesia diptera, *p.* — tetraptera Magnolia speciosa, 3. Prunus pendula, 3. — sibarica, 3. — susquehana, 3. *p.* — chicasa, 3. Pyrus amelanchier, 3. — americana, 3. — græca, 3.	WHITE. Euonymus europ. fru. alb. — — pall. — latifolius Philadelphus coronarius — — flo. pleno — — fol. var. Prunus cerasifera — chamæ cerasus — nigra, 3. Pyrus sorbifolia, *p.* Sambucus nigra, fol. var. — alba — laciniata Spartium multiflorum Syringa vulgaris alba, 3. — monstrosa	WHITE. Celtis orientalis Mespilus pyrifolia — spathulata — spinosissima — splendens — tanacetifolia Euonymus europæus — — fol. aur. Prunus armeniaca, 3. — spinosa, 3. Pyrus baccata, 3. — pollveria, 3. Broussonetia papyrif. mas. — — fœmina
YELLOW. Genista decumbens, *p.* Spartium alpinum — decumbens	YELLOW. Berberis cretica, *p.* Daphne altaica, 3. *p.* Fraxinus pumila Spartium angulatum Robinia chamlagu Myrica cerifera, *p.* — — latifolia — gale Rhamnus alnifolius — hybridus Rhus aromaticum, *p.* — suaveolens, *p.* Spiræa lævigata, 3. *p.* — sibrica — thalictroides, *p.* — trilobata, 3. Syringa persica alba, 3. *p.* Vaccinium salvifolium	YELLOW. Azalea pontica, 3. — — pallida, 3. — — pleno, 3. Berberis americana — vulgaris, 3. Cytisus sessilifolius Fraxinus atra Genista pilosa Lonicera pyrenaica Zanthoxylum fraxineum	YELLOW. Staphylea pinnata	YELLOW. Fraxinus ornus Robinia caragana

DECIDUOUS SHRUBS. — MAY — *continued.*

Height from 0 to 2 feet.	*From 2 feet to 4 feet.*	*From 4 feet to 7 feet.*	*From 7 feet to 10 feet.*	*From 10 feet to 20 feet.*
PURPLE.	**PURPLE.** **Syringa persica purpur. *p.***	**PURPLE.** **Betula pumila, *t. p.*** **Magnolia purpurea, 3.** **Syringa sinensis, *p.***	**PURPLE.** **Syringa vulgaris purpur. 3.** **— — cærulea, 3.**	**PURPLE.**
GREEN. **Berberis daurica**	**GREEN.** **Berberis sibirica** **Hippophae sibirica** **Aristotelia macqui, *p.***	**GREEN.** **Liquidamber imberbe**	**GREEN.**	**GREEN.** **Carpinus betulus incisa** **— orientalis** **Coriaria myrtifolia** **Fagus asplenifolia** **Hippophae rhamnoides** **— argentea.**
BROWN. **Vaccinium marylandic. *p.*** **— pensylvanicum**	**BROWN.**	**BROWN.**	**BROWN.**	**BROWN.**

JUNE.

RED. Vaccinium dumosum, *t. p.* — nitidum Rosa, various sorts, 3. *s.* Ononis fruticosa, 3.	**RED.** Azalea rosea, 3. *p.* — rubra, 3. — rub. plen. — rub. pal. — rutila, 3. — ruberrima, 3. *p.* — viscosa pulchella, 3 — blanda, 3. — carnea, 3. — incarnata, 3. Hydrangea hortensis, 3. *p.* Morus tartarica Vaccinium stami. fl. rub. 3. Colutea cruenta, 3. Rosa, various sorts, 3.	**RED.** Chionanthus virginicus, *p.* — latifolia Pyrus japonica, *p.* — — flo. pleno. 3. Rosa, various sorts, 3. *s.* — — *s.*	**RED.** Mespilus chamæ-mespilus Rosa, various sorts, 3. *s.*	**RED.**
WHITE. Azalea viscos, alb. 3. *p.* — — dealbata Daphne alpina, *p.* Lonicera caucasica Prunus prostrata Vaccinium cinereum, *p.* — diffusum, *t.* — myrsinites — resinosum, *t.* Rosa, various sorts, 3.	**WHITE.** Andromeda canescens, 3. — globulifera, 3. — paniculata — undulata Azalea nudiflora, alb. 3. — — fastigiata, 3. *p.* — — florida, 3. — — staminea, 3. — — villosa, 3. — — tomentosa, 3. — — viscosa sissa, 3. — — floribunda, 3. — — glabra, 3. — — hirta, 3. — — lucida, 3. — — odorata, 3. — — pleno, 3. — — pubescens, 3. Prunus pumila Spartium patens, *p.* — purgans Spiræa stipulacea — ulmifolia Styrax lævigata, *t.* Vaccinium frondosum, *p.* — stamineum Viburnum alnifolium — dentatum — fol. lunatis — nitidum Rosa, various sorts	**WHITE.** Azalea odorata, 3. *p.* Cornus alba — alternifolia — circinata — fastigiata — paniculata — sericea Euonymus angustifolius, *p.* Genista florida Laurus æstivalis Magnolia pyramidata, *p.* Prunus rubra, *s.* Pyrus japonica, flo. albo. Rubus cæsius — corylifolius Sambucus racemosa Spiræa opulifolia — salicifolia — latifolia — paniculata Viburnum pyrifolium, *p.*	**WHITE.** Æsculus aculeata Cornus sanguinea — stricta — — fol. varieg. Fraxinus striata Laurus benzoin Philadelph. coron. multif. Viburnum lantana, *p.* — — fol. var. — — latifolium	**WHITE.** Fraxinus rotundifolia Magnolia auriculata. *p.* — glauca Pyrus americana, 3. *p.* — lanuginosa, 3. *p.*
YELLOW. Hypericum kalmianum Rhamnus saxatilis	**YELLOW.** Coronilla emerus Cytisus biflorus — capitatus, *s.* — elongatus — triflorus Azalea nudifl. aurant. *s. p.* Genista triquetra, *t. p.* Hypericum denticulatum — olympicum Lonicera diervilla Potentilla floribunda Rhamnus lycioides	**YELLOW.** Fraxinus lentiscifolia Rhamnus infectorius Robinia halodendron Staphylea trifoliata Zizyphus paliurus	**YELLOW.** Colutea arborescens, 3.	**PURPLE.** Rhus cotinus
PURPLE. Atraphaxis alpina, *p.*	**PURPLE.**	**PURPLE.** Euonymus atro-purpur. *p.* — latifolius — verrucosus Robinia halodendron	**PURPLE.**	**PURPLE.**
VARIEGATED.	**VARIEGATED.** Azalea fl. rubra et alba, 3. *p.*	**VARIEGATED.** Azalea viscosa variega. 3. *p.*	**VARIEGATED.**	**VARIEGATED.**
GREEN.	**GREEN.** Morus pumila — rubra	**GREEN.**	**GREEN.** Diospyrus lotus Hippophae canadensis	**GREEN.** Diospyrus virginiana
BROWN.	**BROWN.** Calycanthus floridus ? *p.*	**BROWN.** Calycanthus floridus, 3. *p.* — longifolius — pensylvanicus	**BROWN.** Alnus pumila	**BROWN.**

DECIDUOUS SHRUBS.—JULY.

Height from 0 to 2 feet.	*From 2 feet to 4 feet.*	*From 4 feet to 7 feet.*	*From 7 feet to 10 feet.*	*From 10 feet to 20 feet.*
RED. Andromeda mariana, 3. *p.* — — lanceol. Vaccinium tenellum Rosa, various sorts, 3. *s.*	RED. Azalea bicolor, *s. p.* — coccinea crispa, 3. — rubra pallido, *s.* — coccinea, 3. *p.* — flamea, 3. — rubra, flo. pleno, *s.* Daphne mezere. serot. 3. *p.* Hydrangea quercifolia Menziesia globularis, 3. *p.* Rosa, various sorts, 3. *s.*	RED. Rosa, various sorts, 3. *s.*	RED. Gleditschia sinensis, *p.* — horrida Koelreuteria panicul. 3. *p.*	RED.
WHITE. Aralia hispida, *t. p.* Genista pilosa Philadelphus inodorus Viburnum dauricum Rosa, various sorts, 3. *s.*	WHITE. Æsculus humilis Andromeda cassinifol. 3. *p.* — dealbata — frondosa — pulverulenta — racemosa, *p.* Azalea canescens, 3. *p.* — coccinea major, 3. — papillionacea Prinos ambiguus, *p.* — cassinoides — lævigatus — lanceolatus — prunifolius Ptelia trifoliata Rubus hispidus Spartium sphærocarpum, *p.* Viburnum acerifolium — carolineanum, *p.* — lantanoides — nudum	WHITE. Cornus sibirica Prunus verticillatus, *p.* Sambucus canadensis Styrax grandifolium, *t. p.* — officinale, *t.* Viburnum pliminum Rosa, various sorts, 3. *s.*	WHITE. Amphora fruticosa, *t. p.* Andromeda arborea, *t.* Eleagnus angustifolius Ligustrum vulgare — — fruc. flav. *p.* — — fol. varieg. Viburnum lævigatum, *p.*	WHITE.
YELLOW. Cytisus supinus — wolgaricus Hypericum rosmarinifol. Rhamnus pumilus — repens Rosa, various sorts, 3. *s.*	YELLOW. Azalea maxima, 3. *p.* — lutea, *s.* — — major, 3. Cytisus argenteus, 3. — austriacus — nigricans — sericeus Hypericum hircinum — — minor — prolificum Rhamnus latifolius Rhus pumilum, *p.* — radicans Azalea aurantia maj. 3. *p.* — calendulacea, *s.* Rosa, various sorts, 3. *s.*	YELLOW. Hypericum elatum Rhus toxicodendron — vernix	YELLOW. Rhus coriaria — elegans — glabrum — typhinum	YELLOW. Virgilia lutea, *p.*
PURPLE.	PURPLE. Azalea purpurea, *s. p.* Rhododendron azaleoides Cytisus purpureus, 3.	PURPLE.	PURPLE. Betula nana	PURPLE.
GREEN.	GREEN.	GREEN. Celastrus bullatus	GREEN.	GREEN. Castanea americana, *t. p.* — pumila, *t.*
BROWN.	BROWN. Azalea cuprea, *p.* — pallida — bicolor — — major Menziesia ferruginea	BROWN.	BROWN.	BROWN.
AUGUST.				
RED.	RED.	RED. Hibisc. syriac. rub. *s. t.* — — — pleno, *s.* — — — fol. var. *s.* Æsculus parviflora	RED. Æsculus macrostachya	RED.
WHITE. Ceanothus americ. *p.* — — micro. *p.* Lonicera symphoricarp. *p.*	WHITE. Azalea glauca, *s. p.* — — scabra, *s.* Cephalanthus occidentalis Clethra alnifolia, *p.* — acuminata — paniculata — pubescens — scabra Fontanesia phillyreoides Hydrangea glauca, *p.* — heterophylla Itea virginica, *p.*	WHITE. Hibiscus syriacus alba, *s.* Hydrangea arborescens, *p.* Rosa, various sorts, 3. *s.*	WHITE.	WHITE.
YELLOW. Rosa, various sorts	YELLOW. Annona triloba, *p.* Cytisus divaricatus	YELLOW.	YELLOW. Mimosa arborea, *p.*	YELLOW.
PURPLE.	PURPLE.	PURPLE. Hibiscus syriac. purp. *s. t.*	PURPLE.	PURPLE.
VARIEGATED.	VARIEGATED.	VARIEGATED. Hibisc. syri. flo. alb. et r. *s.*	VARIEGATED.	VARIEGATED.

DECIDUOUS SHRUBS. — SEPTEMBER.

	Height from 0 *to* 2 *feet.*	*From* 2 *feet to* 4 *feet.*	*From* 4 *feet to* 7 *feet.*	*From* 7 *feet to* 10 *feet.*	*From* 10 *feet to* 20 *feet.*
RED.			Vitex agnus castus lat. — — angustif.		
WHITE.		Azalea glauca serot. s. p. Gordonia pubescens, t.			
YELLOW.				Aralia spinosa	
VARIEGATED.			Azalea variegata		

Subsect. 2. *Evergreen Shrubs.*

1693.

EVERGREEN SHRUBS. — MARCH.

RED.	Erica carnea, Febr. 3. p.	Daphne collina, 3.			
WHITE.			Viburnum tinus, January — — fol. arg. — — — aur. — — hirtum, 3. — — lucid.		
YELLOW.		Daphne pontica			
GREEN.		Daphne laureola — — fol. var.	Taxus baccata, fol. var.		Taxus baccata — — erecta

APRIL.

RED.	Empetrum nigrum, p. — — scoticum Vaccinium vitis idæa — major — maxima — minor Azalea procumbens, p. Vaccin. vit. idæa, flo. coc. — uliginosa Andromeda polifolia, p. — latifolium — erecta — media — minor				
WHITE.	Andromeda calyculata — latifolia — ventricosa				
YELLOW.	Arbutus alpina Daphne cneorum, 3. p. Erica mediterranea, 3. — minima, 3. — stricta, 3.				
GREEN.			Cupressus thyoides	Buxus sempervirens — — angustifolia — — aur. var. — — arg. — — nana	

MAY.

RED.	Vaccinium myrtillus, p. Erica fuscata, 3. t. p. Kalmia glauca, 3. p. — — pallida, 3.	Erica australis 3. t. p.	Ilex aquifol. crassifol.	Ilex macrophylla	
WHITE.	Andromeda axillaris, p. — catesbæi Ledum buxifolium — angustifolium — decumbens — palustre — latifolium — longifolium Polygala chamæ-buxus, 3 Ruscus & hypogloss. & hypophyll. Olea angustifolia nana Rhodod. maxi.fl. alb. 3. p. Ruscus hypoglossum		Arbutus andrachne, t. — — lucida, t. — — serratif. t.		Ilex aquifolium — — fruc. flo. — — heterophill. — — fol. var. arg. — — — — aur. — — — mac. arg. — — — — aur. — — echinata — — — arg. — — — aur. Prunus laurocerasus — — fol. mac. — — angustif.
YELLOW.	Genista anglica		Spartium scoparium		
GREEN.	Laurus nobilis nana	Acer creticum Thuja filiformis	Laurus nana angustifol. Thuja plicata — tartarica	Quercus coccifera	Juniperus communis Laurus nobilis Thuja occidentalis — densa — orientalis

EVERGREEN SHRUBS.—JUNE.

Height from 0 to 2 feet.	*From 2 feet to 4 feet.*	*From 4 feet to 7 feet.*	*From 7 feet to 10 feet.*	*From 10 feet to 20 feet.*
RED. Cistus apenninus, fl.rub.*p.* — grandiflorus, fl.rub. — helianthemum — — sulph. Linnæa borealis †, *p.* Vaccinium buxifolium — crassifolium — hispidulum — lucidum — macrocarpon — sibiricum Erica cineria, *s. p.* — vulgaris, flo. albo — — fl. pleno	RED. Rhodod.catawbiense. 3. *p.*	RED. Rosa indica, 4 varieties, 3.	RED.	RED.
WHITE. Andromeda coriacea, *t. p.* Astragalus tragacantha — tragodes Cistus alpestris — apenninus, fl. alb.*p.* — helianthemum,fl.a. — — flo. mutabile — incanus — italicus — laxus — polifolius — salvifolius, fl. Daphne gnidium — tarton-rara Erica cinerea, flo. alb. *p.* — vulgaris — umbellata	WHITE. Cistus ladaniferus, *p.* — laurifolius — populifolius — — major — salicifolius Ilex opaca — parado Olea angustifolia rosmari. Ruscus raemosa	WHITE. Rhamnus alaternus, fol. var. org.	WHITE. Ligustrum vulg. semperv. Mespilus pyracantha Olea angustifolia — latifolia — obliqua, — media — buxifolia — pendula — fol. var. Rhamnus alaternus lacini. — — fol. var.	WHITE. Prunus lusitanica, 3. — — fol. mac. Rhamnus alaternus latifol. — — fol. mac.
YELLOW. Cistus apenninus, *p.* — grandiflorus — — flo. sulph — helianthemum — — flo. luteo pleno Genista germanica — sagittalis Hypericum androsæmum — calycinum Cistus helianthem. fl. aur.*p.* — — pleno	YELLOW.	YELLOW. Cytisus hirsutus, *t.* Robinea halodendron Budeia globosa, *t.*	YELLOW.	YELLOW.
PURPLE. Andromeda cærulea Cistus helianthem. fl.pu.*p.* Rhododendron chamæ-Cistus, *t. s. p.* — maximum, *t.* — ponticum-myrtifol. — — pumilum	PURPLE.	PURPLE. Rhododendron pontic.3.*p.* — angustifolia, 3. — contortum, 3. — macrophyllum 3. — roseum, 3. — salicifolium, 3. — fol. arg. var. 3. — — aur. 3. — algarvense, 3, *p.*	PURPLE.	PURPLE.
GREEN. Ephedra distachya Juniperus repens	GREEN. Buxus baliarica Juniperus sabina — — fol. var. — tamariscifolia — sibirica	GREEN. Aucuba japonica, *p.*	GREEN. Juniperus thurifera	GREEN. Juniperus excelsa — lycia — oxycedrus — phœnicea — suecia

JULY.

RED. Erica tetralix, 3. *p.* Gaultheria procumbens Pyrola maculata, 3. Rhododendron ferrugin. 3. *p.* — hirsutum, 3. — fol. mac. 3. Erica ciliaris, 3. *p.* — vagans, 3.	RED.	RED. Kalmia latifolia rub. *p.*	RED.	RED.
WHITE. Atriplex portulacoides Cistus albidus *p.* — crispus, *t.* — monspeliacus, *t.* Cornus canadensis Epigæa repens, 3. Erica tetralix flo. alb. 3. — vagans flo. alb. 3. Pyrola umbellata 3. Salix reticulata Vaccinium arctostaph. *t. p.* Andromeda speciosa	WHITE. Andromeda acumina. *t. p.* — ferruginea, *t.* Euonymus americanus Andromeda serratifolia	WHITE. Atriplex halimus Kalmia latifolia flo. alb. *p.*	WHITE.	WHITE.
YELLOW. Spartium radiatum, *p.* Teucrium flavum — fructicans	YELLOW. Ruta graveolens.	YELLOW. Spartium junceum — — pleno	YELLOW.	YELLOW.
PURPLE. Erica viride purp. 3. *p.* Lavendula stœchas, *t.*	PURPLE.	PURPLE. Rhododendron puncta. 3. — — latifol.	PURPLE.	PURPLE.
GREEN.	GREEN.	GREEN. Bupleurum fruticosum	GREEN. Juniperus daurica	GREEN.

AUGUST.

RED. Polygonum frutescens Rhododendron caucas.3.*p.* Rosa semperflorens 7 varieties, 3. *t. p.*	RED. Ilex cassine major, *p.*	RED.	RED.	RED.

EVERGREEN SHRUBS.—AUGUST.

Height from 0 *to* 2 *feet.*	*From* 2 *feet to* 4 *feet.*	*From* 4 *feet to* 7 *feet.*	*From* 7 *feet to* 10 *feet.*	*From* 10 *feet to* 20 *feet.*
WHITE. Prinos glaber Yucca filamentosa, *t.* — angustifolia, *t.* — gloriosa, *t.* 3.	WHITE. Ilex cassine media, *p.* — — minor Iva frutescens, *p.*	WHITE.	WHITE.	WHITE. Magnolia grandiflora, 3. — acuminata — exoniensis — ferruginea — obtusifolia — rotundifolia — salicifolia
YELLOW. Ruta montana	YELLOW. Jasminum fruticans — humile	YELLOW.	YELLOW.	YELLOW.
GREEN.	GREEN. Artemisia abrotanum	GREEN.	GREEN.	GREEN.
		SEPTEMBER.		
RED. Salvia crecta — officinalis — — angustifol. — triloba Kalmia angustifolia serotina, *p.*	RED.	RED.	RED. Arbutus unedo rubra	RED.
WHITE.	WHITE.	WHITE.	WHITE. Ligustrum lucidum	WHITE.
GREEN. Ephedera monostachya Salsola fruticosa	GREEN.	GREEN.	GREEN.	GREEN.
		OCTOBER.		
WHITE.	WHITE. Arbutus unedo crispa	WHITE. Arbutus unedo pleno	WHITE. Arbutus unedo	WHITE.

SUBSECT. 3. *Climbing and Twining Shrubs.*

1694. CLIMBING HARDY SHRUBS.—APRIL.

BLUE.	BLUE.	BLUE.	BLUE.	BLUE. Atragene austriaca
		MAY.		
WHITE.	WHITE.	WHITE.	WHITE.	WHITE. Lonicera belgicum præcose
PURPLE.	PURPLE. Vinca major — — fol. arg. — — fol. aur. — — flo. pleno	PURPLE. ev. Vinca major.	PURPLE.	PURPLE.
		JUNE.		
RED.	RED.	RED.	RED.	RED. Polygonum volubile Clematis viorna, tw.
WHITE.	WHITE.	WHITE.	WHITE.	WHITE. Ampelopsis cordata, *p.* — hirsuta Celastrus scandens Rosa arvensis — canina — — pleno — — variegata — sempervirens, ev.
YELLOW.	YELLOW.	YELLOW. Lonicera caprifolia, italicum	YELLOW. Clematis reticulata, *p.* — triternata	YELLOW. Aristolochia pubescens, *p.* Lonicera quercifolium — variegatum
PURPLE.	PURPLE.	PURPLE.	PURPLE.	PURPLE. Clematis viorna purp. 3, ev.
GREEN.	GREEN.	GREEN.	GREEN. Vitis labrusca Ziziphus volubilis	GREEN. Vitis laciniosa, *p.* — odoratissima — rotundifolia
		JULY.		
RED.	RED.	RED.	RED. Lonicera implexa, 3. Lycium barbarum	RED. Lonicera sempervirens, *t.* — — minor, *t.* — — longifol.
WHITE.	WHITE.	WHITE.	WHITE. Clematis florida, 3. v. — — flo. pleno, v. 3. Lonicera periclymen. fl. al. — belgicum	WHITE. Atragene americana, 3. *p.* — sibirica Clematis vitalba Jasminum officinale — — fol. arg. — — — aur. ev. Rosa repanda Rubus fruticosus — — fruc. albo — — laciniatus — — flo. pleno

HARDY CLIMBING SHRUBS.—JULY *continued.*

Height from 0 to 2 feet.	*From 2 feet to 4 feet.*	*From 4 feet to 7 feet.*	*From 7 feet to 10 feet.*	*From 10 feet to 20 feet.*
YELLOW.	**YELLOW.**	**YELLOW.**	**YELLOW.** Glycine frutescens. p. Lonicera flava	**YELLOW.**
BLUE.	**BLUE.**	**BLUE.**	**BLUE.**	**BLUE.** Clematis viticella cærul.3. Passiflora cærulea, 3. p.
PURPLE.	**PURPLE.**	**PURPLE.**	**PURPLE.**	**PURPLE.** Clematis viticella rubra — — flo. pleno
GREEN.	**GREEN.**	**GREEN.** Vitis arborea — blanda	**GREEN.** Menispermum canaden. p. — virginicum Passiflora maculata	**GREEN.** Rhus radicans
AUGUST.				
RED.	**RED.**	**RED.**	**RED.**	**RED.** Clematis virginiana, p. — vitalba canadensis Rosa multiflora, 3. t.
WHITE.	**WHITE.**	**WHITE.**	**WHITE.** Periploca græca	**WHITE.**
YELLOW.	**YELLOW.**	**YELLOW.**	**YELLOW.** Clematis orientalis	**YELLOW.** Aristolochia sipho, p. Bignonia radicans, 3. p. — — major, 3.
GREEN.	**GREEN.**	**GREEN.**	**GREEN.** Smilax aspera — sarsaparilla	**GREEN.** ev.Hedera helix,et var.6.Oct. Lonicera grata

The *Propagation and Culture* of shrubs being the same as that for trees, we combine both subjects in the catalogue of arboriculture in the succeeding book.

Sect. III. *Selections of Shrubs for particular Purposes.*

Shrubs, like flowers, may be applied to the concealment of deformities or defects, and production of particular beauties or desirable purposes. We shall here select the names of a few for concealing vertical and horizontal deformity; for producing an immediate effect as to bulk; for producing vegetation under the shade and drip of trees; for ornamenting water and rocks; for forming edgings and hedges; for diffusing agreeable colors; for being ornamental by their fruit; and for economical or botanical purposes.

Subsect. 1. *Shrubs for concealing vertical and horizontal Deformities.*

1695. *Vertical Deformities* may either be concealed by the rapid and tall-growing sorts (subsect. 2.), or by the climbers or twiners, either deciduous or evergreen. The climbers may be nailed to a wall or fence, or tied to a trellis, or allowed to climb on branches and spray; for the twiners, tall sticks or poles are necessary.

Horizontal Deformities may be concealed by rapid-growing bushy plants; by allowing climbers and trailers to spread over them, or by the proper trailers and creepers of the hardiest kinds, a few of which are these:

Deciduous. Rosa arvensis, Rubus fruticosus, Cissus hederacea Cytisus supinu, Genista decumbens Rhamnus repens. *Evergreens.* Rosa sempervirens, Vinca major, and minor.

Subsect. 2. *Shrubs of rapid and bulky Growth.*

1696. These are often desirable to produce immediate effect in laying out pleasure-grounds, as well as for producing shelter, and concealing objects.

Deciduous. Colutea arborescens, et frutescens, Cornus alba, florida, et sanguinea, Cytissus laburnum, et sessilifolius, Ligustrum vulgare, Philadelphus coronarius, Rosa villosa, Sambucus nigra, Spiræa opulifolia, Syringa vulgaris, Viburnum opulus. *Evergreens.* Cupressus sempervirens, Ilex aquifolium, Juniperus virginiana, Ligustrum vulgaris, var. sempervirens, Mespilus pyracantha, Pinus palustris Quercus gramuntia, Prunus laurocerasus, lusitanica, Rhamnus alaternus, Spartium junceum, Taxus baccata, Thuja occidentalis, orientalis, Ulex europæus, var. hibernica.

Subsect. 3. *Shrubs which thrive under the Shade and Drip of Trees.*

1697. In practice, these are a most valuable class for filling up blanks in old shrubberies, or screen plantations; and thus producing greenth, variety, and a healthy aspect, instead of emptiness, haggard stems of trees, or mere ghosts of plants.

Deciduous. Cornus alba, alternifolia, florida, sanguinea, Corylus avellana, Daphne alpina, 3, mezereum, 3. s. m. flo. albo, 3. m. serotina, 3. s. Euonymus angustifolius, 3, latifolius, 3. verrucosus, 3, s. Hypericum hircinum, h. minor, prolificum, Ligustrum vulgare, v. fruc. flavo, v. fol. variegatis, Lonicera symphoricarpus, 3. tartarica, xylosteum, Mespilus tomentosa, Rosa w. sibirica, arvensis, Rubus occidentalis, odoratus, trivialis, villosus, Sambucus nigra fol. var. n. alba, n. laciniata, racemosa, Spiræa canadensis, 3. thalictroides, 3. *Evergreens.* Aucuba japonica, 3. Buxus, sempervirens, s. angustifol. s. aur. var. s. arg. var. s. nana, Cistus canadensis, Daphne cneorum, 3, c. fol. var. collina, 3. s. laureola, l. fol. var. Ephedra distachya, monostachya, Hypericum androsæmum, calycinum, Ilex aquifolium, Ligustrum vulg. semper. vir. Viburnum tinus, t. fol. arg. t. fol. aur. t. hirtum, t. lucidum. *Climbers.* Clematis vitalba, v. canadensis, Hedera ev. helix, e. h. fol. arg. mac. e. h. fol. aur. mac. e. h. fol. arg. var. e. h. fol. aur. var. e. h. fol. maximis. Lonicera periclymenum, p. flo. albo, Rosa arvensis, ev. repanda, Vinca, ev. major, e. minor, e. m. fol. arg. e. m. fol. aur. e. m. flo. pleno.

SUBSECT. 4. *Shrubs for planting by the Sides of Pieces of Water, or in Marshy Grounds, and among Rocks.*

1698. The following may be considered as hardy *aquatic* shrubs: most of the peat-earth species are also suitable for planting in marshy situations.

Deciduous. Alnus pumila, Betula nana, pumila, et sibirica, Dirca palustris, Myrica cerifera, and gale, Salix, most of the species. *Evergreens.* Arbutus unedo, Ledum, S. palustre, Pinus palustris, Salix reticulata.

1699. Of *mountain* shrubs the following are some of the most hardy:

Deciduous. Atraphaxis alpina, Daphne alpina, Genista decumbens, Lonicera alpigena, Ononis fruticosa, Potentilla fruticosa, Rhamnus saxatilis, Rhododendron dauricum, Ribes alpinum, Rosa alpina, spinosissima, Rubus cæsius, Corylifolius hispidus, Spartium alpinum. *Evergreens.* Arbutus alpina, Azalea procumbens, Daphne collina, Empetrum nigrum, Erica, all the species, Cistus all the species, Gaultheria procumbens, Juniperus communis, Rosmarinus officinalis, Ulex europæus, nana.

SUBSECT. 5. *Shrubs for forming Edgings and Hedges in Gardens.*

1700. Few shrubs besides the box (*Buxus sempervirens var. nana*) are used for *edgings*; but some others, as the

Andromeda polifolia, Arbutus alpina, and uva-ursi, Empetrum nigrum, various species of Erica especially herbacea, tetralix, vulgaris, Lavendula spica, Sedum buxifolium, and even Ulex nanus

may be occasionally used.

The following are a few of the numerous plants which may be used as hedges for shelter in gardens; almost all the free-growing sorts may be planted in rows, and cut in the hedge form; but the following sorts will form compact evergreen shelters:

Buxus sempervirens, Juniperus communus, Ulex europæus var. hiberniæ, Ilex aquifolium, Laurus nobilis, Ligustrum vulgaris, sempervirens, olea, (Wild.) angustifolia, latifolia, media, Rhamnus alaternus, Rosmarinus officinalis, Taxus baccata, Thuja occidentalis and orientalis, Viburnum tinus, Prunus laurocerasus:

The creeping shrubs may be formed into hedges by training on frame-work:

Flowering hedges may be formed of the following deciduous sorts.

Rosa. various species, Coronilla emerus, Daphne mesereum, Hibiscus syriacus, Philadelphus coronarius, Pyrus japonica, Robinia hispida, Spartium multiflorum, Spiræa hypericifolia, Syringa persica, vulgaris.

SUBSECT. 6. *Shrubs whose Flowers or Leaves have volatile Odours, and diffuse them in the surrounding Air.*

1701. There are only a few plants which have this quality in the leaves as well as the flower; these are marked *leav.*

Deciduous. Azalea, most of the species, Betula sibirica, *leav.* Daphne mesereum, Rosa rubiginosa, *leav.* Salix most of the species, but especially S. viminalis, alba, Syringa vulgaris. *Evergreens.* Lavandula spica, Rosmarinus officinalis. *Climbers.* Clematis flamula, Jasminum officinale, Lonicera caprifolium, periclymenum.

SUBSECT. 7. *Shrubs ornamental by their Fruit as well as Flowers.*

1702. Besides the agreeable appearance of the fruits of the following shrubs, they are also serviceable as encouraging singing-birds to resort to the shrubbery.

Deciduous. Berberis vulgaris, Ligustrum vulgare, Ribes alpinum, cynosbati, Rosa spinosissima, et villosa, Sorbus americana, et lanuginosa, most of the species of Vaccinium, Lonicera viburnum, and all the species of Cornus, Euonymus, Mespilus, Prunus, Pyrus, and Sambucus. Few shrubs are more ornamental than the sloe (Prunus spinosa, Linn.); it is profusely covered with odoriferous white flowers early in April, and with dark purple fruit with a fine bloom, from September to February. It is much cultivated in Japan (156), where its flowers attain the size of a double rose. *Evergreens.* Arbutus unedo, alpina, and uva-ursi, Cornus canadensis, Empetrum nigrum, Euonymus americanus, Ilex aquifolium, Juniperus communis, and suecia, Mespilus japonica, pyracantha, Prunus, all the species, Taxus baccata, Vaccinium, all the species, Hedera helix. *Climbers and Creepers.* Lonicera, all the species. Rosa canina, Vitis vulpina.

SUBSECT. 8. *Selections of Shrubs for botanical or economical Purposes, parasitic Trees, or Shrubs for a small Shrubbery.*

Shrubs may be arranged in innumerable modes, as well as herbaceous plants; as, according to soil, climate, habitation, country, rarity, place in botanical systems, uses in agriculture, or the arts, &c. No gardener can make any selection who does not know by inspection the actual plants, and their habits, culture, and history; to him it is needless to repeat the sources to which he may have recourse for forming any classification whatever.

1703. A selection for *botanical purposes* will necessarily include parasitic plants, of which the only hardy genus is *Viscum*. This is propagated in February by sticking the berries, which are viscid when bruised, in a slit like that made in budding, on the smooth bark of the apple, pear, thorn, or almost any tree. If these are not washed away by rain, or otherwise rubbed off, they will germinate in the following summer. To make sure of their not falling off, some bore a hole in the bark and insert the seed; or cut a notch in it, or make a slit: the last seems the best mode, and has been successfully adopted by Professor Thouin in the Paris garden, and extensively by Watts, a nurseryman at Acton, on most sorts of trees. Some, as Professor Walker, (*Essays on Nat. Hist.*) on the supposition that the seeds will not vegetate till they have passed through the stomach of a bird, recommend causing fowls to eat the seeds, and then sowing them. But this is found not to answer, for though the digestive powers of the stomach do not destroy the vegetative power of seeds which pass rapidly through it, yet in most cases it does. The misletoe in nature is propagated by the misletoe thrush (*Turdus viscivorus*), but not by means of its excrement. This bird feeds on the berries of the misletoe in winter. These, from their viscosity, often stick to the outer part of the bird's beak, and to disengage them he strikes it against the branch of the tree on which he alights, and leaves the seed sticking to the bark; if this should chance to be a smooth part, the seed will adhere to it, and the succeeding spring will grow, the radicle piercing the bark, and the plume unfolding itself in the air. The viscum grows best on the pyrus and mespilus tribe, but it will also grow on the ash, oak, fir, &c. on which trees we have observed it in abundance in Germany. In the pine-forests near Magdebourg it is most abundant on pinus sylvestris.

1704. Subjoined is a select list of trees and shrubs of great beauty and easy culture, proper for introduction in *shrubberies of limited extent*.

Deciduous Trees. Acer pensylvanicum, Æsculus hippocastanum, Amygdalus communis, Cupressus disticha, Fagus sylvatica purpurea, Platanus occidentalis, Quercus coccinea, Robinia pseud-acacia, Sorbus aucuparia, Tilia europæa.

Evergreen Trees. Pinus cedrus, balsamea, Pinea abies, Cupressus sempervirens, Quercus gramuntia, and suber Juniperus virginiana.

Deciduous Shrubs. Amygdalus nana, Andromeda panicalata, Azalea nudiflora, and pontica, Chericanthus virginica, Colutea cruenta, Cornus florida, Coronilla emerus, Cytisus purpureus, and sessilifolius, Daphne mezereum, Genista florida, Halesia tetraptera, Hibiscus syriacus and varieties, Ligustrum vulgare, Magnolia purpurea, Mespilus, Chamæ-mespilus Philadelphus, coronarius, Prunus cerasifera, Pyrus japonica, Robinia hispida, Rosa alba, centifolia, cinnamomea, damascena, indica, lutea, moschata, muscosa, rubiginosa, spinosissima, villosa, Sorbus lanuginosa, Spartium multiflorum, Spiræa hypericifolia, opulifolia, et canadensis, Syringa persica, sinensis, vulgaris, Viburnum opulus, lantana.

Evergreens. Andromeda calyculata, Arbutus unedo and andrachne, Aucuba japonica, Buddlea globosa, Buxus balearica et sempervirens, Cistus appeninus and grandiflorus, Helianthemum vulgare, Cytisus hirsutus, Daphne laureola et pontica, Erica herbacea et dabœcia, Genista anglica, Ilex aquifolium, and numerous varieties, Jasminum fruticans et humile, Juniperus sabina, Kalmia angustifolia, Lavendula spica, Laurus nobilis, Ligustrum vulgare, var. sempervirens, Magnolia grandiflora, Mespilus pyracantha, olea angustifolia, latifolia, et media, Pinus cembra et lanceolata, Prunus laurocerasus lusitanica, Rhododendron maximum and ponticum, Rosa indica, semperflorens and banksiæ, Rosmarinus officinalis, Ruscus racemosus, Spartium junceum, Taxus baccata, Thuja, occidentalis, et orientalis, Viburnum tinus, Ulex europeus, Yucca filamentosa gloriosa.

Climbers. Atragene austriaca, Bignonia radicans, Clematis cirrhosa, flammula, florida, viorna, vitalba, et viticella, Hedera helix, and varieties. Jasminum officinale, Lonicera, Caprifolium, Periclymenum, belgicum, et sempervirens, Lycium barbarum, Passiflor, cærulea, Rosa arvensis, repanda et sempervirens, Vinca major et minor, Cissus hederacea.

Chap. XI.

Frame Exotics.

Frame plants are such as are rather hardier than those kept in the green-house and of low growth. Some of those enumerated here will also be found among the green-house, and a few among the hardy plants. The frames or pits in which they are kept, are never artificially heated, but are well covered with mats or other materials during severe frost. The frames are sometimes attached to the front of the green-house or stove (*fig.* 307.), and thus derive some heat from the front flue, which, when an outside frame is in contemplation, is generally built in the front wall. When this is not the case, they may be advantageously placed on a border sloping to the east, south, or west (*fig.* 461.), under the shelter of a hedge or wall. The pots should be plunged in scoriæ, ashes, saw-dust, or any similar non-conductors, and abundance of air, and little water given in the winter time.

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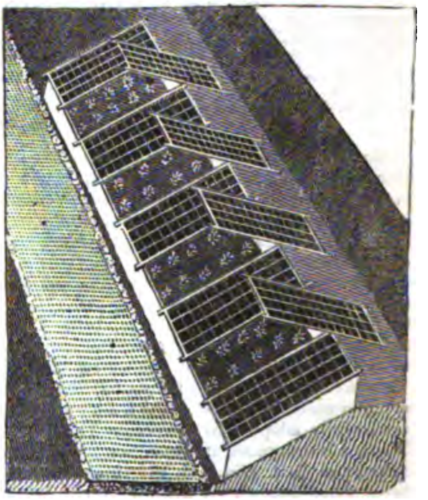

This manner of placing frames answers well for the protection of early or late flowering bulbs, and also for the winter habitation of auriculas, carnations, and alpine plants. Few scenes are more interesting in the spring season than a small oblong flower-garden, surrounded by a holly hedge, enriched with many spikes of coral berries; within the hedge a sloping frame-border, all round; on the north side, containing frame-exotics; on the west, early flowering bulbs, as hyacinth, crocus, narcissus, &c.; on the east, choice auriculas; and on the south side (the border facing the north), a collection of alpines. The middle of the garden laid out in beds of florist's flowers.

Sect. I. *Frame Woody Plants.*

Those marked *cl.* are climbers; *tw.* are twiners; and *tr.* are trailers.

1705.

FRAME WOODY PLANTS.

FEB. MAR. APR.	MAY.	JUNE.	JULY.	AUGUST.	SEPT. to NOV.
Cydonia speciosa Corchorus japonic. 3. Magnolia conspi. *p.* — tomentosa Prenanthes spinosa Thuja articulata	Prunus prostrata Illicium floridanum — parvifloru. *p.* Magnolia obovata, *t. p.* Penstemon campanul. Vella pseudocytisus Anthyllis erinacea Othona chicrifolia Cupressus lusitanicus Smilax pseudo-china Juniperus bermudian. — chinensis	Ilex dahoon, *p.* — angustifolia — vomitoria Lonicera flava Cydonia japonica, *p.* Helianthem. formo. *p.* — atripl. *p.* — halimifo. — elongatu. — glutinos. Thymus tragoriganum Scrophularia frutesce. Biscutella sempervir. Amorpha pubescens Anthyllis hermann. *p.* Medicago arborea, *p.* Conyza candida, *t.*	Lonicera semper. min. Rhododen. chæm. *p.* Hudsonia ericoides, *p.* Rosa berberifol. sinica Cistus villosus — monspeliensis — hirsutus — salvifolius — heterophyllus — creticus — purpureus Helianthem. libanotis — umbella. — lævipes Teucrium massilien. *p.* — flavum — aureum — flavescens — gnaphaloid. Prasium majus Amorpha microphylla Hypericum nudifloru. — rosmarinif. — aspalath. — fasciculat. Centaurea argentea	Ilex cassine, *p.* Pinckneya pubens Prinos lucidus Silene fruticosa Euphorb. paral. suf. *p.* — sylvatica Helianthem. canu. *p.* — scabrosum — lavandul. Reaumuria hyperic. *p.* Stachys orientalis Marrubi. pseudo dict. Thymus mastichina Calamintha cretica Alyssum spinosum Stauracanth. aphyllus Amorpha canescens Lupinus arboreus Artemisia valentina Gleditschia sinensis	Lonicera flexuosa — japonica, 3. *p.* Asparagus albus, *p.* — acutifolius Euphorbia imbric. *p.* Mespilus japonica, *p.* Vitex agnus-castus, *p* Antirrhin. molle, *t.* Lepidium subulatum Gordonia pubescens, *p.*

Sect. II. *Frame Succulents.*

1706.

FRAME SUCCULENT PLANTS.

FEB. MAR. APR.	MAY.	JUNE.	JULY.	AUGUST.	SEPT. to NOV.
Euphorbia characias				Saxifraga sarmentosa Euphorbia nicæensis	Agave virginica

Sect. III. *Frame Herbaceous Plants.*

1707.

FRAME HERBACEOUS PLANTS.

FEB. MAR. APR.	MAY.	JUNE.	JULY.	AUGUST.	SEPT. to NOV.
Helleborus lividus, *p.* Erinus alpinus, 3. — hispanicus Arum crinitum, *p.*	Arum arisarum, *p.*	Saxifraga granulata — — pleno Satureja juliana Mimulus luteus Pedicularis euphrasoi. — myriophyl. — resupinata Erodium glandulosu. — chamædryoi. Geranium argenteum Lotus odoratus Marshallia lanceolata — latifolia Arum ternatum, *p.*	Lobelia fulgens, 3. *p.* — splendens, 3. — cardinalis, 3. Œnothera rosea Saxifraga sarmentosa — virginiensis — congesta — stellaris — bryoides — androsacea — oppositifolia — rivularis Saracenia flava, *p.* — purpurea Satureja græca Scrophularia sambuc. Pedicularis recutita — foliosa — verticillata Iberis umbellata Hedysarum muricatu. Hypericum setosum Eupatorium urticæfo. Artemisia chamæm. Rudbeckia lævigata Centaurea spinosa — sempervir. — ægyptica Calopogon pulchel. *p.*	Linum narbonense, *p.* Rhexia ciliosa, *p.* Saxifrago mutata — autumnalis Dianthus japonicus, *p.* — fruticosa Silene fabaria Sedum spinosum Euphorbia paralias Hydropeltis purpur. *p.* Teucrium nissolianu Marrubium acetabul. Antirrhinum asarina Linaria triornithoph. — bipartita — tristis — reticulata — alpina, *p.* — villosa Pedicularis scep. caro. — flammea — tuberosa — compacta Lupinus villosus, *p.* Glycine reniforme, *p.* Hypericum mutilum — crispum Iresine celosioides	Statice auriculæfol. *p.* — emarginata — cordata — spatulata — speciosa — conspicua Saxifraga aspera — hirculis Scrophularia mellifera Stevia salicifolia Artemisia indica Zaluzania triloba Bupthalmum mariti. Coreopsis færulæfolia Urtica nivea, *p.*

Sect. IV. *Frame Bulbs.*

1708.

FRAME BULBS.

FEB. MAR. APR.	MAY.	JUNE.	JULY.	AUGUST.	SEPT. to SEPT.
Allium chamæ-moly	Ornithogal. arabic. *p.*	Ornithogalum squilla	Ornithogalum ixioid.	Ornithogalum latifol. — juncifo. Uropetalon fulvum Hypoxis juncea, *p.* Helianthemum tuber.	Uropetalon serotinum

SECT. V. *Frame Biennials.*

1709. **FRAME BIENNIALS.**

FEB. MAR. APR.	MAY.	JUNE.	JULY.	AUGUST.	SEPTEMBER.
			Acynos alpinus Verbena aubletia Lepidium subulatum — cardamines Cichorum Cnicus casabonæ spinosum, *s.* — afer — diacanthus Gnaphalium — fœtidum, *s.*	Gaura mutabilis Origanum majorana Celsia arcturus, — cretica, *s.* — lanceolata	

SECT. VI. *Frame Annuals.*

1710. **FRAME ANNUALS.**

FEB. MAR. APR.	MAY.	JUNE.	JULY.	AUGUST.	SEPTEMBER.
		Mazus rugosus Trichosanthes anguina — cucumerina	Saxifraga hederacea Momordica balsamina — charantia — operculata — luffa		

The *Propagation and Culture* of frame exotics is the same as for green-house plants.

CHAP. XII.

Green-house Plants.

Here we shall first arrange some of the more select tribes, and next class the most shewy and easily-flowered green-house plants, under the heads of woody, succulent, climbing, herbaceous, bulbs, annuals, and biennials. Each of these sub-divisions will be arranged as before as far as respects time of flowering and color; but considering the limited height which all exotic plants attain in pots, it has been considered unnecessary to attend to size Such as are trees in their native country will be indicated (by the letters *tr.*); also such as are biennials (by the letter *b.*); the most tender (*t.*); most shewy (*s.*), and those continuing in flower two or three months (3.) as before.

SECT. I. *Select Green-house Plants.*

These we shall consider as the geraniums, heaths, and camellias; which three tribes united, will supply a green-house with flowers of almost all colors, during every month in the year.

SUBSECT. 1. *Geranium.* — *Geranium*, L. *Geranium*, *Erodium*, and *Pelargonium*, of modern authors. *Monadelphia*, L.; and *Geraniæ*, J. *Geranier*, Fr.; *Geranium*, Ger.; and *Geranio*, Ital.

1711. This beautiful tribe comprehends numerous species and varieties of herbaceous suffruticose and shrubby plants, generally of a somewhat succulent nature throughout. They are almost all natives of the Cape of Good Hope, and with the exception of three or four species, have been introduced, or originated here from seed during the present and latter end of the last century. They are chiefly admired for their flowers, which they produce in abundance from May to September, generally in corymbs from the axillæ of the leaves of every shade of red, scarlet, and purple, mixed with white and yellow. The plants are easily cultivated, and by proper pruning, with the aid of gentle forcing in winter, many of the species, as the *P. zonale*, *cuculatum*, *cordatum*, &c. may be kept in flower all the year. The best collection of this family is in the nursery of Messrs. Colville, under the care of R. Sweet, whose "*Geraniæ*," now publishing, is the most elegant and complete work of its kind.

Species and Varieties. Many species and sub-species have been received from the Cape; but the greater number of the admired sorts have been raised in this country from seed; some of these have received systematic appellations, but the greater number have been named by those who raised them after themselves, or their friends, in the manner of florists' flowers. The following table contains some of the old established sorts, arranged according to their habits of growth and time of flowering; the flowers of most of the sorts are so mixed in regard to color, that it is almost impossible to class them in that respect; most of them are variegated with red, purple, scarlet, and white.

GERANIÆ.

EB. MAR. APR.	MAY.	JUNE.	JUNE.	AUGUST.	SEPTEMBER.
elargonium	Pelargonium	Pelargonium	Pelargonium	Pelargonium	Pelargonium
— dipetalum	— longifolium	— undulatum	— radiatum	— lobatum	— balsameum
— spatulatum	— allatum	— auriculatum	— lineare	— triste, t. s.	— quinquevulnerum
— affine	— longiflorum	— purpurascens	— punctatum	— flavum	— bicolor
— roseum	— elegans	— virgineum	— dioicum	— alchimilloides	— canariense
— hirsutum	— althæides	— atrum	— revolutum	— odoratissima	— tricuspidatum, s.
— pictum	— myrrhifolium	— nervifolium	— oxalidifolium	— fragans	— scabrum
— triphyllum	— grevillianum	— nummularifo.	— reflexum	— inodorum	— gratum
— punctatum	— crenatum	— pilosum	— astragalifolium	— columbinum	— consanguineum
— floribundum	— conduplicatum	— melananthon	— coronillæfolium	— coronopifolia	— pallidum
— bubonifolium	— Barringtonii	— chamædrifolium	— luteum	— tricolor	— obtusifolium
— rapaceum	— sidæfolium	— ovale	— barbatum	— reniforme	— tripartitum
— fissifolium luteu.	— cucullatum	— anceps	— incrassatum	— inquinans	— exstipulatum
— laciniatum	— speciosum	— senecioides	— blattarium	— heteroganum	— unicolorum
— carneum	— acerifolium	— coriandrifolium	— tabulare	— monstrum	— willdenowii
— grenvillianum	— quinatum	— glaucum	— grossularioides	— crassicaule, t.	— lævigatum
— pulchellum	— amplissimum	— dentatum	— lacerum	— peltatum	— fragile, t.
— ignescens	— fuscatum	— stenopetalum	— multicaule	— lateripes	— incisum
— ardens	— patulum	— pumilum	— caucalifolium	— tetragonum, t.	— carnosum
— œnothera	— sororium	— zonale	— diversiflorum	— variegatum, t.	— dasycaule
— eriostemon	— grandiflorum	— marginatum	— cuspidatum	— angulosum, t.	— lanceolatum
— procumbens	— gratum	— cochleatum	— penicillatum	— graveolens	— acetosum
— cordatum	— variegatum	— pubescens	— betulinum	— radula	— hybridum
— spurium	— delphinifolium	— rugosum	— formosum	— denticulatum	— reniforme
— nothon	— cynosbatifolia	— rubens, s.	— scandens	— semitrilobum	— cortusæfolium
— alnifolium	— spinosum	— papilionaceum	— lateritium	— splendens	— candidum
	— crispum	— glutinosum	— saniculæfolium	— fulgidum, s.	Erodium hymenodes
	— gibbosum	— hispidum	— australe	— alternans	
	— Beaufortiana	— ceratophyllum	— vitifolium	Erodium crassifolium	
		— crithmifolium	— capitatum	— incarnatum	
		Erodium	— hermannifolium	— geranifolium	
		— alpinum	— adulterinum		
		Geranium	— abrotanifolium		
		— canescens	— tenuifolium		
		— incanum	Geranium spinosum		
		— erubescens			

1712. *Propagation.* The ordinary mode of continuing each species, is by cuttings, but almost all the sorts produce ripe seeds in this country, by which they may be multiplied, and also new varieties produced. The seed, if ripe before midsummer, may be sown as soon as gathered, in pots of light, rich earth, and placed in a gentle hot-bed and shaded; the plants will soon come up, and if, when they show two proper leaves, they are transplanted singly into pots, and kept under a cold frame, they will flower the same autumn. No plant grows more readily by cuttings than the shrubby or suffruticose species of this family: the cuttings may be taken off at a joint where the wood is beginning to ripen; laid in the shade for an hour or two till the wound heals; and then planted in sandy loam, and placed in a gentle heat. The hardier sorts, as *P. zonale, inquinans,* &c. will strike in the open air or in any shady situation, without being covered with a glass. Cuttings of the roots of such sorts, as *P. triste, gibbosum,* &c. strike readily; a small portion of the root being left above ground. The fibrous-rooted herbaceous sorts, as *E. chamædryoides* and *glandulosum,* may be multiplied by dividing the roots.

"From the latter end of March to the middle or end of July," Cushing observes, "cuttings of all the common kinds of geranium may be put in with success: Let a moderate hot-bed be made up, and surfaced with some old tan; when it is of a proper temperature, let the cuttings be made, and put in some nice rich loam; plunge the pots to the rim on the bed, and shade them for a day or two, but no longer. Pick off any damping leaves that may appear, water them occasionally, and observe to pot them off in due time, by which means they will be stout plants by the end of autumn: the more curious kinds are in general done by cuttings of the thick fleshy roots, which they produce in abundance: as many of these as can be spared with safety being taken off carefully from each plant, and a few of the finer fibres attached to them and neatly potted in small pots, leaving the crown of each about one-fourth of an inch over the surface, watered and set on a moderate heat, will in a few weeks, make excellent plants: one, two, or more stems, which they in general produce, being left to form the plant." *Exotic Gard.* 90.

1713. *Culture.* The geraniæ require a light, rich soil; they grow well in equal parts of sandy loam and well rotted dung; or they will grow in leaf-mould and a little sand, without any thing else. As most species are rapid growers, the pots require to be examined in spring and autumn, and the roots and top reduced, or the plant shifted into a larger pot. In general the shrubby sorts should be kept low and bushy by pruning; for when they are allowed to grow tall and straggling, they are very unsightly and do not flower well. Some of the herbaceous sorts may be considered as frame plants; but the greater number require the green-house, and some of the very succulent sorts are best grown in the dry-stove. Where an extensive collection of geraniums is kept, it is desirable to devote a house entirely to their culture; in this the roof should be of a construction to admit as much light as possible, the stage should be near the glass, and there should be ample means of giving air and heat. Most of the species require rather more heat during winter than evergreen woody exotics from the same climates; otherwise they are apt to lose their leaves and to rot at the points of the shoots. To prevent this, heat should be given in the day-time and air admitted, and whenever any leaf begins to decay, it should be removed.

The hardier geraniæ, like other green-house plants, are generally placed in the open air from May to September; but as the flowers are much injured by heavy rains and winds, the more delicate sorts, and all those intended to flower in the best manner, should be kept in the house with abundance of air night and day. In warm situations it is customary in April or May, to plant many of the *P. zonale* and other free-growing sorts in the borders of the flower garden or shrubbery: these have a splendid effect till attacked by frost, when their roots may either be protected where they stand by abundance of litter and mats, or they may be removed into single pots, and placed in a dry part of the green-house till the following spring. The Rev. W. Williamson has found, that if the plants are taken up, deprived of their stalks and fibrous roots; the wounds made in doing this healed by exposure in a dry place; and afterwards the roots deposited in layers in a mass of sand, placed in a cellar, or otherwise excluded from frost, they will retain their vegetative power through the winter, and grow vigorously when replanted in the open air in spring. *Hort. Trans.* iv. 414.

Forcing the Geraniæ. The hardier shrubby sorts force well with a very gentle heat, and in this way may be kept in flower during the winter months till April and May, when they will be succeeded by those that have been kept in the common green-house temperature.

Subsect. 2. *Exotic Heaths.* — *Erica*, L.; *Octan. Monog.* L.; and *Ericeæ*, J. *Bruyére*, Fr.; *Heyde Kraut*, Ger.; and *Macchia*, Ital.

1714. This is an extensive genus of low shrubby evergreen plants, much valued for the beauty of their flowers, and the blossoming of many of them in the winter season. Scarcely any exotic heaths were known in Miller's time, and none of the Cape species. Almost the whole of these have been introduced to Europe during the reign of Geo. III. and the greater part by F. Masson, a collector, who made two voyages to Africa at that king's expence.

Species and Varieties. Above 300 species have been introduced, some of which, from the difficulty of propagation, or accidental causes, have been lost; but there are still upwards of 250 sorts, which may be procured from the nurseries. There are also several varieties which have been raised from seed. The Hon. and Rev. W. Herbert has raised several hybrid heaths, which gives reason (*Hort. Trans.* iv. 27.) for thinking that many of the sorts imported from the Cape, and considered as species, are only hybrids produced by promiscuous impregnation. We have here arranged most of the sorts procurable in the nurseries, and in addition to the time of flowering, height in inches, and color, designated the form of the flower, as bell, (*b*) pill, or tube-shaped, (*p*) open, (*o*) roundish, (*v*) or ventricose (*r*).

1715. ERICA. — MARCH.

Height fr. 0 *to* 6 *inch.*	*From* 6 *to* 12.	*From* 12 *to* 18.	*From* 18 *to* 24.	*From* 24 *to* 30.	*From* 30 *and upwards.*
RED.	RED.	RED.	RED.	RED.	RED.
Ardens, Feb. o. r.					
PURPLE.	PURPLE.	PURPLE.	PURPLE.	PURPLE.	PURPLE.
Oppositifolia, o. v.					
YELLOW.	YELLOW.	YELLOW.	YELLOW.	YELLOW.	YELLOW.
	Pallens, Feb. p.				
GREEN.	GREEN.	GREEN.	GREEN.	GREEN.	GREEN.
			Vernix, r. — major		
WHITE.	WHITE.	WHITE.	WHITE.	WHITE.	WHITE.
	Barbata major, p. — minor — discolor				
APRIL.					
RED.	RED.	RED.	RED.	RED.	RED.
				Costata, t.	
PURPLE.	PURPLE.	PURPLE.	PURPLE.	PURPLE.	PURPLE.
Mutabilis, v.	Finitiana, o. Gracilis, p. Præcox, p.	Baccans, r.	Linnæoides, t.		
YELLOW.	YELLOW.	YELLOW.	YELLOW.	YELLOW.	YELLOW.
			Sessilifolia, t.	Spicata, t.	
GREEN.	GREEN.	GREEN.	GREEN.	GREEN.	GREEN.
			Sessiliflora, t.		
WHITE.	WHITE.	WHITE.	WHITE.	WHITE.	WHITE.
Acutangula		Aristata, o. v.	Gelida	Discolor, t	

ERICA. — MAY.

Height fr. 0 *to* 6 *inch.*	*From* 6 *to* 12.	*From* 12 *to* 18.	*From* 18 *to* 24.	*From* 24 *to* 30.	*Fr.* 30 *and upwards*
RED. Fimbriata, *p.*	RED. Kalmiæflora, *o.* Trivialis, *p.* Trossula rubra, *v.* Venusta Squarrosa carnea, *t.*	RED. Acuminata, *t.* Persoluta rubra, *p.* — conferta	RED. Ruffa, *t.* Versicolor, *t.* Andromadæflora, *r.* Tubiflora, *t.* — fissa Racemiflora, *p.* Spuria pallida, *t.*	RED.	RED. Viscaria, *r.*
PURPLE.	PURPLE. Exserta, *p.* Fragrans Mellifera, *p.* Mollis Puerilis	PURPLE. Patens, *o.* Plumosa Racemosa	PURPLE. Spuria, *t.*	PURPLE.	PURPLE. Concinna, *t.*
YELLOW.	YELLOW. Campanulata, *r.* Lacticolor	YELLOW. Muscaria, *v* Tenuiflora, *t.*	YELLOW. Ignescens, *t.* Hybrida	YELLOW. Enneaphylla, *t.*	YELLOW.
WHITE. Arborea racemosa, *p.* Squarrosa	WHITE. Arctata, *p.* Biflora, *r.* Cordata, *o. p.* Mundula, *r.* Odore rosæ, *o. r.* Nigrita, *r.* Densa Stellata, *p.* Trossula alba, *v.* Ursina, *r.*	WHITE. Actea, *p.* Donnia — variegated Persoluta alba, *p.* Pinifolia discolor	WHITE. Pattersonia major, *t.* Conferta, *p.* Flexuosa	WHITE.	WHITE.
JUNE.					
RED. Longipedunculata, *o. r.* Saturcifolia, *o. p.*	RED. Bracteata, *o. o.* Pistillaris, *p.* Hyacinthoides, *r.*	DED. Linnæa superba, *t.* Empetroides, *p.* Lævis rubra Margaritacea incarnata	RED. Splendens, *o. t.* Riflexa rubra, *r.*	RED.	RED.
PURPLE. Banksia purpurea, *t.* Eleveta, *o. v.* Droseroides minor, *o.* Elegans, *o. p*	PURPLE. Blanda, *o. t.* Concava, *o.* Congesta, *p.* Depressa, *t.* Nivenia, *o. v.* Nobilis, *o. p.*	PURPLE. Empetrifolia, *p.*	PURPLE.	PURTLE.	PURPLE.
YELLOW. Banksia, *t.*	YELLOW. Halicacaba, *v.*	YELLOW. Flammea, *o. t.* Epistomia, *v.* Erecta, *t.*	YELLOW. Simplicifolia, *t.*	YELLOW.	YELLOW.
WHITE. Acuta, *o. t.* Petiolata, *p.* Primuloides, *v.*	WHITE. Nivea, *r.* Rostella, *p.*	WHITE. Lævis, *p.* Linnæ, *t.* Margaritacea, *p.* Melanthera Pyrolæflora, *r.* Regerminans, *p.* Triflora, *r.*	WHITE. Absynthoides, *p.* Aristata serotina, *o.* Reflexa alba	WHITE.	WHITE.
JULY.					
RED. Paniculata, *o.* Lachnæa rubra, *o. p.*	RED. Dickinsonia rubra Articulata, *d.* Comosa conferta, *v.* — rubra Kennedya, *o. t.* Parmentiera, *t.* Ventricosa, *r.* — superba Hirta	RED. Inflata, *v.* Mucosa, *p.* Pedunculata Ramentacea Walkeria superba, *v.* Canescens, *o.* Incana, *o. r.* Incarnata major, *p.* Juliana, *v.* Moschata, *p.* Propendens, *o.*	RED. Oblata, *o. r.* — major, 3. *o.* Penicillata rubra, *t.* Pinifolia coccinea Hirta, *t.* Hispida, *p.* Aitonia, *t.* Imbecilla, *p.*	RED.	RED. Rosea Vestita carnea
PURPLE. roseroides major, *o. r.*	PURPLE. Campestris, *p.* Comosa alba, *v.* Ovata, *o. p.* Protrudens	PURPLE. Obliqua, *o. r.* Perspicua, *t.* Pubescens major, *p.* Petiveria minor — minima Recurvata, *r.*	PURPLE. Decora, *v.* Glauca, *r.* Sebana, *t.*	PURPLE.	PURPLE.
YELLOW.	YELLOW. Sparmannia, *t.* Lutea Magnifica, *o. l.*	YELLOW. Exsurgens coccin. *d. t.* — fulgida Petiveria aurania Sebana minor Tetragona, *v.* Thunbergia, *r.*	YELLOW. Mollissima Foliosa, *t.* Formosa, *t.* Glabra, *b. t.* Hibbertia — minor Patersonia coccinea Sebana fusca, *t.* — aurantia — lutea, *t.*	YELLOW. Conspicua	YELLOW. Grandiflora
GREEN.	GREEN. Massonia ferruginea, *t.* — minor, *o.*	GREEN.	GREEN.	GREEN.	GREEN. Coronata, *o. t.*
WHITE. istifolia, *o. d.* achnæa, *o.* upestris	WHITE. Complanata, *o.* Dickinsonia alba, *p.* Glomerata Pehiza, *o. r.* Retorta, *o. v.* Bravifolia, *o.* Rotundifolia Selfaria, *r.* Thymifolia, *p.*	WHITE. Assurgens, *p.* Capitata, *r.* Decumbens Humea, *v.* Urceolaris, *r.*	WHITE. Marifolia, *p.* Monsonia minor, *v.* Penicillata, *t.* Pinifolia Triumphans, *r.*	WHITE.	WHITE. Vestita alba
VARIEGATED.	VARIEGATED.	VARIEGATED.	VARIEGATED. Melastoma, *t.*	VARIEGATED.	VARIEGATED.

ERICA. — AUGUST — *continued.*

Height fr. 0 to 6 inch.	*From 6 to 12.*	*From 12 to 18.*	*From 18 to 24.*	*From 24 to 30.*	*From 30 and upw*
RED.	RED.	RED.	RED.	RED,	RED.
Pumila, o. r.	Calycina major, o. p. Obcordata rubra. r. Paradisiaca, p. Peltata, o. Flagelliformis, p. Taxifolia Deflexa, p. Noisettea, r.	Ignescens, t. Rubella, p. Rubens Sebana sanguinea, t. Templea, o. o. Denticulata rubra, o. Mucrosoides, p. Rigida, t. Brunioides, r.	Ampullacea, o. v. Broadiyana, o. r. Carinata, t. Salisburya Jasminiflora, v. Vestita incarnata, t. Verticillata, t. Mammosa alba, t. Pellucida	Elongata, t.	Bucciniformis, t.
PURPLE.	PURPLE.	PURPLE.	PURPLE.	PURPLE.	PURPLE.
	Scariosa, r.	Lucida, p. Quadriflora, r. Strigosa, p.	Mammosa, t. — major, t. Pallida Nitida, p.		
YELLOW.	YELLOW.	YELLOW.	YELLOW.	YELLOW.	YELLOW.
	Metulæflora, o. v. Sordida, t.	Albens, v. Denticulata	Horrida, t. Nudiflora		Elata, t.
GREEN.	GREEN.	GREEN.	GREEN.	GREEN.	GREEN.
		Bandonia, v. Gemmifera, o. t.	Swainsonia, o. t.	Imperialis, t.	Massonia, r.
WHITE.	WHITE.	WHITE.	WHITE.	WHITE.	WHITE.
Intertexta, v.	Aggregata, p. Densa Infundibuliformis, o. t. Lambertia, o. r. Proboscidea Struthiolæflora, o. p.	Argentiflora, t. Aspera, p. Caffra Daphnæflora, v. Fastigiata, Flaccida, p. Pendula Phyllicoides Shannonia, v.	Arbutiflora, r. Cupressina, p. Mirabilis, t. — major Physodes, r. Pilosa, t.		Monsonia, r.
VARIEGATED.	VARIEGATED.	VARIEGATED.	VARIEGATED.	VARIEGATED.	VARIEGATED.
		Caffra spicata, p. Tricolor minor, o. t.	Tricolor major		
SEPTEMBER.					
RED.	RED.	RED.	RED.	RED.	RED.
Calycina minor, o. p. Tenuifolia, v.	Declinata, p. Fibula Floribunda Plunkenetia nana, t. Cernua. p. Imbricata	Coccinea, t. — major Mucronata Globosa, r. Rollinsonia, t. Archeria, o. t. Princeps, o. r. Erubescens, t. Palustris, p. Pulchella Scabriuscula, p. Sebana viridis	Pregnans coccinea, r. Carneola Multiflora, p. Pregnans, v.		Vestita coccinea, t.
PURPLE.	PURPLE	PURPLE.	PURPLE.	PURPLE.	PURPLE.
Smithia, p. Archeria, v	Cyathoides, o.	Tiaræflora Rugata, t.	Vestita purpurea, t.		Vestita fulgens, t.
YELLOW.	YELLOW.	YELLOW.	YELLOW.	YELLOW.	YELLOW.
Speciosa	Glandulosa Lanuginiosa, r.		Petiverianacoccinea, t. Glutinosa Petiveriana		Leea
GREEN	GREEN.	GREEN.	GREEN.	GREEN.	GREEN.
			Superba Viridiflora Viridescens		
WHITE.	WHITE.	WHITE.	WHITE.	WHITE.	WHITE.
	Cumulata Ocularia Pura, t. Solandra	Eriocephala, p. Plunkenetia alba, t.	Planifolia, p. Setacea		
OCTOBER.					
RED.	RED.	RED.	RED.	RED.	RED.
		Turgida, r. Horizontalis, t. Pyramidalis, o. Perlata rubra, o.	Cerinthoides lanata, t. Pulverulenta, r. Cerinthoides capitat. t.		Cerinthoides ciota
PURPLE.	PURPLE.	PURPLE.	PURPLE.	PURPLE.	PURPLE.
	Rosacea, o.		Filamentosa, v. t. Purpurea		
YELLOW.	YELLOW.	YELLOW.	YELLOW.	YELLOW.	YELLOW.
	Radiata, t.	Corrugata, t. Picta Serratifolia Flava, t.	Aurea, t.		
GREEN.	GREEN.	GREEN.	GREEN.	GREEN.	GREEN.
		Viridis, t.		Ewerana, t. — pilosa — speciosa	
WHITE.	WHITE.	WHITE.	WHITE.	WHITE.	WHITE.
		Denticulata alba v. Perlata, p. Senectula	Pinastri, t.		
NOVEMBER.					
RED.	RED,	RED.	RED.	RED.	RED.
					Vestita rosea, Dec t.
PURPLE.	PURPLE.	PURPLE.	PURPLE.	PURPLE.	PURPLE.
		Laxa, p.	Colorans		
YELLOW.	YELLOW.	YELLOW.	YELLOW.	YELLOW.	YELLOW.
			Sulphurea, t.		
WHITE.	WHITE.	WHITE.	WHITE.	WHITE.	WHITE.
	Pinea				

1715. *Propagation.* A number of the sorts ripen their seeds in this country, and may be so propagated; but the greater number are struck from cuttings, and some few, as *E. Massoni, retorta, petiolata,* &c. by layers, which require two years to throw out roots. The seeds are often imported from the Cape, and arrive in winter: they should be sown early in the spring following, in frames, filled with equal parts of peat and sand, very thinly covered, placed in the shade, and bell-glasses placed over them. The soil must be kept moderately moist by gentle waterings: they will in general come up in six weeks or three months, and may then be kept close to the glass in the heathery, or in a frame or pit till autumn, when they may be potted off. Seeds which are saved in this country may be sown as soon as gathered, if they ripen before September, but after that period it will be better to preserve them till next spring; as the plants produced from them would not be sufficiently advanced to endure the winter. Cushing (*Exotic Gard.* 74.) prefers a September sowing, because he finds the plants will stand the winter in the seed-pot better than those that have been raised early in spring, and transplanted in autumn into single pots.

Ample directions for striking heaths will be found in Cushing's "Exotic Gardener," who observes, that cultivators failed at first by planting large cuttings of ripened wood, instead of taking only the points of the fresh shoot. The true method, he considers, of propagating heaths was first discovered in the Hammersmith nursery, and the following abstract of the practice there is from Page's *Prodromus* "About the month of June, or as soon as the plant has made fresh shoots, cut off the extreme points about an inch long or less, according as the sort may afford, but always in the fresh shoot; take off the leaves from the lower part, as far as it is to be put in the sand, without injuring the shoot; this is rather a nice operation, and should be done with a sharp penknife, for the least bruise spoils the cutting. Dibble them into a pot, filled with moistened common white house-sand, before they have time to flag; when they are all planted, water the whole to fix them still better; let the moisture a little subside, then cover them with a small·bell-glass, fitted within the rim of the pot, and place them in the shade on a spent hot-bed, keeping them close till rooted, which will, with the free sorts, take place in about two months: when rooted, which is known by their shooting, take off the small glass, for about a week, at night, previous to its total removal. They will be fit to pot off in March the ensuing year."

Culture. "A prejudice," Page observes, "having spread that the culture of these plants is difficult, one of the greatest ornaments of the green-house has hence, of late, been neglected; although the method of culture is as easy, and nearly as certain, as that of the geranium, but requiring a little more delicacy in the execution." The soil for all the species is peat earth mixed with from one-sixth to one-fourth of fine white sand. The pots should be well drained and rather small, but large, in proportion to the size of the plants.

Heaths thrive best in a house by themselves, and placed as close to the glass as possible without risk from frosts: they do not require so much heat as most green-house plants, but abundance of air, and, above all, great regularity as to water, so as to preserve as much as possible, an equable and moderate degree of moisture about their roots. The mass of mould, being once thoroughly dried, the plant is irrecoverably lost; and it is equally so, though the operation goes on with less rapidity, if the pot is kept in a pan of water. No kind of plant is more injured by being kept in a chamber than heath, nor will they thrive in a green-house or in the open air, within the influence of the smoke of large towns. In the best situations and under the best management, many of the species are short-lived, and therefore require to be frequently renewed by cuttings or seed.

SUBSECT. 3. *Camellia.* *Camellia* and *Thea,* W.; *Monad. Polyand.* L.; and *Aurantiæ,* J.

1716. Of this genus there are four species introduced; the *C. bohea viridis,* and *sasanqua* are the plants whose leaves furnish the tea imported from China. *C. japonica,* introduced in 1739, is an ornamental, evergreen shrub, which grows to the size of a low tree in China, with dark-green, ovate leaves, on short petioles, and flowers red, white, striped, and variegated, and single, semi-double, and double, without fragrance, but of great splendor and beauty, and peculiarly valuable, as appearing in December, January, and February.

Varieties. There are:

White, single, semi-double, double, and spotted-leaved; and of *red*, the single, semi-double, double, pale, dark, largest pæony, pompone, pink, buff, long-leaved, striped-leaved, myrtle-leaved, Lady Hume's, Greville's coronet, and warratab. The *red and white* sorts are, the striped, double, and semi-double, the variegated, and the spotted-leaved.

Propagation. The single red camellia is propagated by cuttings, layers, and seeds, for stocks; and on these the other sorts are generally innarched, and sometimes budded or grafted.

The *cuttings* are formed of ripened shoots of the preceding summer, which are taken off in August, cut smoothly across at a joint or bud, two or three of the lower leaves only taken off, and the cutting then planted and made firm with a small dibber, in pans of sand and loam, or, by some cultivators, sand and peat. The pans are kept in a pit or cold frame, without being covered with glasses, but shaded during powerful sunshine; and in the following spring such as are struck will begin to push, when they are to be placed in a gentle heat. In September or October following, the rooted plants will be fit to pot off; and in the second or third spring they may be used as stocks. A more speedy mode of obtaining stocks is by planting stools in a pit devoted to that purpose, and *laying* these in autumn; the following autumn most of the layers will have produced roots, when they may be taken off and potted, and used as stocks in the succeeding spring. Innarching or grafting is performed early in spring, when the plants begin to grow; the chief care requisite is so to place and fix the pot containing the stock, as that it may not be disturbed during the connection of the scion with the parent plant. The graft being clayed over, is then covered with moss, to prevent its cracking. When independent grafting is resorted to, the mode called *side-grafting* (898), is generally used, as in the case of orange-trees (1509.); but the operation of tonguing is generally omitted, as weakening the stock, and unnecessary, with a view to prevent the scion from being blown off by winds.

A few seeds are sometimes obtained from the single red and semi-double camellias; these require two years to come up, but make the best stocks of any. The tea camellias are generally propagated by layers.

1717. *Culture.* Some cultivators grow the camellias chiefly in peat; but Messrs. Loddiges, who have the most numerous collection of this genus, formerly used loam, with a little sand and peat for most of the sorts; and they are grown in a similar soil in the Hammersmith nursery. Of late, Messrs. Lodiges find light loam alone to answer as well or better. In the Count de Vandes' garden, at Bayswater, rotten dung is mixed with loam and peat, and the surface of the pots are top-dressed with fresh cow-dung, free from litter. The plants appear to us to grow most luxuriantly in a strong rich loam; but to be most prolific in flower-buds in loam and peat.

Camellias have the best effect, and are grown to most advantage in a house entirely devoted to them. Such a house should be rather lofty, as the plants never look so well as when six or eight feet high, trained in a conic form, and clothed with branches from the root upwards. The plants should be raised near to the glass by means of a stage, which should be so contrived that, as they advance in height, it may be lowered in proportion. Only the very best crown or patent glass should be used; because it is found, from experience, that the least inequality of surface, or thickness of material so operates on the sun's rays, as to concentrate them, and burn or produce blotches on the leaves of the plants. Every cultivator must have observed, that leathery shining leaves like those of the orange, myrtle, &c. are more or less obnoxious to this solar injury; but the leaves of the camellia are particularly so. Some nurserymen recommend a roof which will not admit much light; others, the use of green glass; of an opaque roof, with glass in front only; or, of a house, facing the north. Our opinion is, that a light house, facing the south, or, better still, glass on all sides, is essential to the perfect growth of the plants; and that all solar accidents may be avoided, or at least rendered of no consequence, by using the best glass, and placing the plants as near it as possible.

To grow the camellia to a high degree of perfection, considerable care is requisite. The roots are very apt to get matted in the pot, and by the space they occupy, so to compress the ball of mould as after a time to render it impervious to water. Hence frequent attention should be had, to see that the water poured on the pots, moistens all the earth, and does not escape by the sides of the pot, moistening only the web of fibres. The same cause renders examining the roots, and shifting or reducing and replanting them, a necessary measure, at least once a-year. When the plants are in flower, and in a growing state, they require to be liberally watered, and also a degree of heat somewhat more than is usually given to green-house plants. If this heat is not given in November and December, the plants will not expand their blossoms freely; and if both water and heat are not regularly applied after the blossoming season, vigorous shoots will not be produced. To form handsome plants, they should be trained with single stems to rods, and pruned so as to make them throw out side branches from every part of the stem: to encourage these, the plants should not be set close together on the stage. In summer they may either be set out of doors on a stratum of scoriæ, or on a pavement, in a sheltered but open situation; or the glass roof may be taken off. The hardier sorts, as the double reds, blush pæony, flowered, &c. answer very well when planted in the bed or border of a conservatory, provided the roof or entire superstructure can be removed in summer to admit the full influence of the weather. Where this cannot be done, the camellia, and most other plants, are better in portable utensils, which admit both of examining their roots, and placing them in the open air, or in a greater degree of heat at pleasure. The single and double red camellia will endure the open air, when trained against a south wall, and protected by mats in winter; and there can be no doubt that in time these and other species will be more perfectly inured to our climate.

Subsect. 4. *Various Genera which may be considered as select Green-House Plants, showy, fragrant, and of easy Culture.*

1718. The first of these we shall mention is the citrus tribe, already treated of as fruit-trees (1501.); the beauty and fragrance of which need no encomium. They merit a house by themselves, though they will thrive perfectly in the same climate as camellia, The myrtle comes next in order; nerium is a well-known genus, whose flowers are of great beauty and long duration; fuchsia is universally admired; jasminum, gardenia. and daphne, have flowers of great fragrance; heliotropium is remarkable as smelling like new hay; various species and varieties of rosa indica, and semperflorens, are both beautiful and odoriferous, and flower throughout the winter. Among the new genera from the Cape and Botany Bay, acacia, mimosa, eucalyptus, melaleuca, metrosideros, and the proteaceæ, are admired for being prolific in showy flowers, which, for the most part, appear early in spring, and being chiefly evergreens and large growing hardy plants. Diosma, gnidia, and struthiola, are admired for their minute foliage and elegant flowers: those of xeranthemum are prized for their durability.

Bignonia, cobœa, dolichos, jasminum, lonicera, and passiflora, are admired climbers; mesembryanthemum, cactus, and yucca, are curious and beautiful succulents; amaryllis, cyclamen, iris, ixia, and gladiola, lachenalia, babiana, ferraria, and oxalis, are beautiful bulbous-rooted plants; and calla, celsia, cineraria, lobelia, tropæolum, and jacobæa, select herbaceous sorts.

The principal species of these genera will be found arranged in the following sections, with their colors, and other particulars, added to each. They are of easy culture, and, with the genera of the preceding subsections, may be considered as affording the best choice for a small, showy, odoriferous, evergreen, and ever-flowering collection.

Sect. II. *Woody Green-House Plants.*

1719. WOODY GREEN-HOUSE PLANTS. — JAN. FEB. MARCH.

RED.	PURPLE.	YELLOW.	WHITE.	VARIEGATED.
Salvia dentata, *p.* Azalea indica Daphne odora, flo. purp. Camelia various sorts Erica, various sorts	Erica, various sorts	Hyperium creticum, *p.* Pogonia glabra Cluytia alaternoides, *p.* Erica various sorts	Banksia paludosa, *p*, Phylica ericoides — erubescens Banksia marcessens, *p.* Dapne odora — — fol. var. fl. Erica various sorts Protea mellifera, fol. — pendula Camella various sorts Isopogon anethyfolius	Protea amplexicaulis Camella various sorts Erica various sorts

APRIL.

RED.	PURPLE.	YELLOW.	WHITE.	VARIEGATED.
Epacris pungens rosea, *p.* Myrsine africana, *p.*	Boronia pinnata Cineraria ameloides	Hermannia grossularif. *p.* Hypericum balearicum — monogynum Acacia pubescens, *p.* — suaveolens Parietaria arborea, *p.*	Banksia littoralis Dryandra tenuifolia Epacris attenuata — — rubra — pungens alba Myrtus commun. 12 var. Phylica pubescens, *p.* Isopogon formosus Protea longiflora Struthiola erecta, *p.*	

MAY.

RED.	PURPLE.	YELLOW.	WHITE.	ORANGE.
Aotus villosa, *p.* — cordifolia Bauera humilis, *p.* — rubioides Chorizema rhombea Daviesia ulecina, *p.* — — major Fuchsia lycioides Magnolia annonifolia, *p.* — fuscata Mahernia pinnata Melaleuca tomentosa Pæonia moutan — papaveracea Polygala mixta rubra, *p.* Struthiol. ciliat. flo. rub. *p.* Camella various sorts	Cheiranthus mutabilis, *p.* Daphne olefolia, *p.* Diosma purpurea, *p.* Indigofera australis, *p.* Lavatera maritima, *p.* Lotus jacobæus Pæonia moutan, flo. pu. *p.* Polygala cordifolia, *p.* — heisteria — stipulacea Salvia africana	Edwardsia grandiflora — — minor — microphylla Genista linifolia — canariense Gnidia simplex, *p.* — pinifolia — ciliata — radiata — sericea — capitata — flava — gaandis Pultenæa flexilis, *t. p.* — obcordata, *t.* — retusa, *t.*	Arbutus cassinifolia, *p.* Buchnera viscosa, *p.* Cistus vaginatus Correa alba, *p.* Diosma capitata, *p.* — ciliata — ericoides — ovata — pulchella — uniflora — umbellata Empetrum album Hakea pugioniformis, *p.* Malva capensis, *p.* Melaleuca viridiflora Pittosporum undulat. *p.* Pomaderris elliptica Protea lanceolata Struthiola ciliata — imbricata — ovata	Pultenæa flexilis, *p.* — linophylla — obcordata — retusa

JUNE.

RED.	PURPLE AND BLUE.	YELLOW.	WHITE.	ORANGE.
Brachysema latifolium, p. Calothamnus quadrifida — villosa Cheiranthus tristis Correa speciosa Crotolaria elegans, d. p. Epacris grandiflora, p. Illicium floridanum — parviflorum Melaleuca styphelioides, p. — thymifolia Metrosideros angustifolia — floribunda — lanceolata Oxylobium cordifolium, p. Pimelia linifolia, flo. roseo Virgilia capensis	Convolvulus cneorum, p. Indigofera angustifolia p. — purpureum Lasiopetalum roseum, p. Podalyria calyptrata, p. Polygala bracteata — cordifolia — oppositifolia Swainsonia galegifolia — betonicum Teucrium fruticans	Brunia ericoides, p. Cliffortia ericæfolia Correa viridiflora, p. Gnaphalium arborescens — congestum — grandiflorum Gnidia imberbis Loddigesia oxalidifolia, p. Acacia ensifolia — juniperina — pinifolia — lophantha, p. Pittosporum revolutum — tobira Acacia alata	Andersonia sprengelioides, p Buchnera pedunculata Citrus aurantium — buxifolius — decumana — limon — limonella — medica. — nobilis Diosma fragrans, p. — oppositifolia Empleurum serrulatum — latifolium Gnidia oppositifolia Acacia lophantha, p. Pimelia linifolia Protea candidans Zieria smithii.	Bossiæa cinerea, p. — heterophylla — scolopendrium Daviesia latifolia — saligna — ericifolia Dillwynia glaberrima — hirta — floribunda Goodia lotifolia — pubescens Pultenæa daphnoides, p. Sphærolobium vimineum —

JULY.

RED.	PURPLE.	YELLOW.	WHITE.	ORANGE.
Beaufortia decussata, p. — glauca Bouvardia triphylla, p. Calothamnus gracilis Colutea frutescens Epacris pulchella, p. — — minor Fuchsia coccinea Hermannia flammea, p. Lambertia formosa Marrub. pseudo dictam. p. Melaleuca densa — fulgens — pulchella	Grevillea linearis Lachnea purpurea, p. Lavandula pinnata Psoralea aculeata Salvia africana, p. Scabiosa africana, t. Swainsonia coron. fol. p. — galegifolia	Cassia corymbosa, p. Cytissus tomentosus, p. Gardenia Thunbergia Gnidia flava, p. — grandis — sericea Hypericum coris, p. Jasminum odoratissimum Leptospermum arborescens, p. Magnolia pumila Acacia acicularis Salvia aurea	Aster argophyllus, p. Banksia præmorsa Cassine maurocenia Cistus algarvensis, p. — canariensis Clethra arborea Dais cotonifolia Diosma imbricata — orbicularis — speciosa Dryandra floribunda Heliotropium grandiflorum Leptospermum ambiguum Protea latifolia — mucronifolia	Bæckia virgata, p. Bosea yervamora Bossiæa microphylla Buddlea salvifolia Platylobium formosum, p. — minor

AUGUST.

RED.	PURPLE.	YELLOW.	WHITE.	ORANGE.
Hermannia cuneifolia, p. — odorata Melaleuca decussata — globifera — hypericifolia — linarifolia Nerium oleander — flo pleno — splendens Erica various sorts	Blæria purpurea, p. Diosma tetragona, p. Lavandula dentata Podalyria sericea, p. Polygala filiformis — speciosa Trachelium cæruleum Erica variou sorts	Brunia candidans, p. — elegans Hypericum canariense — crispum — olympicum — reflexum — lanceolatum Jasminum odoratissimum Acacia discolor Plectranthus fruticosus Erica various sorts	Banksia attenuata, p. Beaufortia glauca, p. Celastrus cassinoides, p. Diosma latifolia Donnia glutinosa, p. Hakea cineria Leptospermum obliquum — flo. albo, p. Nerium oleander — — flo. plen. Protea umbellata Selago corymbosa, p. Struthiola virgata, p. Stylidium fruticosum, p. Erica various sorts	Eutaxia myrtifolia, p. Platylobium triangulare Tristania conferta, p. — nerifolia Erica various sorts

SEPTEMBER.

RED.	PURPLE.	YELLOW.	WHITE.	ORANGE.
Phlomis leonorus Ericæ et Geraniæ	Ericæ et Geraniæ	Gordonia lasianthus, p. Ericæ et Geraniæ	Phylica ericoides, p. Protea tomentosa Ericæ et Geraniæ	Ericæ et Geraniæ

OCTOBER, NOVEMBER, DECEMBER.

RED.	PURPLE.	YELLOW.	WHITE.	ORANGE.
Phlomis nepetifolia, p. Lantana africana Ericæ et Geraniæ	Statice mucronata Ericæ et Geraniæ	Linum trigynum, p. Ericæ et Geraniæ	Arbutus longifolia, p. Protea hypophylla, p. Gomphocarpus arborescens, p. Westringia rosmariniformis Ericæ et Geraniæ	Ericæ et Geraniæ

1719. *Propagation*. The method universally applicable is that by cuttings; but a few sorts, which are very difficult to strike, are sometimes layered, grafted, or inarched.

Many green-house plants bring their seeds to perfection in this country; at whatever time these ripen, unless before Midsummer, it is best to keep them till the following February. Sown at that season, they soon vegetate, and make strong plants before winter. The pots should be well drained, filled with mould suitable to the species to be sown, and the surface covered with mould of the finest quality, as a bed for the seeds. Several kinds may be sown in a pot, where the quantity of seed is not great, or its quality doubtful; cover with the same fine mould, according to the size of the seeds, and then give a gentle watering with the finest-rosed watering-pot. They may now be set in the most dry, airy part of the propagation-house, where they can be regularly attended, as to watering and weeding. "Watering," Cushing observes, "they will require at least once a-day, in a greater or less degree; for if they are not kept properly moist, the seeds will not by any means vegetate freely, if at all; however, the other extreme is to be studiously avoided. The weeds should be regularly pulled out before they attain any size; else, besides their tops smothering the young seedlings, which may have started, the roots, in getting them out afterwards, not only disturb them, but also the remaining seeds that may be perhaps on the point of bursting their embryo. As the spring advances, it will be necessary to lay a few sheets of strong paper over the pots, for two or three hours in the middle of the day, if the weather happens to be clear, and the sun acts forcibly on them; particularly those in which the finer seeds are sown, in order to prevent the surface getting over dry and powder-like; or otherwise if the mould happens to be pretty moist, it is liable to form a mossy crust, which might be particularly injurious, by preventing the young seedling ushering itself into the light, from penetrating through it with that ease which is requisite.

"In this manner must they be managed until the beginning or middle of June, at which season the larger kinds of seed may be removed to some shady border, where the pots can be plunged nearly up to the rim in coal ashes, or sand; which will greatly assist to keep them in a proper moist state: here, all the care they will require is to be kept clear from weeds, and regularly watered, morning and evening, if requisite; but never when the sun shines strong upon them, lest the tender leaves of the young plants should get scorched; it will be also necessary to have a careful eye daily for slugs, worms, &c. Should there be any fine, light-covered seeds, such as heaths, &c. they must be set in such a manner, that they may be covered with a common hot-bed frame, in a moderately exposed situation, so that in case of sudden or heavy showers, which might otherwise wash the seeds out of the pots, they may be occasionally covered to preserve them from such violence; yet they may be exposed to gentle rains at times, but never long together, lest they become over wet, which would soon perish them in this tender state. They will likewise require to be shaded with a mat in clear weather, or even a double mat, in the very hottest season.

"Early in July, many of them will be growing pretty fast, and will require to be potted off into separate pots; as it is much preferable to do this while they are young and small, before their roots become matted together, than it is afterwards; besides, that they have a considerable portion of the growing season before them to establish themselves, before the winter stops their career.

"In performing this work, care should be taken to match the pot to the size of the plant, and nature of the species to be potted; as overpotting these small seedlings might be of the worst consequence. The largest sized pots for this use, unless the plants are particularly strong, are what are called N° 60s: but for heaths, and such like very small articles, a still less size, known by the name of thimble pots, are to be preferred.

"Being provided with a quantity of these, and the different sorts of mould properly prepared, that may be requisite for the kinds to be done, proceed to part the plants; in doing which, let the nicest care be taken to preserve as much roots and earth to each plant as can possibly be done without injuring the others; let them be neatly potted in the proper mould, which must be gently pressed to the roots, that they may the sooner incorporate themselves with it. In this manner, pot as many as may be thought sufficient for the present purpose, at the same time allowing a few for mischances. They must then be well-watered, in the manner already directed for seedlings, and set in a cool frame, on coal-ashes well-rolled, or any other hard substance that will prevent the worms getting so freely into them, as they otherwise would. The lights must be kept constantly on, and closed, for a few days, more or less, as circumstances may require; and it will be also necessary to shade them very secure from the strong rays of the sun at first; however, in a little time, the lights may be taken off at night, if fine, having them on, and shading in the day, until by degrees the plants are so hardened as to be able to withstand the full power of the sun; thus, in the space of a fortnight or so, they will be fit to be set along with the other plants.

"This business should not be undertaken later than the middle of August; for if executed at a more advanced season, the plants will not have time to establish themselves; therefore, any that may remain in the pots, not strong enough to be parted by that period, should be removed into the propagation-house early in September, and there placed in their proper situation in that department until the spring following. Indeed, there are some seeds which absolutely require to be kept for that term before they will vegetate; whereby it becomes necessary to examine with care whatever pots have not by that time shown any signs of vegetation, and those which are found alive must be saved, and treated in the same manner as fresh-sown seeds.

"The pots set in the house will require nearly the same treatment as usual, viz. to be kept perfectly clear from weeds, and regularly watered. Water should now be given in the morning only, as any damps it may occasion will have time sufficient to evaporate in the course of the ensuing day; whereas, if given in the evening, it causes a chillness about their tender leaves, and from the necessary closeness of the house at night, not having free exhalation, it may do a material injury; not only to the seedlings themselves, but likewise to the adjacent plants, by tending to increase the general damp of the house.

"When first housed, if the weather prove clear, they must be shaded for two or three hours at mid-day; but this practice must not be followed too closely, as the influence of the sun is but seldom too powerful for them at this season, and during the winter months, the more sun they receive the better: it is also necessary to be particular in observing that no slugs, snails, or any other insect, harbor about them. Those seeds received from New South Wales, in general, as well as many others of the South Sea Islands, and also several of the larger sorts from the interior parts of the Cape of Good Hope, from the warmer countries of temperate America, and in short, any of the climes in, or approaching the same latitudes, although the plants when grown will florish and come to perfection in the green-house, yet the seeds will require the aid of a hot-bed when first sown, to set them in vegetation, and until they are parted and established in their separate pots, then to be hardened by degrees to the open air; from which time, they may be treated as directed for the more hardy and common sorts of seedlings." *Exotic Gard.* 84.

1720. *By Cuttings.* This mode of propagation may be commenced about the middle or end of January. As young shoots in a growing state generally strike most freely where these are wanting on particular specimens, the plants may be forced for a few weeks in the stove, or in any of the pits in the reserve flower-garden, to produce them. All the soft-wooded, tender, pithy kinds, such as indigofera, crotolaria, polygala, houstonia, chironia, &c. as well as some of the more curious geraniæ, may require this treatment. By the end of February, the heat will have produced shoots of from two to four inches in length, "and from that to any time in March, proceed to cut and dress them neatly with a sharp penknife, taking off all the leaves as close to the stem as possible without wounding it, except a few at the top, to be left for the free respiration of the cutting: this observation should be particularly attended to in making cuttings of evergreens in general, whether hardy or tender: let them be cut off at bottom with a clean horizontal cut, at a joint or bud, and immediately inserted in their proper pot. To have these properly prepared is a very necessary part of the business; being well drained, they should be rather more than half filled with the mould, or compost best suited to the nature of the plant, and afterwards filled with good loam or sand, whichsoever may be thought more advisable to insert the cutting in: if sand is used, it should be previously well watered, otherwise it cannot be sufficiently tightened to the base of the cutting; a most essential point to be observed: however, it should have time to be well drained off from the pot before the cuttings are put in; as they, being so tender, are extremely liable to damp at this season; than which nothing is more injurious. The loam will, in general, be found sufficiently moist of itself; and should it be of a fine sandy nature, so much the better; but if not, a third or fourth part of fine sand should be added, and well mixed previous to its being used.

"Being properly planted, let them be covered immediately with the proper glass, well fitted, and pressed moderately on the mould, so as perfectly to exclude the air. They should then be plunged in the front of the bark-pit of the propagation-house; or otherwise in a hot-bed frame made up for that purpose. The inside of the glasses should be regularly wiped with a dry cloth every morning; and any of them that happen to damp, carefully taken away before they contaminate the rest. If the sun happens to be unclouded, they must be shaded for a few days moderately with strong paper, or some such article; but by no means is it to be left on too late in the afternoon, as the cuttings being so soft and tender, are extremely susceptible of injury by over-shading.

"In the space of ten days or a fortnight, some of the free-rooting kinds will be making efforts of growth; as soon as this is noticed, it will be necessary to give them a little air, by taking the glasses off every evening, when the sun is quite receded from them, and putting them on again early the following morning; until they are by that means hardened, so as to be able to bear the full power of the sun without the glass, when it is to be entirely discontinued. If any of them should droop their heads when this operation is first performed, it is proper to refrain from moving the glasses until they have gained more strength. The shading is also to be decreased by degrees, but not so much as to be entirely done away while there remains any of them under glasses. In this manner is the business to be followed at different intervals, according as the cuttings are ready during the month of March and April."

"May and June is the most proper time for propagating most or all of the woody, shrub-like plants; such as myrtles, oranges, metrosideros, banksias, &c. and more particularly heaths, as the young wood will by that time be in general pretty far advanced.

"If this business is begun in June, which is early enough, they must, on account of the increased heat of the season, be plunged in some cool, shady situation, where they can be conveniently shaded when requisite: an exhausted hot-bed, with a frame and good lights on it, will answer very well; or otherwise, the north side of any low wall or hedge, where they will be a little sheltered from the noon-day sun, and have the benefit of it morning and evening; in either place, the pots must be plunged up to the rim in old tan or saw-dust; and in the latter, they will also require to be covered with large cap-glasses over the small ones, as well mixed cuttings as heaths, except a few of the herbaceous sorts, such as arctotis, calendula, &c. and strong, substantial, broad-leaved kinds, as camellia, laurus, &c. which will succeed better without the small glasses at this season, so that they are covered with sound air-tight caps.

"There are many others, indeed all late-growing deciduous, as well as evergreen sorts, as pomegranates, oleas, myrtles, &c.; which, in general, only form their callosities previous to the ensuing spring, that do better without the small glasses, as their leaves drop off much sooner when too closely covered, than they do when differently managed; and it is well certified, that the longer the leaves are retained in an active state, the greater the probability of success: this is to be merely understood as relating to late cuttings; for the same articles, if put in early in spring, *very young*, in a moderate heat, closely covered, properly shaded and dried, will strike astonishingly quick. Cuttings of all the kinds that remain to be propagated should also be made at this season, and managed in the same manner.

"The whole being thus arranged, they must be carefully shaded whenever the sun acts violently on them, especially when first put in; but they ought not to be shaded longer than four or five o'clock in the afternoon, according to circumstances, as the mild influence of the sun at that hour will be necessary to dry up any damps that may have arisen within the caps. It will be also requisite to dry the small bell-glasses every morning, as directed for the spring-cuttings, and to water occasionally any of the pots which may require it; for though it is proper to keep the top of the cutting dry, yet the mould in the pot must be kept as near a medium as possible between wet and dry, otherwise they will not freely vegetate.

"Some of the first put-in spring-cuttings will, in May or June, require to be parted and potted separately in small pots; in performing which, be careful to avoid breaking the roots, using them much in the same manner as already directed for seedlings. When potted and watered, they must be set in the propagation-house for a few days, and shaded until they have established themselves in the fresh mould: as soon as they have taken to grow freely, let them be removed to a frame; but observe not to expose them to the open air entirely at first, as it might do them a material injury, on account of which, the lights over them should be kept closer than usual for a few days.

"About the middle of June, any of the tenderer green-house cuttings that have been left in the propagation-house since spring, should be plunged under the cap-glasses along with the others: where the whole must be carefully attended to every morning, to pick off damps, dry the glasses, and water when wanted; it is advisable, when fresh watered, to let the glasses stand off for about a quarter or half an hour, to dry the surface a little, except the sun happens to be very clear, and shining direct on them. It has been already remarked, that there are many kinds which do better without the small glasses; such as the strong-growing, spongy, and succulent kinds; also those with thick, leathery leaves, as the camellia, and some species of ilex, &c. which are very liable to have their leaves scorched, by the glasses collecting the rays of the sun.

"Any time during the months of June or July, cuttings of these sorts may be made with success; as by that time the young shoots will be sufficiently firm for that purpose, and will strike freely in good loam: but camellias, and such like sorts, should not be cut until the shoots have finished their growth, and the leaves attained their full size, as they are, when taken too young, particularly subject to rottenness and damp.

"In July and August, there will be many of the earlier cuttings growing, they should have their glasses taken off, as before directed; and afterwards be set for a few days in a more exposed situation, to harden them by degrees, in which they must be shaded from the midday sun, but freely exposed to the air at night.

"Parting and potting should also be occasionally performed on such as are ready for that operation; when, if any of them happen to be more backward than others, in the same pot, and not rooted, let them be put in again as cuttings, and treated as such; those potted should be set in a cool frame, as directed for seedlings, where they must be kept close and shaded, except in mild weather, until they are by degrees inured to the free air.

" At the season in which it is judged advisable to house the general collection of green-house plants, it will be also requisite to have the cuttings removed to the propagation-house, to be cleaned, sorted, and regulated, according to their different kinds and stages of growth. The commoner sorts will do to be set in any part of the house where they will have free air and light, and that they can be got at conveniently to water, and pick them when necessary; the more curious kinds should be set in a dry, airy part, where they can be carefully attended, to prevent their getting over dry or dirty, and also to take the glasses occasionally off those that may be growing. All the backward heaths, proteas, or any other hard-wooded kinds, such as are most of the Botany Bay plants, &c. that take a long time to strike, should be set in one of the coolest and driest situations of the hot-house, where they must be watered and cleaned, like the others, throughout the winter. Towards the commencement of the new year, many of them will begin to grow, therefore the glasses must be taken off such as soon as necessary. With the advancing season, these will likewise advance, and soon require to be parted, and potted separately." *Exotic Gard.* 101.

Almost all the woody green-house plants may be propagated by cuttings; but a few are occasionally layered, innarched, or grafted, as the camellia, citrus, daphne, &c. which have been already treated of.

1721. *General Culture of Woody Green-House Plants.* We shall commence with the shifting season, which generally takes place about the end of May, and trace, from Cushing, an outline for their general culture and management throughout the year. " Green-house plants," this author observes, " for the most part require a considerable share of pot-room, as many of them are very free-growers; but still great caution is necessary to avoid over-potting the tenderer, weak-growing kinds. When shifted, let them be neatly tied up, if requisite, and well-watered. Any dead, or ill-grown parts can now be, with propriety, cut away, so as to give the heads a regular, neat appearance. In bright sunshine it may be also necessary to shade them for a few days from the influence of the sun and winds, until they are perfectly established in the fresh mould.

" By the middle of June, it will be time to think of preparing the out-door departments, in which it is intended the plants should stand during the summer months. The most eligible situations for this purpose are, the north aspect of vacant walls or hedges, where they will be a little shaded from the noonday sun, or between rows of close hedges, particularly planted, and solely appropriated to this purpose. By no means set them close under the shade or branches of large trees; as the plants are thereby inevitably drawn into a weak state in a few weeks, and those who adopt such situations are not unfrequently under the disagreeable necessity of throwing away many of, perhaps, their most rare plants, every autumn; and even those that remain will have a bad unsightly appearance. Indeed, shelter from the winds is the great desideratum to prevent their being upset, for most green-house plants are fond of the warmth of the sun, except when recently potted, provided their roots are kept moderately moist.

" The practice of some gardeners is to plunge them amongst the shrubs and flowers of the pleasure-ground; this answers pretty well with the strong-growing kinds, such as myrtles, geraniums, coronillas, &c. old plants or supernumeraries that will not be wanted to house in the autumn; and even has a very pretty effect when judiciously done; but it will by no means do for the tenderer species. Therefore, upon the whole, the most unexceptionable situations are such as at the same time afford a moderate portion of shade, and are so situated as to break the force of those strong gales which frequently blow in the summer and early autumn months, and yet allow that free circulation of air so necessary to the well-being of plants in general, and at all seasons. Having fixed on the place they are to stand, it must be thoroughly cleansed from weeds, and the hedges, if any, neatly clipped. It should then be well rolled, to make it perfectly firm and level, over it a layer of good lime, slacked and made into the consistency of thick white-wash, should be poured, and left to soak into the surface, as a preventative against worms getting into the pots. When this is dry, let about an inch of finely-sifted coal-ashes be regularly laid on, and firmly rolled a second time.

" Being thus prepared, the plants may be brought out and set regularly and level on the surface, in whatever form or arrangement may best suit the situation or the taste of the cultivator." (See 1621).

1722. *Housing in Autumn.* " As the young tender shoots of the summer's growth are extremely liable to be injured by the frost, as soon as any symptoms of this appear, they should be removed to their winter quarters, where, if the green-house is built on a proper principle, they can still have the benefit of the free air, and at the same time be in a situation to be protected when necessity requires. They should, at all events, be removed in the earlier part of September. Therefore, about a fortnight before that time, they should be regularly examined, and any roots that may have extended themselves through the holes at the bottom of the pots, cleanly cut away: this tends to stop the too luxuriant growth, and being executed at a proper period, before their final removal, they have time to recover themselves from the partial check they may have received by it; which would come doubly severe, if deferred until the time of removing them into the house; the transition from the cool bottom on which they stood, to the dry boards of the green-house stage, being so materially different. Whatever may be the mode of arrangement adopted (1621.), the plants must not be set too close when first put in, as it would occasion most of their tender leaves to turn yellow and fall off; neither should they, if the house happens to have been built on a close construction, be by any means taken in when their leaves are wet.

" When they are all housed, and dirt of every description taken away, let as much free air be given as possible in the day-time; and even at night, should the weather prove moderately mild, and free from any appearance of frost. Frosts, at this early season, are seldom so severe as to injure any green-house plants that were not immediately exposed to its perpendicular effect; therefore the front windows may be kept open continually, unless there is a prospect of its being particularly severe, or accompanied with cold, driving winds, in which case it will be necessary to have them pretty close. If air is too sparingly admitted at this season, when many of the plants have not yet finished their summer's growth, it will inevitably cause them to produce weak and tender shoots, which will be extremely liable to damp off at a more advanced season, when the house must be unavoidably kept close on account of the severities of the external air; and besides, it will tend to give them a more general tender habit, and render them less able to resist the winter colds than they otherwise would. Hence it is evident, that they cannot receive too much air, whenever the state of the external air will admit of it, by being free from all appearance of frost, as it will be so much to their advantage to be thus hardened before the winter assumes its greatest severity.

" Water should also be plentifully administered when they are first taken into the house, as the dry boards on which they now stand, as well as the elevated situation and free circulating air, occasions them to require more than when they stood on the moist earth; however, by no means go to the extreme, giving it only when evidently necessary.

" As the close foggy weather advances, water must be given more sparingly, else it will conspire with the atmosphere to increase the damps of the house, which will inevitably injure the plants, by rotting their leaves. These, and dead flowers, should be picked off as soon as they are observable, otherwise they will make a very disagreeable appearance.

" The months of November and December seem to be more noxious to the health of plants than any other season, by reason of their being full of young sappy leaves, and the remains of many of the autumn flowers still on them, when the weather, (which at this time generally becomes close and chilly,) renders it necessary to keep the house shut and warm; this occasions a most pernicious damp to exhale from every part of the house, and even from the earth in the pots, which fixes on the leaves, and other parts of the plants, to their inevitable injury, particularly the younger parts, such as were the produce of the preceding summer. If this kind of weather continues for any considerable time, it will be advisable to give a little fire-heat, to help in drying up these baneful exhalations, and also as much air as can be safely admitted by the doors and front windows, more especially when fire is added, otherwise the heat of the flues will, instead of expelling the contaminated air, rather occasion it to exhale more freely, and be of worse consequences. At this season also, the plants should be regularly examined to clear them of all dirt, and also to scrape off any moss, &c. that may have grown on the surface of the mould, and to renew it with a little fresh loam; this contributes much to their good appearance, if neatly executed."

1723. *Fire-heat.* " Very little fire-heat seems to be requisite to the preservation of green-house plants in this climate; in fact, the less it is found necessary to use the better. Except in the case of damps, as before-mentioned, it need not be used till the frost be so severe as to lower the thermometer several degrees below 48°, and then merely sufficient to raise it again to that point. If this can be done without the assistance of fire, so much the better; for which purpose, bass mats may be used along the lower parts of the house, where they can be conveniently fastened: these will be of infinite service; even when fire is used, as less of that element will suffice; but they should be always taken off in the day to admit the light, unless the weather happens to be particularly severe. It may be also proper to remark, that the more dry the mould in the pots is kept at this season the better, as it will be less liable to attract the frost; therefore, water must be used very sparingly, and only to such as are in actual want of it.

" Sometimes, in the depth of winter, there is a succession of very clear weather for several days together, wherein warm sunny days succeed the coldest frost, and nights in which fires have been absolutely necessary; in this case, it will be requisite to give all the air possible in the day, (unless strong harsh winds, or other occasional preventatives, happen to prevail,) observing to shut the windows up close early in the afternoon, so as to include part of the natural heat of the atmosphere within the house. Such weather renders an increase of water necessary, especially over the entrance of the flues, where the fires have the greatest force. It should be administered in the morning, and ought to be kept in the house all night, to expel any frosty particles it may have imbibed, and render it nearly equal to the temperature of the air of the house. But unless water becomes actually necessary by the action of the fire, or the extreme drought of the season, (a circumstance not much to be dreaded in our climate at this time of the year), the less water used the better; for though the plants in general like to be kept pretty moist in the summer, there is hardly any thing more pernicious to them now than an extreme of moisture."

1724. *Winter and Spring Treatment, Insects, &c.* " During the months of January and February, and, indeed, all through the winter and early spring, on account of the necessary closeness of these departments, it may be expected to see a few dead or yellow leaves on the plants; these, together with the dead flowers, and whatever damps may occasionally appear, should be picked off as soon as discovered.

" The mildew and green-fly will also be paying frequent visits at this season; particularly on the young shoots of heaths, and such like tender-leaved plants. The best remedy for the first of these is, to procure about equal proportions of sulphur and roach-lime, slacked and finely sifted, the quantity according to the number of plants infected, to be used in the following manner:

" As soon as the least symptom of this disease is perceived, (for the sooner it is stopped the better,) which makes its appearance like a whitish down around the tops of the tender shoots, or a species of fungus on the back, or under part of the leaves, provide a vessel full of clear water, large enough to emerge the plant in, exclusive of the pot, which must be held in an inverted position, with the hand placed so as to prevent the mould falling out; in this manner, plunge the plant into the water, and while it is wet, holding it in the same position, let another apply the above preparation with a powder-puff, or some such machine, in such a manner, that every part of the plant may be perfectly covered: one dressing in this way will, in general, be found sufficient. The plants should afterwards be taken to the reserve-department, or placed in some dry, airy part of the house, not conspicuous, until it recovers its verdure.

" As to the fly, fumigation with tobacco will be found adequate to its destruction; strictly observing to perform it at the proper season, that is, when the air is perfectly calm, and if close, foggy weather, so much the better; every aperture should also be stopped, so as to exclude the external air as much as possible.

" Towards the end of winter, the plants should be regularly examined, and cleaned from any filth they may have acquired during that dreary season; such as moss on the surface of the pots, and leaves that have dropped thereon; also any plants that may have grown into a loose habit, should be tied up. The platforms or stages should be clean brushed, whilst the plants are removed, and any worms that may have harbored in the pots dislodged, by turning them upside down, and lifting them carefully off without breaking the ball of roots, at the bottom or sides of which they are generally to be found. It is easily known when they are in the pots, by their casts on the surface. Indeed, this is a thing that should be attended to at every season of the year, as they are to be observed more or less at all times, and considerably disorganize the œconomy of the pot, when suffered to persevere.

" As the spring advances, it will be found necessary and convenient to admit a more free circulation of fresh air, and on account of the increasing draught and heat of the season, water must be given more plentifully; but the houses must not yet be left open at night, particularly the top-lights, as the weather is in general so very changeable at this season, that it frequently happens, although the evening may appear mild and serene, the morning ushers in with a severe frost, which, if admitted to the plants, would materially injure them; and perhaps at once render all the winter's care and attention abortive. Until about the middle or end of May, the weather seldom becomes in any degree settled; but at that season we may venture to expose the plants both day and night to all the vicissitudes of the weather, should it continue in any degree moderate.

" Being thus treated, they will require a considerable increase of water, which may now be copiously given to them, particularly the more free-growing kinds; but let the following be observed as a general maxim not to be departed from; that it is necessary to the health of plants, especially the tenderer species, to be permitted to become moderately dry before they are again watered; because, when kept in a continual wet state, the mould becomes entirely destitute of that active quality so indispensably necessary to vegetation; and the plant, in consequence, will assume a very unhealthy appearance, which many might perhaps not attribute to the proper cause." *Exotic Gard.* 130.

1725. *Treatment of Green-House Plants in a Conservatory.* This should resemble the treatment of plants in pots, as far as the difference of circumstances will permit. The plants in the conservatory cannot be set out in the open garden; but the roof can be removed to produce the same effect, and should be done about the same time. Instead of shifting, the soil can be refreshed by manure, and top-dressings, or it may be entirely renewed; and pruning, training, and attention to cleanliness and neatness are alike applicable to both modes of culture.

When the green-house plants are housed, the lights or roof of the conservatory should be replaced. "The plants in the mean time will require as much air as it is possible to admit on all fine days, and in case rain prevents the letting down of the roof-lights, the front ones, if any, should be as open as possible. This is to prevent the plants being drawn into long naked stems, and weak branches, which, from their free habit of growth, they inevitably otherwise would be. As the cold of winter increases, which it naturally will do in the months of October, November, and December, a proportionate decrease must be observed in giving either air or water; and, if necessary, add a little fire-heat, and mats along those parts of the glass nearest the plants, in such manner as to prevent the frost or piercing winds from injuring them. The conservatory, in these particulars, requires to be managed in the same manner as directed for the green-house.

"As few objects are more desirable than to preserve the gay appearance of the plants, it will be requisite to pay constant attention to the removal of decayed leaves, and weeds of every description; also to tie up or cut short any loose straggling branches that happen to show themselves, and the removing of those pots which may have been plunged or set on the pit when out of flower, and, if convenient, their places supplied with others in a fresher state.

"During November, December, January, and February, the moisture of the atmosphere in such departments, where there is a great body of damp mould, will occasion several species of the bryum, and other mosses, as also of the fungi, to vegetate; particularly as the mould has had time to settle, and the surface to become of a close, firm texture, which would give the house a very unclean appearance. It must be remedied by frequently stirring with a small fork the whole of the pit, to the depth of two or three inches, and raking it over smoothly with a neat, close-toothed rake; which, as well as the fork, should be particularly adapted to this purpose, by being furnished with short handles; so as to enable the operator to use them with freedom under the plants, by which means many branches and flowers will escape being broken off, which cannot be well avoided when awkward tools are allowed to be used for this purpose. As soon as raked, let some fine-sifted, fresh loam be thinly scattered over the surface, and it will tend to give it a more agreeable appearance; besides, being dry, it will serve to imbibe a good quantity of the superabundant moisture.

As the spring advances, they will require considerable attention to keep them in proper order, on account of their great increase of growth, more particularly the climbing plants, trained against the walls or trellis-work; these should be daily attended to, and trained in their proper places; directing their course to those parts of the house which, from their nakedness, appear to want them most: also these species of plants being remarkable free-growers in general, it will frequently be found necessary to thin them, by cutting away any unsightly parts, and those branches most destitute of flowers; by which means there will be sufficient room for the young vigorous growth, and these should be trained in regularly as they advance, otherwise they will attach themselves to the first object they meet, and render it difficult to dress them neatly afterwards.

"Slugs, snails, and other vermin, are very fond of harbouring among the leaves of these plants, when permitted to grow crowded; also under any low bushy plants in the pit, whence they make their nightly excursions, to the great injury of the foliage in general, if not seasonably detected. The drought and warmth increasing with the year, will render it convenient to admit more air, and an increase of water; two very essential points, that should never be neglected.

"In summer, the lights having been removed, as before directed, the plants should have any necessary pruning, and be all regularly fresh tied up, to secure them against the free action of the wind; they will, if the weather happens to be dry, which is most frequently the case at this season, require an abundant supply of water, particularly the strong, free-growing sorts, on account of being thus exposed to the open air. The cause for thus taking off the top-lights every summer is, that the plants may have the benefit of the warm, invigorating showers of that season, and the action of the perpendicular air, which will be a great means of their acquiring that strong, healthy, robust growth, so much wished for: indeed, where it is not practised, the plants seldom fail of being drawn into the opposite unsightly extreme. In two or three years from the first planting, many of them will be grown to as large a size as the house will admit. The knife must be then freely used among such, to keep them within bounds, and prevent their injuring each other, which they inevitably would, if permitted to grow too close together. However, in performing this, one must be very careful lest they disfigure the general appearance of the plant, cutting away only the rude and overgrown parts, which should be taken clean off, without leaving any of the stumps behind. The younger parts which are suffered to remain should then be tied neatly up, so as to form a handsome middling-sized bush.

"It will also be necessary to observe whether any have outgrown their neighbours in the front rows; these may conveniently be moved into more backward situations, and their places supplied with other new varieties, if to be had. This work may be done with safety any time in spring or autumn, when the weather happens to be a little dull; it will be adviseable, however, to cut off a few of the most luxuriant shoots, and to run a spade or large trowel down, around the roots, so as to form a ball, some days previous to its final transplanting, which also operates as a partial check on the free growth of the plant. It should be taken up with a good ball of roots and earth, and well-watered as soon as replanted: it may also be found requisite to shade such as are thus removed lightly for a few days, if the weather happens to be very clear."

SECT. III. *Climbing Green-House Plants.* — *Those marked* (h) *have Herbaceous Stems.*

1726. CLIMBING GREEN-HOUSE PLANTS.

MAY.	JUNE.	JULY.	AUGUST.	SEPT. OCT.
Aristolochia sempervir. p.	Asclepi ascarnosa, p. Hibbertia crenata, p. — volubilis Kennedia coccinea Psoralea palæstina	Aristolochia glauca, p. Bignonia grandiflora Capparis spinosa Cobœa scandens, h. Dolichos lignosus, p. Kennedia monophylla Convolvulus canariense, h.	Jasminum gracile, t. — grandiflorum — revolutum Kennedia bimaculata, p.	Lonicera japonica, p. Jasminum azoricum

The *Propagation and Culture* of this tribe is the same as for woody plants. The situation proper for planting climbers and creepers has already been considered. (1620). To cultivate them to perfection, a house should be entirely devoted to them, in which they should be planted in prepared soil, and trained on poles, like hops, or on arcades, or on single rods running from the front or sides of the house to the back or centre; but sufficiently distant from the glass to show the beauty of the flowers and foliage to the spectator.

SECT. IV. *Succulent Green-House Plants.*

1727. SUCCULENT GREEN-HOUSE PLANTS.

MAY.	JUNE.	JULY.	AUGUST.	SEPT. OCT.
Aloe ferox, 3. — glauca — reticulata Anthericum pugioniform. Crassula nudicaulis — obliqua — odoratissima Mesembryanthemum — marginatum — microphyllum Portulacaria afra	Aloe lingua — margaritifera — — media — — minor, 3. — pentagona — perfoliata Anthericum aloides Crassula orbicularis Mesembryanthemum aurantium — capitatum Sempervivum montanum — villosum Tetragonia herbacea	Agave americana Aloe maculata — mitriformis — — minor — rigida — spiralis — triangularis — viscosa — frutescens Cotyledon fascicularis — hemispherica — linguæformis Talinum arachnoides — filamentosum	Aizoon lanceolatum Aloe albicans — cymbiformis, 3. — depressa — dichotoma Cacalia repens, p. Cotyledon oblongata Crassula canescens — ciliata — coccinea Mesembryanthemum bellidiflorum — canaliculatum	Aloe arborescens — picta — major — purpurascens Anthericum revolutum Cacalia articulata, p. — carnosa — ficoides — kleinia Mesembryanthemum compressum — inclaudens — linguæform. cruciatum — depressum — difforme Septas capensis, p. — globiflora

Propagation. With succulents this is remarkably easy, as cuttings and suckers, where they can be procured, seldom fail to put out roots; however, some sorts of aloe, crassula, &c. do not readily produce shoots of any sort by which they may be multiplied. When the leaves are taken off cuttings, or suckers, the latter should be laid in a dry, airy place, till the wounds heal; they may then be planted in the proper soil, one in each of the smallest sized pots, and being kept a few weeks in a dry heat, and shaded from bright sunshine, they will seldom fail to grow. In raising succulents from seeds, proceed as directed for the seeds of woody plants; but observe to be more sparing of water after the plants come up.

Culture. A sandy loam is the soil universally allowed as the most proper for these plants; not over-finely sifted, in order to let the water pass the more rapidly through it; and for the more succulent and dwarf sorts, as stapelia, cactus, &c. about an eighth part of old lime rubbish may be added. Succulents do not associate well with any other description of plants, neither as to appearance or modes of culture; therefore, wherever they are extensively cultivated, there should be a house or houses on purpose for them. One house would be required for the more hardy sorts included in this section, and another for the dry-stove succulents, given in a succeeding table. They require very little watering, and never over the top during the winter months; in summer, if the pots be well-drained, they will bear more water, especially when in flower. The pots in which they are placed should be smaller in proportion than for other plants, as they grow slowly, evaporate little, and apparently derive great part of their sustenance from the air. They need not be shifted oftener than once in two or three years; but the surface earth should be taken off, and fresh compost added every year. They do not require to be set out in the open garden during summer; but as much air as possible should be admitted to them, and the roof of the house should be open at that season, night and day, excepting during heavy rains. "The greatest injury," Page observes, "which these plants have to be guarded against, is damps in winter; therefore they should be frequently looked over, and all decayed parts removed, particularly from those which are stemless, and when the leaves touch the earth." He adds,

"Few of these plants, either those of the green-house or hot-house, are cultivated in general, but merely to fill up the bye-shelves and odd corners of the exotic houses; but if a proper attention was paid to them, and their cultivation better known from a study of their characters, we have no doubt but they might be rendered as ornamental and interesting as those now considered the most select. Most of the forms and growths of these plants are truly curious; and many of their flowers of the greatest beauty and brilliancy. Since the days of Dillenius and the late James Lee, these plants have had few admirers; but the present Emperor of Germany, the Prince of Salm, the Vice King of Lombardy, and our countrymen, Haworth and Anderson, the latter the able curator of Chelsea Botanic Garden, are endeavouring to bring them again into that notice which they so eminently deserve." *Prodromus*, 220.

Sect. V. *Bulbous Green-House Plants.*

1728. BULBOUS GREEN-HOUSE PLANTS.

MARCH TO MAY.	JUNE.	JULY.	AUGUST.	SEPT. TO OCT.
Antholyza cunonia, *p.*	Amaryllis formosissimo	Amaryllis capensis	Amaryllis crispa	Amaryllis sarniensis corymbosus
Cyclamen hederæfoliu. *p.*	Antholyza brevifolio, *p.*	— Fothergilli	— Johsonii	Lachenalia lanceæfolia
— persicum	— marginata	— — major	— linearis	Ornithogalum altissimum
— — flo. albo.	— meriana	— glauca	Antholyza ringens, *p.*	Oxalis rubella, *p.*
— — flo. adorata	— merianella	— humilis	Gladiolus cardinalis	— tenuifolia, *p.*
Gladiolus abreviatus, *p.*	Spicata	— tabulare	.. polystachius	— tricolor
— carinatus	— pallida	— vittata	Hyacinthus revolutus	— variabilis
— cuspidatus	— tubulosa	Antholyza æthiopica, *p.*	Ixia stellata alba, *p.*	Veltheimia viridifolia
— marginatus	Gladiolus angustus	— iridifolia	— purpurea	
— orchidiflorus	— bicolor	— — fulgens	Ornithogalum niveum	
— praecox, (March)	— blandus	— — fusca	Polyanthes tuberosa	
— watsonius	— byzantinus major	Gladiolus versicolor	— — flo. pleno.	
Iris sisyrinchium	— — flo. albo.	.. undulatus	Tigridia pavonia, *p.*	
Ixia aulica	— campanulatus	Ixia columnaris		
— bulbifera	— carneus	— — grandiflora		
Lachenalia flava, (April)	— galeatus	— purpurea		
Massonia angustifolia	— namaquensis	— versicolor		
— latifolia, April	— pyramidalus	Scilla hyacinthoides		
— Massonia scab. (Mar.)	— roseus			
— violacea, (March)	— striatus			
Oxalis laburnifolia, *p.*	Iris tricuspis			
Tulipa clusiana	Ixia flexuosa			

Propagation and Culture. After the ample directions on the subject of propagating and cultivating bulbs, already given, (1658) very little can require to be added here. A mode of propagating such as rarely produce offsets may be mentioned: it applies only to tunicate bulbs, which, if cut over transversely, a little above the middle, will form young bulbs in abundance near the margin of the outer coat. This has been successfully practised with *hæmanthus pubescens*, and several of the more rare *ornithogali.*

The grand art in cultivating bulbs is, to attend to the proper time for putting them into a state of rest; and when they are in a growing state, to place them so near the light, and afford such a supply of air and water as will enable them to bring their leaves to perfection. The management of exotic bulbs is, in general, very imperfect among gardeners, who cannot be too much impressed with the importance of attending to these two points,—the perfecting the leaves, and the putting the bulbs into, and keeping them during a proper time in, a state of rest. Bulbous-rooted plants associate almost as ill with all others as succulents do; and, therefore, wherever a good collection is kept, there should be a house entirely devoted to their culture. The roof should be low and not very steep, and the pots should be kept on a level stage or platform, raised table high, or about two feet and a half, that the flowers may be near the eye. A house, glass on all sides, with a central platform, six or eight feet wide, and two side ones, or side borders, about three feet wide, would form an excellent house for plants of this description, as all of them would be near the glass, and near the eye of the spectator. Whenever the bulbs, cultivated in such a house, became in a dormant state, they could be removed to a pit or frame of proper temperature in the reserve-garden, and kept there dry, and in a proper temperature, till the growing season. Exotic bulbs require nearly the same degree of heat, when lying dormant, as they do when growing.

Sect. VI. *Herbaceous and stemless Green-house Plants.*

1729. HERBACEOUS AND STEMLESS GREEN-HOUSE PLANTS.

MARCH TO MAY.	JUNE.	JULY.	AUGUST.	SEPT. TO OCT.
	Linum flavum	Campanula mollis, *p.*	Achillea ægyptiaca, *p.*	Agapanthus umbella. maj
	— suffruticosum, *p.*	Witsenia corymbosa, *p.*	Antirrhinum molle	— — media
	Lotus creticus		Gnaphalium orientale, *p.*	— — minor
	Sowerbia juncea, *p.*		Ononis natrix, *p.*	—
	Statice mucronata		— crispa	

Propagation and Culture. A small house, consructed like the bulb-house, should be devoted to these plants; some of which are of considerable beauty: but they do not assort well with woody and evergreens. All the difference between the culture of hardy, and exotic herbaceous plants, consists in the latter being kept in a different climate and in pots.

Sect. V. *Of Selections of Green-house Plants for particular Purposes.*

1730. These purposes are few compared with those for which plants which grow in the open air, may be selected. The most hardy species will be found arranged as frame plants; the most showy and odoriferous under the first four sections. There are scarcely any green-house aquatics; but a few marsh plants; and no parasites, or air plants suitable for the green-house, have been introduced hitherto. Collections, however, might be made of such as are grown in their native countries, for useful or economical purposes, and whose produce is imported to this country, as of *Laurus camphora,* the camphor tree; *Pistacia lentiscus,* the tree which affords mastich (See 380. to 390.); of such as are highly odoriferous, as *Verbena, Heliotropium,* &c.

In a botanical collection, *dionæa* and *sarracenia* are plants of great rarity, and difficult to preserve or propagate. They are generally procured from their native countries, and grown in peat earth, kept moist, and the atmosphere also rendered humid by covering them with a hand-glass. J. Cresswell has produced very strong plants of *S. purpurea,* by treating it as a stove-plant. Under his management, "it is planted in a mixture of the fibrous roots, obtained from peat earth, with an equal quantity of rotten willow wood, broken into small pieces, by which the soil is kept perfectly drained. The pots in which the plants grow are kept in a shaded part of the stove, and watered occasionally, but they do not require to be placed in pans of water, except they become so dry as not to absorb the water given in the usual way." *Hort. Trans.* iii. 360.

Some fine specimens of these genera, and also of *Nepenthes distillatoria,* are contained in the collection of Messrs. Loddiges, at Hackney.

Chap. XIII.

Dry-stove Plants.

What are called dry-stove plants, are such, as from experience, have been found to require an intermediate degree of heat between the green-house and bark-stove plants, and a more dry atmosphere than the latter. Their propagation and culture is the same as for green-house plants; with this difference, that they are not in general removed to the open air during summer; but where the construction of the house admits, the sashes may be removed in dry weather during the three warmest months, but always replaced on the commencement of heavy or cold rains and boisterous winds. We shall arrange them as woody climbers, succulent, bulbous, and herbaceous plants. To cultivate them to any degree of perfection, it is essentially necessary that a house be appropriated to each section; and each house so arranged as that the plants may be near the glass, and that heat and air may be supplied at the pleasure of the cultivator, or a long narrow house may be divided so as to keep each class separate.

Sect. I. *Woody Dry-stove Plants.*

1731. WOODY DRY STOVE PLANTS.

MARCH TO MAY.	JUNE.	JULY.	AUGUST.	SEPT. TO OCT.
Lotus cordifolia, p.	Aitonia capensis, p.	Chironia angustifolia, p.	Citrus trifoliata, p.	Crowea saligna, p.
— villosa	Andersonia spregeloides, p.	— decussata	Platylobium parviflorum, p	— latifolia
Mahernia pinnata, p.	Correa speciosa, p.	— frutescens	Abroma angusta, p.	Ardisia acuminato, p.
Phylica plumosa	Crotolaria elegans, p.	Chorizema illicifolia, p.	Annona glabra	— sinensis
Antidesma alexiteria, p.	Gardenia radicans, p.	— nana	Aralia capitata, p.	— solonacea
— paniculata	Barringtonia speciosa	Gardenia florida, p.	Ardisia elegans	Bixa orellana, p.
Bocconia frutescens	Bontia daphnoides, p.	Heliotropium peruviana	— lateriflora	Cestrum diurnum, p.
Crotalaria paniculata, p.	Borassus flabelliformis	Roella ciliata, p.	Bauhinia anatomica	— laurifolium
— pulchra	Brosimum alicastrum	Achania malvaviscus, p.	Clerodendrum fragrans	— nocturnum
Cylista villosa	— spurium	— mollis	Duranta ellisia	Clerodendrum inerme
Eugenia uniflora, p.	Gardenia pavetta	Achras mammosa	Erithalis fruticosa	— ligustrinum
— zeylanica	Grislea tomentosa, p.	— sapota	Gardenia micranthus	— paniculatum
Ficus bengalensis	Justicia gendarussa, p.	Ailanthus excelsa, p.	Grewia asiatica	— siphonanthus
Gardenia randia	— pectinata	Alangium decapetalum, p.	Hibiscus abelmoschus	Duranta plumieri
— tubiflora	Lantana involucrata	Amyris sylvatica	— manihot, p.	Grewia velutina
Melastoma rubra, p.	Muntingia balabura	Annona hexapantha	— phoeniceus	Lantana radula
Ruizia variabilis, p.	Ophioxylon serpentinum	Asclepias parviflora	— populneus	— scabrida
Solandra grandiflora	Rhamnus colubrinus, p.	Bignonia leucoxylon, p.	— rosa sinensis	Panax fruticosum
	Samyda rosea, p.	— tomentosa	— — flo. pleno.	
		Blakea trinerva, p.	— — — pl. pallido	
		Cestrum angustifolium, p.		
		— tomentosum, p.		
		— vespertinum		

Sect. II. *Climbing Dry-stove Plants.*

1732. CLIMBING DRY STOVE PLANTS.

MARCH TO MAY.	JUNE.	JULY.	AUGUST.	SEPT. TO OCT.
Passiflora lutea, p.	Asclepias scandens, p.	Dolichos urens	Basella alba	Cynanchum suberosum, p.
	— viminalis, p.	Dracontium nymphæfolium, p.	— rubra	— viminale
	Banisteria purpurea, p.	Echites biflora	Bautrinia anatomica, p.	Dioscoria pentaphylla
	Cylista villosa, p.	— elastica	Bignonia crucigera, p.	Ipomœa sanguinea, p.
	— scariosa. p.	Gronovia scandens	— paniculata	— splendens
	Dracontium pertusum	Passiflora foetida, p.	— unguis	Nissolia fruticosa, p.
	— triphyllum	— laurifolia	Cissampelos parieira	Passiflora maliformis.
		— murucuja	— smilacina	
		Roxburghia gloriosoides, p.	Cissus acida, p.	
		Securidaca volubilis, p.	— sicyoides	
			— trifoliata	
			— vitiginea	

Sect. III. *Succulent Dry-stove Plants.*

1733. SUCCULENT DRY-STOVÉ PLANTS.

MARCH TO MAY.	JUNE.	JULY.	AUGUST.	SEPT. TO OCT.
Aloe glauca	Aloe arachnoides	Aloe maculata	Aloe albicans	Agave virginica
— reticulata	— foliolosa	— recurva	— aspera	Cacalia papillaris, p.
Cactus flagelliformis	— pentagona	Cactus heptagonus	— cymbiformis	— kleinia
Euphorbia canariense, p.	— perfoliata	— pentagonus	— depressa	Mesembryanthem. digitat.
Mesembryanthemu. aurea	Bryophyllum calycinum	— peruvianus	Cacalia tomentosa, p.	— felinum
— fissum	Crassula imbricata	Crassula cordata	Cactus cochinillifer	Agave fœtida, p.
Xanthorrhæo hastile, p.	Mesembranthe. rubicaule	Mesembranthemum anceps	— cylindricus	— vivipara
— minor	Aloe viscosa aspera, p.	— expansum	— ficus indica	Euphorbia heptagona
Piper magnoliæfolium	Euphorbia clava	Sempervivum monanthes	Crassula columnaris	— hystrix, p.
— nigrum	Piper clusiæfolium	— villosum	Crithmum latifolium	— mamillaris
Pitcairnia bracteata, p.	Pitcairnia bromeliæfol. p.	Agave lurida, p.	— maritimum	Piper polystachyon
	— graminifolia	— rigida	Mesembryanthemum elongatum	— reticulatam
		Cactus grandiflorus	Aloe barbadensis, p.	Pitcairnia angustifolia, p.
		Euphorbia nerifolia	— lineata	Stapelia anguina
		— piscatoria	— albicans	— articulata
		— tirucalli	Cactus hexagonus	— campanulata
		— tithymaloides	— lanuginosus	— concinna
			— mamillaris	— clypeata
			— melocactus	— divaricata
				— humilis

Sect. IV. *Bulbous Dry-stove Plants.*

1734. BULBOUS DRY-STOVE PLANTS.

MARCH TO MAY.	JUNE.	JULY.	AUGUST.	SEPT. TO OCT.
Albuca altissima	Albuca coarctata	Albuca fragrans, p.	Amaryllis purpurea	Amaryllis pumila
— major	— caudata	Amaryllis tubispatha	— albucoides	Drimia elata, p.
— spiralis, (April), p.	— minor	Babiana villosa, p.	Anthericum albucoides	Oxalis monophylla
Anthericum canaliculatu.	— vittata, p.	Cyanella capensis, p.	Gladiolus tristus tardivus, p	— tricolor
Babiana rubro-cyanea, p.	Amaryllis maculata	Ericomis punctata	— luteo	
— sulphurea	— undulata	— striata		
— tenuifolia	Anthericum asphodeloid.	Galaxia graminea		
Drimia pusilla, p.	Babiana latifolia, p:	Gethyllis ciliaris		
Ericomis bifolia, (April)	Cyrtanthus albus	— spiralis		
— nana	— obliquus latifolius	Gladiolus grandiflorus		
Ferraria antherosa, p.	— ventricosus	Oxalis monophylla		
— undulata, p.	Galaxia grandiflora, p.			
	Gladiolus alatus			

Sect. V. *Herbaceous Dry-stove Plants.*

1735. HERBACEOUS DRY STOVE PLANTS.

MARCH TO MAY.	JUNE.	JULY.	AUGUST.	SEPT. TO OCT.
Canarina campanula	Arum divaricatum, p.	Adiantum reniforme, p.	Alstrœmeria pelegrina	Arum auritum, p.
Bletia tankervilliæ, p.	Commelina tuberosa	— trapeziforme	Witsenia maura, p.	— orixense
Neottia elata	— bengalensis	Arum bicolor, p.	Arum esculentum, p.	— sagittifolium
— orchioides	Marica martinicensis	— colocasia	Asplenium præmorsum	Begonia acuminata
— picta	— northiana	Begonia nitida	— striatum	Cyrilla pulchella
Pothos cordata	Phytolacca octandra	Besleria melittifolia	Begonia dichotoma	Leea crispa
Pteris grandifolia	Polypodium asplenifolium	Calea lobata	— evansiana	— macrophylla
	Pothos cannæfolia	Callisia repens	— macrophylla	
		Monsonia speciosa	Dianella ensifolia	
		Geranium incarnatum	Gloriosa superba	
			Gloxinia maculata	
			— speciosa	

Chap. XIV.

Hot-house, or Bark-stove Plants.

These are such as require the highest degree of heat, which has generally been given by the aid of a bed of bark or other fermenting substance, in which the pots containing the plants are plunged. Sometimes, as before observed (1603.), steam or flues are applied under a vault covered with earth or sand as a substitute for bark; and more recently the pots have not been plunged in any material nor bottom-heat applied, but a greater atmospherical heat communicated, and the atmosphere about the pots kept moist by watering, &c. We shall arrange the most ornamental species under woody, climbing, bulbous, perennial, annual, aquatic, and reedy plants.

Sect. I. *Woody Bark-stove Plants.*

1736. WOODY BARK-STOVE PLANTS.

MAY.	JUNE.	JULY.	AUGUST.	SEPTEMBER.
Brucea ferruginea, p.	Cassia alata, p.	Adenanthera pavonia, p.	Æschynomene grandifl. p.	Cameraria angustifolia
Cassia bicapsularis, p.	Chrysophyllum cainito	Æschynomene sensitiva	Amerimnum ebenus	Carissa spinarum
Cordia gerascanthus	— fuscum	Allamanda cathartica	Asclepias gigantea	Cassia biflora, p.
— monoica	Eugenia fragrans, p.	Amyris sylvatica	Bauhinia acuminata, p.	Cerbera manghas
Elate sylvestris	Myrtus disticha	Asclepias curassavica	Bignonia longissima, p.	Cinchona caribea, p.
Erythrina carnea	— dumosa	— parviflora	— paniculata	Clusia flava
— crista galli	— pimenta	Bauhinia divaricata, p.	— pentaphylla	Croton aromaticum, p.
— rosea	— — longifolia	— porrecta	Brownea coccinea	Desmanthus virgatus
Eugenia jambos, p.	— tomentosa, p.	Bignonia leucoxylon, p.	Brunfelsia undulata	Ephielis guianensis, p.
— uniflora	— zeylanica	Brunsfelsia americana	Bucida buceras	Erythrina speciosa
Euphorbia punicea	— zuzygium	Carolinea minor, p.	Cassia occidentalis	Fagara pterota
Hillia longiflora	Samyda rosea	Gardenia aculeata	— viminea	Hamellia ventricosa, p.
Myrtus biflora, p.	Sophora tomentosa, p.	Gossypium vitifolium, p.	Gardenia dumetorum	Hedysarum strobiliferum
		Hedysarum pictum, p.	Gossypium arboreum, p.	Helicteris baruensis
		Helicteris isora	Guaicum officinale	Ixora alba
		Heliocarpus americana	Hedysarum gyrans, p.	— pavetta
		Ixora purpurea	Ixora blanda	
			— coccinea	

1737. *Propagation.* All the known modes are occasionally adopted, but those by seeds and cuttings are the most general. Few stove plants ripen their seeds in this country, and such as are obtained are therefore generally procured from abroad. "Tropical seeds in general," Cushing observes, "are very liable to lose their powers of vegetation by reason of the transition from warm to cold climates, combined with the length of time which commonly intervenes between their gathering and arrival with us, especially if they have been exposed to damps; on that account they should be sown as soon as they arrive, at least a part of each parcel. Much depends on the state of the seeds when received. East and West India seeds generally arrive with the regular fleets, as indeed do those from the Cape of Good Hope, and all the South Sea Islands, for the most part by the Eastern and China ships; so that one may in general be prepared against their arrival. As early spring is undoubtedly the best time for sowing, a few weeks' delay may in some instances be adviseable. If received late in October or November, wait until January, or perhaps February, unless it evidently appears they will not keep out of the earth so long a time in a vegetative state; such as can be sown before August have a good chance to acquire sufficient strength of growth to carry them through the winter months, so adverse to the general efforts of young vegetable life.

"The pots being well drained should be filled with the compost suitable to the species of plant of which the seed intended to be sown has been produced; (see the table); let it be pressed down to about a third, or half an inch below the edge of the rim, according to the size of the seeds; if they are small or light sorts, it will be necessary to press it pretty tight, and to add a little of the very fine-sifted mould on which to deposit the seed, previously smoothing it with a bit of thin flat wood, bent so as to lie on it level. Being thus prepared, let the seed be sown regularly on the surface, and cover it from about an eighth to a quarter of an inch, according to the size of the seed as before, with the same sort of fine mould. But if the seed is of the largest sorts, as, for instance, the nut or stone kind, no more is necessary than to press them into the earth with the finger, and to cover somewhat thicker than is recommended for the others. In either case, the covering should be pressed moderately on the seed with the hand; which is indeed a most necessary caution in sowing seeds of any description whatever. In order to ensure the vegetation of hard or very tough shelled seeds, some have them soaked in water for a few days; say a week, or even ten days, for such as happen to be very dry, previous to sowing: a shallow pan placed on the coolest part of the flue in the propagation stove, is the readiest and safest article to receive them for this purpose; they should be examined daily, and sown the moment any sign of swelling or growth appears: this process, however, is fraught with danger to many of the lighter and smaller sorts.

"The sowing being finished, the pots must be set on a level spot, and gently, but thoroughly watered with a pot, the rose of which has been made particularly fine, for this and other such uses; and immediately plunged in a strong heat, without which they will not be likely to vegetate: if a close dung hot-bed the better. A regular but moderate watering, steady heat, and occasional weeding, should any such appear, is all they will now require until they are fit to be removed into separate pots; which may be done as soon as they have attained a few inches growth above their cotyledons, or seed leaves.

"There are some fruit, such as nelumbium, whose exterior coat is so very hard that the embryo plants are not able to burst through; at least, with us; to remedy which, the knife is not unfrequently used to pare them thin, even to making a hole in them, but not too near the eye or part where they sprout with good effect.

"If the business of seed-sowing is performed in spring, or early in summer, the smaller sorts may be expected to vegetate in the course of five or six weeks at farthest; whereas, the larger boney kinds will sometimes remain dormant in the earth for the space perhaps of twelve months: this must be attended to, else one might think them beyond a chance of growing, and perhaps throw them away without examination. Whenever there is any doubt of their vegetating, let some of them be taken up and opened with a knife; when they will at once discover whether they are sound or not; if sound, they must be still kept in a strong heat, and regularly watered as before: for want of this simple precaution, valuable seeds are often carelessly thrown on the rubbish heap, when just bursting their shell or embryo; and not unfrequently, by that accidental check, are so materially injured as to prevent more than one half of them vegetating again; if they have been at all so fortunate as to be noticed and resowed." *Exotic Gard.* p. 8.

1738. *By Cuttings.* Besides the usual supply of the different sorts of earth, &c. there is another article necessary to be provided before we begin the business of making cuttings; which is, a few dozen of small bell glasses, (the white glass is best,) of as many different sizes as are the pots in which the cuttings are intended to be planted; they should be fitted to the pot, so as to rest on the inner side of it, about an inch below the rim; by observing which circumstance, when the pot is filled with earth, the glass will have room sufficient to sink a little into it, so as to perfectly exclude the external air; of very essential importance to the cutting while in a dormant state, that is, from the time they are put in until they begin to grow.

"The cuttings of hot-house plants may, with pretty tolerable success, be made almost every season of the year; yet, the months of April, May, and June are certainly the most proper; as the plants are at that season plentifully supplied with young wood, which, in most species, produce roots when made into cuttings, much sooner than the old wood will if used in the same manner. When the day is fixed upon for this business, let a quantity of pots of the proper size be selected, and prepared by covering their bottoms to the depth of one or two inches with potsherds; and then, as wanted, about half filled with the compost best suited to the plant intended to be propagated, to grow in for a few weeks, when first struck, and the remaining part with the best loam that can be procured, to insert the cutting in when ready. On the purity and clearness of the loam depends in a great measure the success of many of the tenderer kinds of cuttings, particularly those which are obliged to be kept in moist heat, as it is, when contaminated with other composts, very liable in these situations to cause damp and rottenness, by the particles of putrifying matter generally contained in mixed earths;

and the properties of which are put in motion, by the application of heat. As an exception to this rule, may be adduced sand; which is of very great utility to mix with the loam, should it happen to be rather stiff for the nature of the cutting: but then, the sand proper for this use is of so pure a nature in itself, that it is evident it cannot have the effect noticed above in regard to mixed soils.

" In the choice of cuttings, preference should be given to the firmest wood of the same year's growth; and of these, only such whose leaves have attained their full size and proper color, which are generally to be selected from the lateral shoots; as the upright leading ones are mostly too luxuriant to make good cuttings. The cuttings of many plants, if taken from the lateral shoots, never become proper erect stems; but are inclined at all times to form an irregular, bushy, weak head: this is not of small importance to such collectors as cultivate plants merely for the flower; as such heads generally produce them sooner than luxuriant leaders. The lovers of handsome erect plants, however, choose their cuttings from the upright shoots, early in the season, before they acquire that luxuriance of growth so unfit for the purposes of propagation. The tops of the shoots are to be preferred, unless they happen to flag before used. To prepare them for insertion, most of the leaves must be trimmed off close to the stem, leaving only a few at the top, to allow a free respiration of the air necessary to the life of the plant. This is a most essential article in the art of making cuttings, particularly those of evergreens; for if they are deprived entirely of their leaves, or that they otherwise flag, or occasionally fall off soon after they are put in, there will be little or no chance of their growing. The reason is obvious, because the inherent sap of the cutting, being deprived of these organs of respiration that kept it in motion, and the cutting having no roots by the efforts of which to produce new leaves, the sap, consequently, becomes stagnated in the pores of the wood; which, like the stagnation of the blood in animals, will in all likelihood prove mortal, by occasioning an immediate mortification.

" In shortening each cutting to the most convenient length, care must be taken to do it with a clean cut, in a transverse direction at a joint; and by no means should they be left exposed, or to lie any considerable time before planted. In planting, a small dibble or other convenient instrument should be used to press the loam sufficiently tight, to the base of the cutting, as that is the principal part to be made fast, as soon as the whole are inserted and the surface of the mould made level and a little firm, give them a gentle watering to settle them; they should be left to soak about a quarter of an hour, and then covered with a bell-glass, which should be pressed pretty tight, so as perfectly to exclude the outward air. The atmospheric air being prevented by the glass from exhaling any of the juices of the plant, all its powers are forced downward to produce roots, and these will soon prove their existence by producing young leaves and branches. If there are several cuttings of the same sort, they may be all put in one pot, unless they happen to be very large, or curious sorts; but in general each species should be kept in a separate one, on account of the difference in time that some of them require to strike roots; and also, that any scarce or valuable kind should be put only one in a small pot, as they then are not liable to be injured so much by damp; neither do they require to go through the precarious operation of separate potting, so soon after being struck.

" Should it be requisite to have a considerable quantity of cuttings made at the same time, it would be proper to have a one-light frame, with close glasses, placed on a moderate hot-bed, ready to receive them. It should be covered with saw-dust, or clean tan, about a foot deep, in which to plunge the pots: but if there are only a few done, they may be plunged in any frame among other things, provided there is a moderate heat.

" They will now require the most particular attention as to watering and shading. The water must be given twice or thrice very moderately until the earth becomes sufficiently moist, which, if once so, will retain the moisture for a length of time, by being covered with the glass: but the shading is the principal care whenever the sun's rays fall on the glasses, as nothing will create rottenness sooner than letting the leaves flag, and lie upon each other, which will be the positive consequence of a neglect of shade. The most adviseable method to do it is, to have a few large sheets of strong paper, to lay over the glasses within the frame; which, at the same time that it shades the cuttings, does not prevent the sun's rays from entering the frame and clearing off any damps that may be accumulated therein; whereas, if mats are laid on the outside of the frame light, it is evident they will tend to have the direct contrary effect. However, in the course of a week or fortnight, they will be able to withstand a little of the rays of the morning and evening sun.

" While in an inactive state, they should be kept rather dry, but not let to an extreme; else the bark will become shrivelled, and occasion a very smart falling off amongst them; on the other hand, should they be kept in an over moist state, the consequence would not be less disagreeable on account of the damp, occasioned by the air being so closely confined under the glasses; in this case it would be of infinite service to have the glasses wiped with a dry cloth about once a week, which is quite sufficient for hot-house cuttings, as they are not so liable to suffer from this cause as those of green-house plants.

" As the heat of the bed declines, it will be necessary to have another, properly tempered, ready, in which to plunge them when requisite; or otherwise, let the old one be renovated with linings of fresh warm dung; but in such manner as to avoid creating any violent degree of heat or strong rank steam in the bed; as it is better to do it often and but slightly at a time, it being but a trifling increase of labor compared with the probable consequences. By this management one may expect to have some of the free-growing kinds well rooted, and making rapid progress in the course of a very few weeks; when such is the case, it will be necessary to give them a little air by taking off the bell-glasses at night, and to keep them a little moister than before. If they endure this pretty well for a few days, the glasses may be left off entirely; which will harden and prepare them by the time in which it may be thought convenient to part and pot them separately.

" In taking the bell-glasses off at night, it is necessary to observe that from their closeness they sometimes occasion the cuttings, more frequently the harder sorts, to produce young leaves and even shoots, before they have sufficient roots: if at any time these should be mistaken for well rooted plants, and their glasses taken off accordingly, in a few hours they may be perceived by their leaves beginning to flag; in which case the glasses must be immediately replaced; otherwise, if neglected, these tender shoots will be utterly spoiled, and it will be a very great chance whether the cutting will ever produce more or not.

" Should the above circumstance happen, they will be observed to be more impatient of damp afterwards; as indeed will all those be which are growing; the glasses should therefore be more frequently dried, and kept off until the leaves, &c. which were under them, become dry by evaporation; lest we risk their success, I may say, perhaps, their existence, by rotting the first weak efforts towards active life.

" The rooted cuttings being thus prepared, they may be occasionally taken out of the frame, and set in more exposed airy situations in the hot-house: but as some kinds require a much longer time to produce roots than others, it will be necessary to keep such still in the frame, shading and watering them when requisite, as already directed. Thus may they be treated until the autumn; when, if any yet remain in the cutting state, it will be adviseable to have them taken to the propagation-stove, and plunged in the bark-pit; previously clearing them from any damps, moss, or weeds that may have grown amongst them, and renewing the surface with a little fresh loam. Here they will require the same care as when in the frame, except that as the influence of the sun decreases, so must the shading in proportion; using it only for two or three hours in the middle of the day, if at all requisite, and indeed it is necessary here to observe, that in the winter, and early spring months, they must not be shaded on any account, nor watered except when absolute necessity requires it; neither should the cuttings that may be occasionally made at these seasons, receive any water when first put in, as directed for those made in summer, as the mould will be found in general sufficiently moist, in itself; and as there is not that quick principle of vegetation at this season, the water might prove materially injurious, by promoting damp and rottenness. It is even necessary in some instances, should the cutting be of a succulent plant, or in any degree approaching that nature, to provide loam rather dry, than moist; in which they must be planted and left without water, until they have completely formed their callosities, and the wounds are healed; however, in either case those fresh put in must be partially shaded for a few days, should the weather happen to be clear and sunny. It will be also necessary to dry the inside of the bell-glasses more frequently in the winter months; as there is generally a stronger heat kept in the tan-pit, which gives rise to an increased evaporation; and damp at this season, should be more particularly avoided than at any other. In the ensuing spring those put in early, as well as what have remained since the preceding summer, will in general make an effort to grow; as soon as they are observed in this state, let them be managed in the same manner as those already rooted have been.

" In regard to parting and potting the rooted cuttings or seedlings separately, the greatest nicety should be observed; first, in turning them out of the pots without lacerating the roots; and secondly, in shaking and working the earth from amongst them, until they can be readily parted without breaking; if any of the mould can be conveniently preserved to them, so much the better; but the preservation of the roots should be the principal object. They must be immediately potted in their proper soil, in pots suited to the size of the cuttings, and neatly tied up, if necessary; let them be then well watered with a rose-pot moderately fine, but by no means should they be flooded, or slushed with it, as too many are apt to do, but let it be given gently, and time allowed for it to soak regularly into the mould. They will require a brisk heat and close shading for a few days, until they have established themselves in the fresh mould." *Exotic Gardener*, 26.

1739. *Laying and Inarching*, are rarely practised on hot-house plants. However, there are some that do not produce roots freely by cuttings, which may be multiplied successfully by these methods.

" In *laying*, choice should be made of the young tender shoots of the present year; the soft bark of which will sooner form a callosity, and produce roots, than that of any of the preceding year's growth. It is particularly necessary to observe, whether the plant intended to be layed is of a brittle nature or not; for if it is, it will be necessary that the shoots be pegged gently down to the surface previous to laying, and thus left until their tops naturally acquire a perpendicular direction, which they will do in a few days; without this precaution, it would be extremely difficult to cut or tongue them without cracking, or breaking them off; but if treated in this manner, the most brittle may be layed without danger.

" It is a conclusion drawn from several experiments, that the layer, which is inserted to a proper depth, roots sooner and better than that which is layed near the surface; the reason of which is, at a certain depth the air is better excluded, and there is a more regular degree of moisture for the nourishment of the young fibres, when they make their appearance. No part of the shoot should on any pretence be covered with the mould, except that which is meant to produce roots, as the covering the whole renders it extremely liable to rot: and therefore, if any particularly tender plant should happen to be thus treated, it would evidently endanger the whole stool.

" Inarching is much preferable to the common grafting, for evergreens in particular; it is principally practised as the best means of multiplying all the double varieties of camellia and plants of similar habits; because their strong leaves, if only for a few days deprived of their regular support, by being cut clear from the mother stock, if not covered closely with a glass, will be certain to wither and fall off; after which, there will be but very slender chance of the scion's completing an union: it is performed as follows:

" Having provided a stock, which should always be some of the coarser, free kinds of the same genus of plants, and nearly of the same diameter as the shoot which is intended for inarching; cut a thin slip from two to three inches long, and about one-third or something better of the whole thickness, smoothly off from each of them, in the clearest part of the stem, with a small sharp knife; (a most necessary instrument for this business;) the bark of each must then be fitted together in the exactest manner, at least on one side, and tied perfectly tight with good matting: they must be clayed in the same manner as grafts; and as being within doors in a warm house will occasion the clay to become over dry, and in consequence, liable to crack, they should, at least in dry weather, receive two or three times a week some water from the rose of a water-pot, or by means of a syringe, to preserve it in a moist proper state, observing to do it in the evening, lest the leaves should get scorched by the rays of the sun: a little moss tied neatly round each ball of clay, will prevent the water being so frequently necessary: eight or ten weeks will in general be found sufficient time for them to unite; at all events, by that time, they may be partially separated from the parent plant by cutting the inarched shoots better than half way through; and if, on trial, they are found to be united, and bear that operation well, they may in a few days afterwards be entirely cut off and placed in a shady part of the house, where they must be kept moderately syringed as before, and some additional shade given according to the state of the weather for two or three weeks; during which time they may be untied, and the top of the stock cut off in a neat manner; and also any unnecessary part of the bottom of the scion that may remain: let a little clay be again applied, that these fresh wounds may have sufficient time to become properly healed, which they will in a few weeks." In this manner, Cushing succeeded with *myrtus pimento*, and other plants allied to it may be propagated on the common myrtle, which are particularly difficult to multiply by any other means; and also many other plants of the same description upon their kind.

1740. *General Culture.* To attain a respectable degree of perfection in the culture of tropical plants, Cushing observes, " the principal objects to which one should direct his attention, are, assiduity in keeping up the stock by propagation; a careful nicety in potting, and shifting in the proper season: a regularity in watering when requisite: a thorough knowledge of the temperature necessary to be kept in the house: and a steady attention to the cleanliness and habits of the plants in general.

" The business of shifting, or refreshing the roots of plants with earth properly prepared for that purpose, and transplanting them into larger pots than they before occupied, is one of the most necessary operations required to keep them in a good state of growth. The quantity of earth contained in a flower-pot being in comparison so small, to that which is requisite to the support of the generality of plants, it must be supposed that unless it is changed or augmented in due season, they will soon exhaust every particle of vegetative matter contained therein, though frequently assisted by proper water, which doubtless contains a large portion of the food of vegetables, the consequence of which is to the weaker growing and tender kinds, that its salts being dissolved, and the sandy particles which kept it in a free open state washed away by the frequent and long continued ablutions, it becomes in the case of ill-drained pots for seeds, sour and coagulated; and the plant, being no longer able to draw its proper nourishment from it, must inevitably decline, and at last becomes a nuisance to the collection, by breeding insects and filthiness: to the stronger sorts, though in a different manner, it will be no less pernicious, by starving them, and thereby occasioning them to dwindle into naked stems, and awkward unsightly forms.

" The season most proper for shifting hot-house plants is about the middle or end of April; if done earlier (though some hot-house plants may be said to be in a state of growth for the greater part of the year) the generality of them will be found dormant; and therefore will not have the power to establish themselves sufficiently in the fresh earth to prevent a great part of their leaves falling off, and the whole plant acquiring a sickly appearance; and on the other hand, if done much later, most of them will be in a vigorous state, and it will require infinite care, and increase of labor to keep them properly shaded, else the intense influence of the sun on them, at an advanced season, will have, though a different cause, nearly the same effect; and reduce them to fully as disagreeable a state as the former case. But if taken, soon after they have made the first effort for the season's growth, the fibres being set in motion, and not having a top full of young tender leaves to support, they soon find their way into the fresh mould; and the plants, by being thus taken in time, and when done, placed in a brisk bottom-heat to assist them, will in the space of three or four days at farthest be well recovered, and in general, able to support themselves against the strongest rays we may reasonably expect at that season, without much danger to their leaves.

1741. *Shifting.* " Being fully prepared for the removal of the plants, let a part of them be taken to the potting-shed together, that they may be no longer than necessary out of the stove; and while these are shifting, the remainder may be taken out of the tan, and set on any of the shelves or benches that are over the flues, so as to allow sufficient room to have it forked up and turned; and should it be sunk considerably below the desired height, some fresh well-dried tan should be added, and mixed well with the old in turning; when done, let it be made pretty level with a rake that the plants may be conveniently and regularly set on the surface when shifted.

" In shifting the plant, the greatest nicety should be used not to injure the roots; because, if the roots, from a multiplicity of wounds, (which are more frequently lacerated than cleanly cut,) once become cankered, or contaminated in any manner, the branches must also be expected to suffer and decay.

" It may not be amiss here to notice an old but erroneous practice followed by many, that off paring off the best part of the roots with a knife; that is, the tips or ends of the fibres, which are undoubtedly the active agents in collecting the food for the stem, &c.; then, without ever loosening the remaining part of the ball, set in the new pot with a little fresh earth thrown loosely about it: as a matter of course, they think it must then be completely drenched or flooded from the water-pot; and lastly, to crown the whole, perhaps set it immediately in a pan of water; when, if they only took time to consider the mutilated state, to which they have reduced the roots, it is impossible they could ever conceive them to be in a state fit to undergo such treatment with any kind of advantage: but it is the misfortune of many, who will not for a moment hesitate to undertake the care of tender and curious plants, as a matter easily understood; yet will not take the trouble of judging for themselves, to follow the old track of cutting and watering, the same as they may have before seen practised on the hardiest geraniums or myrtles. Though the method may not seem to hurt some few kinds of strong free-growing plants; yet it never can be allowed as a proper mode of treatment for all plants indiscriminately, because they may happen to have a good portion of roots: indeed, more plants have been destroyed by this practice than by any other particular part of the system of mismanagement which some so blindly follow.

" There are instances, however, wherein a knife is necessary to the roots as well as the branches, viz. when they become rotten or otherwise contaminated; and also to such as are propagated by cuttings of the roots, as most species of geranium may be, some mimosæ also, and indeed any that are observed to produce suckers: in all which cases they should be taken off with precision, and a sufficiency left to support the parent, if considered worth preserving.

"In *shifting*, let the plant be carefully turned out of its pot, in doing which, observe if the roots have perforated it in any part, so as to render it impossible to part them without breaking the one, or lacerating the other; in which case prefer the former as the slightest damage; however, when the ball of roots is divested of its pot, let the broken tiles, or whatever substance may have been used as draining, be carefully picked out without tearing off the roots that may have grown amongst them; also any caked or mossy substance on the surface, which will come easily off with the fingers. Then proceed to loosen the earth and matted roots, by gently patting them on the side of the ball with the hand; or otherwise, by pressing it so as to open the pores of the earth without cracking the roots; shake off any loose earth, and having a proper sized pot ready prepared, put in a quantity of the fresh mould sufficient to raise the crown of the roots to about half an inch below the rim of the pot, on which set the plant; and add more earth, lightly shaking it in among the fibres; let the whole be pressed moderately light, but not so as to render it hard in the least degree, nor by any means using a stick for this purpose: another never failing attendant on the former practice, by which the roots are extremely liable to be torn or bruised; add mould sufficient to raise the surface level with the rim, as it will settle to a proper depth with watering, and smooth the whole off neatly with the hand.

"It will be found necessary, where there is much of this work to be done, to have two or three assistants, one of which to be employed in supplying pots and other necessaries; the others in washing and cleaning from insects, &c. any plants that may happen to stand in need before shifted; and in tying them up properly to their sticks afterwards: new sticks should be had at least once a year, to hot-house plants in particular; as the old ones very often harbor more or less of the several pestiferous insects, which infest these deparments. This done, let the plants be set on a level spot together, and moderately watered with a fine rose-pot, held at a distance above their tops so as to give the leaves a good rincing; but observe to give no more water than is sufficient to settle the fresh mould to the roots, and by no means to slush or give the surface that puddled appearance, so very disagreeable to be observed in departments where neatness should be the uniform and leading principle. Having thus finished the first division, let them be immediately taken to the stove, to be set on the fresh-turned tan for the present, and those that remained there, taken to the shed to be treated and shifted in the same manner as the others.

"When the whole are shifted, they may be partially plunged for a few days; setting the pot about half its depth loosely into the tan, to avoid the danger that attends too violent a heat arising in the pit; which is frequently the case, when it has been recently turned or augmented. However, there must be a pretty brisk fire heat kept up in the house, until the plants recover from their inactive state, the unavoidable consequence of their roots being so recently disturbed.

"They will be much benefited at this time by a moderate use of the hand-syringe, in the morning before the sun has begun to act upon them with force; also by raising a strong steam in the house, to be done by throwing water on the tops and sides of the warm flues. But when they are freely treated in this manner, they require but little from the water-pot; as over-watering is very pernicious to plants in general, and at no time is it more particularly so, than when they have been lately shifted. However this must unavoidably depend on the judgment of him in whose care they are placed; as some of them will require considerably more than others.

"In a few days, when the danger of a violent heat is over, the plants may be plunged neatly in the tan up to the rim; but observe that it is not left scattered on the surface of the pots, as it would give the work an extreme slovenly appearance; a few inches of clean saw-dust laid over the tan, gives a clean and neat appearance, which, in most gardens, is a particularly essential part of the curator's conduct.

"All the plants which require the aid of tan-heat, being properly plunged, and the remaining ones regulated on the different benches or shelves; let the place be well cleaned out, when little more will be necessary for a few weeks, than watering when requisite, squirting, steaming, and attention to the degree of heat necessary to be kept in the house at this season. This should in general be about sixty degrees. If it is kept much lower, it will considerably retard the plants in recovering their vigor; and if many degrees higher, the free growing kinds will soon over-top, and materially injure the weak and more tardy sorts unless prevented; besides themselves becoming unsightly, the consequence of being drawn, or forced into long weak ungainly stems.

1742. *Insects.* As the heat increases with the advancing season, the different species of insects to which these departments are liable, will multiply incredibly. Those which seem to make the greatest havoc amongst plants in the hot-house, are, the green-fly, the thrips, the mealy white bug, the great scaly bug, the small scale, or the pine-bug, and the red spider; which, although the smallest, is by far the most destructive of any of the species that exist in these departments.

"For the first and second of these species above-mentioned, there is no process which seems to take so much effect on them, as a strong fumigation of tobacco; repeated twice or thrice, according to the strength the insects may have attained.

"For the third, fourth, and fifth species there is none of the several expensive methods mentioned in different authors so effectual, as simply picking them off: this may be said to be tedious, but then it has surety to plead; besides, that the plants are in no manner disfigured by the operation; but unless regularity be observed in looking for them, examining plant by plant, and leaf by leaf, from top to bottom, and also any incisions or cracks that may be in the bark of the stem, &c. there will be a constant and tiresome employment; on the contrary, if regularly done, one operation will be of more service than five, if executed in a careless inattentive manner.

"As each individual plant is picked, it should be carefully washed with a strong lixivium of soft soap and water, which will have a powerful effect on their remains or young ovaria, which are in general sufficiently small to elude the eye, or perhaps so situated within the young buds that they cannot be got at without materially injuring the future growth; the wash will, however, penetrate into these secret holds, and in general be fully adequate to their destruction.

"When the plants are out of the houses in summer, every part of it should be well washed with strong soap-suds, in which a little of the same tobacco, as used for fumigating, has been infused; in particular, all the joints of the wood-work, and also whatever nail-holes or other crevices may happen to be therein: as in these places some of the species, more especially the white mealy bug, is much inclined to secrete itself for breeding. This operation will, however, if performed in spring and autumn, be a great means of their extinction, and will tend in a great degree to check the multiplication of the others.

"The last and most pernicious of the species mentioned, viz. the red spider, is to be overcome neither by fumigation nor picking; but by the free but well directed use of common water; either by steam or with the hand-syringe. The steam, by creating a fine dew in the house, prevents the insect from extending its slender web from leaf to leaf, and thus checks its progress; while the syringe, by superior force, breaks the ligaments of those already made, and in most instances washes the insects to the ground; where, although it may recover its fall for the first or second application, it is in the end sure to perish. They will sometimes, however, elude the greatest diligence, for a while, by collecting under large horizontal leaves, which serve them as citadels against the attacks of the water; but here they will soon betray themselves, by extracting the fluid substance of the leaf for their support; in consequence of which it loses its verdure and becomes conspicuous; this, when found, should be picked off, and taken out of the house immediately; for if left any where among the plants they will in a little time establish themselves on others. If they happen to be discovered before the leaf has lost its beauty, they may be rubbed off with the hand on a sheet of paper, and expelled the premises.

"If at any time the quantity of water necessary to be used in these operations, should occasion the earth to become over-wet, in those pots particularly which are plunged in the bark-bed; the syringing must be omitted, and use made of the steam only, until they again become reasonably dry. Neither should it be performed when the sun acts freely upon the plants, lest their leaves become in consequence disfigured. For the water forms itself into little spherules, the surfaces of which collect the rays of the sun in a greater or less degree according to their convexity; and thereby the leaves are disfigured by being burned in the focus of each spherule.

1743. *Summer Treatment.* "As the season advances, it will become necessary to admit a reasonable portion of air on all fine sunny days; and also to decrease the strength of the fires at night: but in these particulars, the only criterions to be guided by, are experience and observations on the weather, the variations in which render it utterly impossible to lay down any certain rule to act by, further than the admonitions of the thermometer; observing to keep it pretty near to sixty degrees. About the beginning or middle of May at farthest, fires may be omitted entirely; as the natural heat of the season united to that of the bark-bed, will in general be found sufficient to keep the mercury up to the above-mentioned point.

"Towards the latter end of June, the plants by this treatment will generally be in a very luxuriant free state of growth; it will be therefore requisite to raise the pots quite out of the tan-bed, to check and harden them a little, so as to be able to bear the air of the green-house for a few weeks, which will be of considerable advantage to them the ensuing winter.

"Should any of them remain of a sickly appearance, (and that a few may be in that state in large collections, must be reasonably expected,) or any particular tender sorts among them, they must be removed to a separate house, as already hinted, where the tan being previously forked up, and otherwise properly prepared for their reception, they must be immediately replunged: if no such house is convenient, a large deep hotbed frame, set on a good bed of well prepared dung, will answer nearly as well for this purpose; having nine or ten inches of rotten tan or saw-dust spread regularly over the bed within the frame, in which the pots are to be plunged.

"It is necessary to observe, that when the bed has been got ready, a few days should elapse before the plants are set in it, that the steam and violent heat may have sufficient time to evaporate. At the expiration of five or six days, however, the plants in their pots may be set on the surface; where they should remain a little time longer without being plunged; but particular care is necessary that the frame at this time may not be kept too close, which would occasion the heat to ascend more rapidly than the plants could well bear; to avoid this, give plenty of air in the day-time and also a little at night, with a mat hung before it to prevent the sharp air entering into the frame. When the heat of the bed has attained a proper temperature, so that there may be no danger of the roots being burned or otherwise injured, let the plants be plunged; and afterwards treated in the same manner as if they were still in the hot-house: only observing to keep those that are in a weak state rather dry; as nothing can be more injurious to a sickly plant than too much moisture, by reason of its inability to imbibe the usual quantity through want of vigor.

"The plants which remain, intended to be set in the green-house, must now have a considerable increase of fresh air on all fine days; and also (the pots being quite out of the tan,) they will require a greater portion of water than has been usually given them when plunged.

"As soon as the weather becomes settled, and the night perfectly free from all chilliness and frost, which is seldom much before the middle of July, the plants may with safety be removed from the stove to the green-house; and set regularly, on the benches lately occupied by the green-house plants; which they will ornament very much, during the time the latter are set in clumps in the open air.

"The stove may in this interval be furnished with a few of each of the different tender annuals, to give it something of a gay, lively appearance. They will likewise in some measure serve as a kind of natural trap for the spider, &c.; as they will, should there be any of them left in the house, immediately attack the soft tender leaves of these plants, in which case, as soon as they are observed to be collected in force upon any individual plant, it should be removed to the open air, without loss of time, and another substituted in its room; this practice will contribute towards subduing this formidable enemy, so that, combined with other exertions, by the time it becomes necessary to have the hot-house plants reinstated in the bark-bed, the house should be pretty free from them.

"These being now in the green-house, will require a little attention to preserve their verdure, such as keeping the glasses close at night and admitting air only on fine days; thus to exclude any chilling or strong winds that may happen to prevail, which would occasion the leaves to contract a languid, yellowish appearance; however, in course of a week or ten days, they will be able to withstand any weather that may in reason be expected at this season; unless it happens to be unusually violent, in which case it must be guarded against accordingly.

"The principal care they will require now for about a month or so, is to be regularly cleaned from insects, weeds, and dead leaves, whenever they appear; also casually tying up any that may want it, and watering, in which last article, it must be observed, that as they now stand upon dry boards, and the air acting freely on every side of the pot, they must consequently be allowed an increase of water to counbalance its effect.

"The evening is the most proper time for watering at this season, as well as syringing, particularly when dry and warm; for if administered in the morning, the rising heat of the sun exhales it, before it has time to descend to the lower roots; and unless replenished frequently in course of the succeeding day, they are liable to much injury, by being left in an exhausted state until the following morning, and which, it is probable, may not prove more fortunate; whereas, if administered in the evening, it refreshes them after the preceding day's drought, and having sufficient time to penetrate to the roots, they have the night to recruit themselves against the following day. Besides, in syringing, there is much more danger of having the leaves scorched by the sun's rays, if done in the morning, than if done as here recommended: but as either extreme is dangerous, care must be taken to use no more water than is evidently necessary for the health of the plants: for if used to that degree that the earth becomes sour and deprived of its vegetative powers, the consequences may be rather unpleasant.

"By thus setting the plants in the green-house, it tends to prevent the increase of insects; also their too luxuriant growth during the summer months; and by hardening and ripening the wood, renders them strong and firm, and therefore more likely to bloom; which is, in these ornamental plants, the principal object of the cultivator: besides that they are not so liable to be injured by the severities of the succeeding winter.

1744. *Autumn Treatment.* "Towards the latter end of August the natural heat of the atmosphere will be on the decline; therefore, except on particular fine days, when a small portion of air may be given, the lights must be kept perfectly close; but more especially so at night: as we have frequently at this season heavy chilling dews, and are also often surprised with unexpected showers of rain or hail; to admit either of which might be very injurious to the plants; however, by shutting up the house before the sun has withdrawn its influence entirely from it, and thereby warming the enclosed air, they may safely stand here some days longer.

"As soon as the month of September commences, it is time to think of getting the stoves ready for their reception; first, a quantity of fresh tan should be provided, sufficient to raise the bed at least six inches above the kirb or wall of the pit, in conjunction with the best of the old already there, which is to be extracted by sifting. Let the new tan be spread out to dry in ridges, upon some clean airy spot, or convenient yard, for two or three days, where it should be regularly turned twice or thrice a day, and covered with mats at night; while this is preparing, let the flues of the house be well cleaned and the walls white-washed; an operation necessary to be done every year in these departments, where strong fires are kept for such a length of time; likewise, let the old tan be sifted in the common way, with a pretty coarse sieve or riddle: some gardeners throw it entirely away, but the part sifted being mixed with the new, prevents its heating so violently as it otherwise would when first put in; it also tends to preserve a more regular heat in the other longer than it naturally would if used by itself; as it would be very violent at first, and consequently, like most other things that are worked up above their pitch, liable to be sooner exhausted in proportion to the first foundation.

"Having sifted and got away all the refuse of the old tan, let the fresh, if well dried, be immediately carried in, and both well mixed together in the pit; still adding, until the bed is raised to the proper height; this done, let the wood and glass-work, kirbs, passages, &c. in short, every part of the house be diligently washed; for the twofold purpose of endeavouring to clear it as much as possible from insects, as well as to give it a cleanly appearance: being thus prepared, the plants may be removed from the green-house, observing to examine each of them diligently lest any of those plagues so often mentioned, should find their way back to the stove.

"The pots must not by any means be plunged in the tan at first; as well on account of the danger of the violent heat injuring the roots, as because this early plunging might start them into a fresh growth; which, at this late season, would not be at all to their advantage. They must, therefore, be set on the surface of the tan in regular order, where they may stand twelve or fifteen days, or perhaps longer; being guided in this particular by the state of the atmosphere abroad, as well as the internal temperature of the heat in the pit: by the first week in October, the heat of the external air will be considerably abated, and that in the pit sufficiently moderate.

"The time for plunging being fixed on, observe to have it done in the most exact manner, placing the tall plants towards the back or centre, and the lower ones to the front or sides of the pit in regular order; according to the form of the house, and the mode of arrangement adopted. If saw-dust is used, it will contribute much to their cleanliness, and also make a more agreeable appearance than the tan. All being set to rights, and the passages, &c. swept clean, give the plants a good syringing to wash off whatever dust they may have acquired during their removal, which will complete the business for this time.

"The principal care afterwards for a few weeks, is to give them a reasonable share of fresh air and water, according to the temperature of the weather; but it is more proper to perform the watering, syringing, and steaming, from this time to the beginning or middle of May, in the forenoon; observing to do it while the rays of the sun fall so obliquely as to insure the plants from being injured by it: should it be done in the evening, the air in the house would unavoidably get chilled, especially in frosty weather. It is even necessary that the water used for this purpose should be nearly of the same temperature as the air in the house.

"About the middle of October it will be necessary to add a little fire-heat at night, beginning with slow fires at first, and regularly increasing them as the severities of the weather increase.

"Although a circulation of fresh air is at all times requisite to the health of plants, yet the heat of the external atmosphere will at this season be so much diminished that it will not be found convenient to admit it in any considerable quantity, in fact, none should be given, except on particular fine days; when the front or end lights may be opened a few inches. They should be shut early in the day, seldom permitting them to remain open longer than one o'clock; thereby giving the sun time to warm the fresh admitted air before the chill of the night commences; even this little indulgence cannot be allowed from about the end of October until the beginning of April: as the strong cold winds which generally blow during the winter months, find of themselves but too many entrances.

" As to watering in the winter, discontinue it to those plants plunged in the pit, as the moisture of the tan, added to that which proceeds from the syringe, will be found quite sufficient for most of them; on the contrary, those over the flues, or on the shelves or kirbs near the fires, will require an additional portion on account of the strong fires necessary to be kept when the weather happens to be severe. The use of the syringe and steam must also be stopped in the severest frosts, lest by that means the house should get over chilled; however, they may both be used freely, when the weather proves moderately mild and fine; but by no means is it to be understood, that the house at this time is to be kept in a continual mist; or, on the other hand, that the plants are not to be carefully examined as usual, and watered liberally when in want of it.

" It is necessary to notice that those plants which are inclined to be deciduous, and also some of the more tender ones, will be occasionally dropping part of their leaves; these should be picked off as soon as they appear, otherwise they will have rather a disagreeable appearance among the plants.

1745. *Winter Treatment.* About the middle or end of December, it will be necessary to have the tan in the pit turned, and renovated with a little fresh well-dried bark to enliven the heat, as the severest part of the season is still to be expected; however, in performing this work, great care is required that the plants are not chilled or injured by being removed out of the tan-bed at this cold season: therefore, the mildest weather must be chosen for performing the operation.

" The pit being cleared, immediately proceed to turn over and mix the old and new tan well together, in which, as soon as it is completed and levelled fit to receive the pots, they may be plunged without delay; as there is not that certain danger of a burning heat ascending now as in the summer months, in which season the powerful action of the sun occasions it to ascend more violently.

" Should it not be convenient to have the whole plunged the same day, those left will require to be set on the surface of the tan during night; lest by being left near the glass, or extreme parts of the house, they might be severely injured ere the morning by the cold air: as it is therefore advisable to keep them as short a time as possible out of the tan at this season, they should without fail be plunged the next or following day at farthest: it will be also requisite to keep a pretty brisk fire-heat in the house, while the plants are out of the tan, and until the bottom-heat in the pit becomes sufficently strong: else they will be liable thereby to droop, and lose many of their leaves in consequence of being checked at this season.

" Should it happen that a series of clear, fine weather, follows this operation, the action of the sun may possibly occasion the heat to rise rather violent in course of a few days after being renewed: to this particular attention must be paid, and if any such symptom should appear, it must be immediately remedied by lifting the pots out of their places, and throwing into the holes a small quantity of the surface tan; on which the pots may be again set in a loose manner; thus, by permitting the heat to pass freely off by the sides of the pots, it prevents its burning the earth or roots, which would be certain death to the plants: when its violence has subsided, let the pit be levelled, and pots properly replunged; but unless the weather, as already noticed, happens to be particularly clear, in all likelihood this labor will not be encountered.

" They will require from this time until about the beginning of March, nothing more than the usual care of watering when necessary, and cleaning them from all dirt or insects as soon as they appear; also to keep the temperature of the enclosed air as near to its regular pitch as possible: to assist in compassing this object, when the weather sets in severe, it will be proper to use either shutters of canvas or bass mats to cover all the lowest parts of the house; and in particular those at the greatest distance from the entrance of the fires every night; otherwise the frost will easily enter these remote parts, and chill the air through the whole house; the consequence of which may be very injurious: on the other hand, if these precautions are not attended to, there will be a necessity of keeping up a very strong fire-heat, which will likewise be attended with pernicious effects.

" It is in these intervals that that destructive insect the red spider makes the most rapid progress, on account of the necessity there exists of keeping the houses close, and supporting a dry, warm air, both of which circumstances are particularly congenial to its nature; therefore on all fine mild mornings, observe to raise a powerful steam in the house as already directed; by the frequent repetition of which there will be a possibility of keeping them under control.

"As the internal strength and heat of the tan will now be much on the decline, in consequence of the length of time it has been in use, it will be requisite to turn it more frequently, so that about the beginning of March, it should be again stirred to at least half its depth; which will afford a temperate heat, until the time in which the plants are usually sifted, when it is generally renewed.

"Some gardeners make it a practice to have merely the upper half of their tan-pits stirred at any time throughout the year, when the heat happens to be on the decline; this is certainly a very proper method where there is plenty of time and hands to perform it; as there is no danger of a burning heat arising; but it requires to be done so much the oftener, such heat seldom lasting above a month or six weeks; it consequently will not answer where these conveniences are not to be had. The plants being regulated in proper order as before, let them have the usual treatment until the time of sifting." *Exotic Gard.* p. 70.

Sect. II. *Climbing Bark-stove Plants.*

1746. CLIMBING BARK-STOVE PLANTS.

MAY.	JUNE.	JULY.	AUGUST.	SEPTEMBER.
Pergularia odoratissima	Aristolochia triloba, *p.*	Aristolochia odoratissi. *p.* Cratæva fragrans Gronovia scandens, *p.* Pergularia minor Roxburghia glorioseoides Thunbergia fragrans, *p.*	Abrus precatorius, *p.* Convolvulus speciosus, *p.* Jasminum hirsutum — multiflorum — sambac — — flo. pleno — — monstrum Passiflora biflora — quadrangularis	Convolvulus jalapa Jasminum auriculatum

The *Propagation* and *Culture* adopted for green-house climbers, is equally so for those of the bark-stove, the difference of temperature being taken into consideration. See 1048, and 1719.

Sect. III. *Bulbous rooted Bark-stove Plants.*

All the plants in this section may, no doubt, be kept in the dry-stove; but if it is wished that they should flower in any degree of perfection, they must be plunged in the bark-bed, when newly planted. The same remark will apply indeed to most of the dry-stove bulbs.

1747. BULBOUS-ROOTED BARK-STOVE PLANTS.

MAY.	JUNE.	JULY.	AUGUST.	SEPTEMBER.
Allium gracile Amaryllis falcata — flexilis — — angustifolia — — minor — reginæ — reticulata Hæmanthus coarctatus Ornithogalum arabicum — caudatum Pancratium amboinense	Amaryllis advena — brancla — cruciata — radiata — radula Hæmanthus albiflos — carinatus — pilosus — pubescens Ornithogalum latifolium	Amaryllis Brunswigii — ciliata — curvifolia — disticha — — undulata — josephinæ — longifolia — zeylanica Crinum americanum — asiaticum — australe — erubescens Hæmanthus longifolius — multiflorus Pancratium caroliniaenum — mexicanum	Amaryllis aurea — crocea — equestris — latifolia — orientalis — ornata — undulæfolia Crinum amabile — giganteum — latifolium Hæmanthus coccineus — orbicularis Pancratium amœnum — calythinum — fragrans — littorale	Amaryllis brasiliensis — marginata — spectabilis Hæmanthus quadrivalvis

Sect. IV. *Perennial Herbaceous Bark-stove Plants.*

1748. HERBACEOUS BARK-STOVE PLANTS.

MAY.	JUNE.	JULY.	AUGUST.	SEPTEMBER.
Ærides odoratum, *p.*	Lobelia surinamensis, *p.* Peliosanthes teta	Buttneria scabra, *p.* Lobelia longiflora, *p.* Tacca integrifolia — pinnatifida	Achyranthes porrigens Dionæa muscipula, *p.* Elephantophus scaber Gloriosa superba, *p.*	Columnea hirsuta, *p.* — scandens Leea crispa — macrophylla Lobelia assurgens

The *Propagation* and *Culture* of these need not be entered on, being essentially the same as for hardy or green-house herbaceous plants, the difference of temperature being taken into consideration. See 1656, and 1719.

Such as have tuberous roots must be treated on the same principle as tubers in the open garden, as for example, those of *Fumaria cava*, *Erythronium*, &c. which have their regular seasons of rest. That grand, beautiful tuberous-rooted stove-plant, the *Gloriosa superba*, for want of attention to the nature of its roots and its habits of growth, seldom produces flowers in this country. "Its failure," J. Sweet observes, "arises chiefly from the defective method in which its roots are preserved during their inaction, and from the want of proper treatment, when they first vegetate in the spring. Injured at these periods, the plants generally continue through the summer, weak and unpromising, throwing up only a few small stems, which do not flower in sufficient strength and beauty." Under the following management, J. Sweet has had perfect success, and has known a single root grow ten feet in the course of a season, with numerous blossoms upon it.

"When the stalks and foliage have decayed in the autumn, and left the root, like a well-ripened potatoe, in a dormant state, the pot containing it must be removed from the bark-bed to the top of the hot-house flue, at some distance from the fire, all the warmth at this time necessary being merely what is sufficient to keep the earth in the pot free from damp; and to prevent the waterings of the house, or other moisture, falling on the earth in the pot, it should be covered, by inverting upon it in another pot of the same size; or if larger, it will hang over its edges and more effectually exclude the wet. If the roots are small, two or three may be placed together in the same pot, whilst in their dormant state; but if they are thus shifted, the mould must be well shaken down in the pot, in order to prevent the access of air to them; the old mould in which they grew must also be used; for fresh earth or sand would stimulate them to move too early.

"About the second week in March, the roots must be planted, putting one or two, according to their size, into pots measuring six inches over. The best compost for them is fresh loam, mixed with an equal quantity of bog earth of good quality: the loam should be good, not over rich with dung, nor too heavy. The roots are to be covered about two inches deep, and care must be taken not to break them, unless nature has shown where it is practicable to divide them easily. The pots, when filled, must be plunged into the bark-bed, where the heat should be equal to ninety-five degrees of Fahrenheit's scale. Water is to be given very sparingly at first, and though, as they grow, they will require a more liberal supply, yet it is necessary, at all times, to be very moderate in giving it. The heat must be well kept up, and as the shoots extend, they must be supported by sticks, or trained in any direction on wire or cords." (*Hort. Trans.* vol. iii. 23.)

Sect. V. *Annual Herbaceous Bark-stove Plants.*

1749. BARK-STOVE ANNUALS.

MAY.	JUNE.	JULY.	AUGUST.	SEPTEMBER.
		Amethystea cærulea, p.	Amaranthus bicolor	Celosia argentea
		Calceolaria pinnata	— cruentus	— cernua
		Campanula capensis	— rubricaulis	— cristata rub.
		Cassia chamæchrista	— tricolor	— — dwarf, red
		— tora	Browallia demissa	— — tall, buff
		Cleome pentaphylla, p.	— elata cœrulea	— — dwarf
		— spinosa	— — flo. albo	— — imperial, red
		— viscosa	Buchnera capensis, p.	— — purple
		Convolvulus pes capræ	— fœtida	— — buff
		Crotolarea juncea	Campanula debilis	— — variegat.
		Hedysarum gangeticum	Cardiospermum halicacabum	Clitoria brasiliana, p.
		— vespertillio	Convolvulus nil. p.	— ternatea
		Heliophila integrifolia	— tridentatum	— — flo. albo
		Heliotropium indicum, p.	Ipomæa phœnicea	Crotolaria verrucosa
		Impatiens balsamina	— quamoclit	Datura fastuosa, pl.
		— — flesh-col.dble	— — flo. albo	— — flo. albo
		— bizar, tall, dble.	Lobelia gracilis, p.	Gomphrena globosa
		— — dwarf, dble.	Mimosa pudica	— — flo. albo
		— — pur.str.dble.	— sensitiva	— — flo. stri.
		— — scarl.str.dble	Sida cordifolia, p.	Martynia proboscidea
		Mesembryanthemum glabrum		Mesembryanthemum crystallinum
		— pinnatifidum		Pentapetes phœnicea, p.
		Physalis prostrata, p.		
		Sida dilleniana		
		— hastata		
		Solanum melongena		
		— — fructu purp.		

Propagation and Culture. They are all propagated from seeds, most of which ripen in this country; but some few sorts are continued by cuttings for the sake of preserving particular variations. Sow in February or March in pots, to be plunged in a hot-bed; prick out the plants into the smallest sized pots, when they have attained one or two proper leaves, and shift them once or twice into pots a size larger in the manner recommended for the balsam (1653); keeping the plants in hot-beds or pits till ready to blossom, when they may either be removed to such of the houses as are empty at the time, as the bulb-house, green-house, &c. or assembled in a house devoted to annuals. Some few of them, as the ice-plant (*Mesmbryanthemum crystallinum*), and egg-plant (*Solanum Melongenum*) may be plunged in a warm situation in the open garden.

Sect. VI. *Aquatic Stove Plants.*

1750. HOT-HOUSE AQUATIC PLANTS.

MARCH.	JUNE.	JULY.	AUGUST.	SEPTEMBER.
Arum venosum	Menyanthes indica	Aponogeton angustifolium	Aponogeton monostachyon	Cyperus papyrus
Cyperus alternifolius	— ovata	— distachyon	Damasonium indicum	Thalia dealbata
	Nymphæa pubescens	Euryale ferox	Nymphæa lotus	
	— pygmæa	Nelumbium speciosum	Pontederia cordata	
	Pontederia dilatata	Nymphæa cærulea	Sagittaria obtusifolia	
		— rubra		
		— stellata		
		— versicolor		
		Philydrum lanuginosum		
		Sagittaria lancifolia		

1751. *Propagation and Culture.* Being all herbaceous plants they are to be propagated as these generally are; some are raised from seeds, which in general should be sown as soon as ripe, and the pots plunged in shallow water; when the plants come up, they may be transplanted into other pots, and shifted as they advance in growth, till in a pot of sufficient size to admit their flowering, which will generally take place the same season. Instead of being kept in pots, the plants may be inserted in a bed of earth on the bottom of the aquarium. The most beautiful of the exotic aquatics, are the nymphæas and nelumbiums; these, with other genera, have been cultivated to a high degree of perfection by N. Kent, who, instead of a regular aquarium employs pans and small cisterns, plunged in hot-beds. Where a regular aquarium is not formed to be heated by flues, (*figs.* 422. and 423.) we would suggest the idea of a cistern (*fig.* 462.) to be placed on pillars in the open air. When the season for forcing the nymphæas commenced, it may be surmounted by a hot-bed frame of the same diameter, and surrounded by linings of dung. By this means any required degree of heat might be produced during the flowering season, and if it were desired to continue any of the plants in a growing state during winter, the linings and frame could be continued; if not, the plants might be removed to a reserve aquarium, in the stove or propagation-house.

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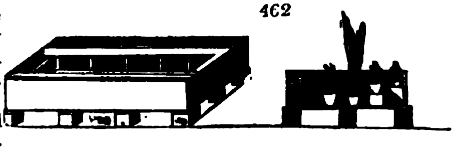

N. Kent finds that *Menyanthes*, *Nymphæa*, and *Euryale ferox* (an annual, with singularly constructed leaves, often of thirty inches diameter), thrive best in a close heat. Menyanthes requires only to be fresh potted in spring, and placed in a pan in a hot-bed, where it will flower the whole summer. The nymphæas having tuberous roots, he keeps, through the winter, in small pots, (sixties,) in a dormant state, in a small trough of water in the stove. Early in April, he prepares them for their summer culture, by placing them in small wooden cisterns, two feet long, fourteen inches wide, and six inches deep, and then placing these in any cucumber or melon frames which may be then in use. " In about a fortnight or three weeks a number of offsets or runners will be thrown from the bulbs. These are then separated and put into small pots; and in the course of ten or twelve days a strong plant of each species is selected, and placed in the cisterns for flowering.

" The tender aquatics, especially the *Nymphæas*, grow in a brick, three-light frame, thirteen feet long, and six feet broad; inside depth at back, five feet, and above the ground, four feet: which is filled with tan. I have four wooden cisterns, lined with lead, four feet long, two feet six inches wide, and fifteen inches deep: they are plunged in the tan, and filled with strong rich loam, about six inches deep, the bottom part of which is rammed down; and the plants placed in them, one or two in each, according to their habit of growth. The cisterns are then filled with water by degrees. As the plants advance in size, they must be replenished and cleared from confervæ as often as necessary; and if the plants are occasionally watered over their leaves, from a watering-pot, through a rose, their vigor will be greatly increased. It is important to keep them in a constant state of growth: for if checked, they will form bulbs; and grow no more during the season. This will be caused by cold; but this year (1817), the

" In *shifting*, let the plant be carefully turned out of its pot, in doing which, observe if the roots have perforated it in any part, so as to render it impossible to part them without breaking the one, or lacerating the other; in which case prefer the former as the slightest damage; however, when the ball of roots is divested of its pot, let the broken tiles, or whatever substance may have been used as draining, be carefully picked out without tearing off the roots that may have grown amongst them; also any caked or mossy substance on the surface, which will come easily off with the fingers. Then proceed to loosen the earth and matted roots, by gently patting them on the side of the ball with the hand; or otherwise, by pressing it so as to open the pores of the earth without cracking the roots; shake off any loose earth, and having a proper sized pot, ready prepared, put in a quantity of the fresh mould sufficient to raise the crown of the roots to about half an inch below the rim of the pot, on which set the plant; and add more earth, lightly shaking it in among the fibres; let the whole be pressed moderately light, but not so as to render it hard in the least degree, nor by any means using a stick for this purpose: another never failing attendant on the former practice, by which the roots are extremely liable to be torn or bruised; add mould sufficient to raise the surface level with the rim, as it will settle to a proper depth with watering, and smooth the whole off neatly with the hand.

" It will be found necessary, where there is much of this work to be done, to have two or three assistants, one of which to be employed in supplying pots and other necessaries; the others in washing and cleaning from insects, &c. any plants that may happen to stand in need before shifted; and in tying them up properly to their sticks afterwards: new sticks should be had at least once a year, to hot-house plants in particular; as the old ones very often harbor more or less of the several pestiferous insects, which infest these deparments. This done, let the plants be set on a level spot together, and moderately watered with a fine rose-pot, held at a distance above their tops so as to give the leaves a good rincing; but observe to give no more water than is sufficient to settle the fresh mould to the roots, and by no means to slush or give the surface that puddled appearance, so very disagreeable to be observed in departments where neatness should be the uniform and leading principle. Having thus finished the first division, let them be immediately taken to the stove, to be set on the fresh-turned tan for the present, and those that remained there, taken to the shed to be treated and shifted in the same manner as the others.

" When the whole are shifted, they may be partially plunged for a few days; setting the pot about half its depth loosely into the tan, to avoid the danger that attends too violent a heat arising in the pit; which is frequently the case, when it has been recently turned or augmented. However, there must be a pretty brisk fire heat kept up in the house, until the plants recover from their inactive state, the unavoidable consequence of their roots being so recently disturbed.

" They will be much benefited at this time by a moderate use of the hand-syringe, in the morning before the sun has begun to act upon them with force; also by raising a strong steam in the house, to be done by throwing water on the tops and sides of the warm flues. But when they are freely treated in this manner, they require but little from the water-pot; as over-watering is very pernicious to plants in general, and at no time is it more particularly so, than when they have been lately shifted. However this must unavoidably depend on the judgment of him in whose care they are placed; as some of them will require considerably more than others.

" In a few days, when the danger of a violent heat is over, the plants may be plunged neatly in the tan up to the rim; but observe that it is not left scattered on the surface of the pots, as it would give the work an extreme slovenly appearance; a few inches of clean saw-dust laid over the tan, gives a clean and neat appearance, which, in most gardens, is a particularly essential part of the curator's conduct.

" All the plants which require the aid of tan-heat, being properly plunged, and the remaining ones regulated on the different benches or shelves; let the place be well cleaned out, when little more will be necessary for a few weeks, than watering when requisite, squirting, steaming, and attention to the degree of heat necessary to be kept in the house at this season. This should in general be about sixty degrees. If it is kept much lower, it will considerably retard the plants in recovering their vigor; and if many degrees higher, the free growing kinds will soon over-top, and materially injure the weak and more tardy sorts unless prevented; besides themselves becoming unsightly, the consequence of being drawn, or forced into long weak ungainly stems.

1742. *Insects.* As the heat increases with the advancing season, the different species of insects to which these departments are liable, will multiply incredibly. Those which seem to make the greatest havoc amongst plants in the hot-house, are, the green-fly, the thrips, the mealy white bug, the great scaly bug, the small scale, or the pine-bug, and the red spider; which, although the smallest, is by far the most destructive of any of the species that exist in these departments.

" For the first and second of these species above-mentioned, there is no process which seems to take so much effect on them, as a strong fumigation of tobacco; repeated twice or thrice, according to the strength the insects may have attained.

" For the third, fourth, and fifth species there is none of the several expensive methods mentioned in different authors so effectual, as simply picking them off: this may be said to be tedious, but then it has surety to plead; besides, that the plants are in no manner disfigured by the operation; but unless regularity be observed in looking for them, examining plant by plant, and leaf by leaf, from top to bottom, and also any incisions or cracks that may be in the bark of the stem, &c. there will be a constant and tiresome employment; on the contrary, if regularly done, one operation will be of more service than five, if executed in a careless inattentive manner.

" As each individual plant is picked, it should be carefully washed with a strong lixivium of soft soap and water, which will have a powerful effect on their remains or young ovaria, which are in general sufficiently small to elude the eye, or perhaps so situated within the young buds that they cannot be got at without materially injuring the future growth; the wash will, however, penetrate into these secret holds, and in general be fully adequate to their destruction.

" When the plants are out of the houses in summer, every part of it should be well washed with strong soap-suds, in which a little of the same tobacco, as used for fumigating, has been infused; in particular, all the joints of the wood-work, and also whatever nail-holes or other crevices may happen to be therein: as in these places some of the species, more especially the white mealy bug, is much inclined to secrete itself for breeding. This operation will, however, if performed in spring and autumn, be a great means of their extinction, and will tend in a great degree to check the multiplication of the others.

" The last and most pernicious of the species mentioned, viz. the red spider, is to be overcome neither by fumigation nor picking; but by the free but well directed use of common water; either by steam or with the hand-syringe. The steam, by creating a fine dew in the house, prevents the insect from extending its slender web from leaf to leaf, and thus checks its progress; while the syringe, by superior force, breaks the ligaments of those already made, and in most instances washes the insects to the ground; where, although it may recover its fall for the first or second application, it is in the end sure to perish. They will sometimes, however, elude the greatest diligence, for a while, by collecting under large horizontal leaves, which serve them as citadels against the attacks of the water; but here they will soon betray themselves, by extracting the fluid substance of the leaf for their support; in consequence of which it loses its verdure and becomes conspicuous; this, when found, should be picked off, and taken out of the house immediately; for if left any where among the plants they will in a little time establish themselves on others. If they happen to be discovered before the leaf has lost its beauty, they may be rubbed off with the hand on a sheet of paper, and expelled the premises.

" If at any time the quantity of water necessary to be used in these operations, should occasion the earth to become over-wet, in those pots particularly which are plunged in the bark-bed; the syringing must be omitted, and use made of the steam only, until they again become reasonably dry. Neither should it be performed when the sun acts freely upon the plants, lest their leaves become in consequence disfigured. For the water forms itself into little spherules, the surfaces of which collect the rays of the sun in a greater or less degree according to their convexity; and thereby the leaves are disfigured by being burned in the focus of each spherule.

1743. *Summer Treatment.* " As the season advances, it will become necessary to admit a reasonable portion of air on all fine sunny days; and also to decrease the strength of the fires at night: but in these particulars, the only criterions to be guided by, are experience and observations on the weather, the variations in which render it utterly impossible to lay down any certain rule to act by, further than the admonitions of the thermometer; observing to keep it pretty near to sixty degrees. About the beginning or middle of May at farthest, fires may be omitted entirely; as the natural heat of the season united to that of the bark-bed, will in general be found sufficient to keep the mercury up to the above-mentioned point.

" Towards the latter end of June, the plants by this treatment will generally be in a very luxuriant free state of growth; it will be therefore requisite to raise the pots quite out of the tan-bed, to check and harden them a little, so as to be able to bear the air of the green-house for a few weeks, which will be of considerable advantage to them the ensuing winter.

" Should any of them remain of a sickly appearance, (and that a few may be in that state in large collections, must be reasonably expected,) or any particular tender sorts among them, they must be removed to a separate house, as already hinted, where the tan being previously forked up, and otherwise properly prepared for their reception, they must be immediately replunged: if no such house is convenient, a large deep hot-bed frame, set on a good bed of well prepared dung, will answer nearly as well for this purpose; having nine or ten inches of rotten tan or saw-dust spread regularly over the bed within the frame, in which the pots are to be plunged.

" It is necessary to observe, that when the bed has been got ready, a few days should elapse before the plants are set in it, that the steam and violent heat may have sufficient time to evaporate. At the expiration of five or six days, however, the plants in their pots may be set on the surface; where they should remain a little time longer without being plunged; but particular care is necessary that the frame at this time may not be kept too close, which would occasion the heat to ascend more rapidly than the plants could well bear; to avoid this, give plenty of air in the day-time and also a little at night, with a mat hung before it to prevent the sharp air entering into the frame. When the heat of the bed has attained a proper temperature, so that there may be no danger of the roots being burned or otherwise injured, let the plants be plunged; and afterwards treated in the same manner as if they were still in the hot-house: only observing to keep those that are in a weak state rather dry; as nothing can be more injurious to a sickly plant than too much moisture, by reason of its inability to imbibe the usual quantity through want of vigor.

" The plants which remain, intended to be set in the green-house, must now have a considerable increase of fresh air on all fine days; and also (the pots being quite out of the tan,) they will require a greater portion of water than has been usually given them when plunged.

" As soon as the weather becomes settled, and the night perfectly free from all chilliness and frost, which is seldom much before the middle of July, the plants may with safety be removed from the stove to the green-house; and set regularly, on the benches lately occupied by the green-house plants; which they will ornament very much, during the time the latter are set in clumps in the open air.

" The stove may in this interval be furnished with a few of each of the different tender annuals, to give it something of a gay, lively appearance. They will likewise in some measure serve as a kind of natural trap for the spider, &c.; as they will, should there be any of them left in the house, immediately attack the soft tender leaves of these plants, in which case, as soon as they are observed to be collected in force upon any individual plant, it should be removed to the open air, without loss of time, and another substituted in its room; this practice will contribute towards subduing this formidable enemy, so that, combined with other exertions, by the time it becomes necessary to have the hot-house plants reinstated in the bark-bed, the house should be pretty free from them.

" These being now in the green-house, will require a little attention to preserve their verdure, such as keeping the glasses close at night and admitting air only on fine days; thus to exclude any chilling or strong winds that may happen to prevail, which would occasion the leaves to contract a languid, yellowish appearance; however, in course of a week or ten days, they will be able to withstand any weather that may in reason be expected at this season; unless it happens to be unusually violent, in which case it must be guarded against accordingly.

" The principal care they will require now for about a month or so, is to be regularly cleaned from insects, weeds, and dead leaves, whenever they appear; also casually tying up any that may want it, and watering, in which last article, it must be observed, that as they now stand upon dry boards, and the air acting freely on every side of the pot, they must consequently be allowed an increase of water to counbalance its effect.

" The evening is the most proper time for watering at this season, as well as syringing, particularly when dry and warm; for if administered in the morning, the rising heat of the sun exhales it, before it has time to descend to the lower roots; and unless replenished frequently in course of the succeeding day, they are liable to much injury, by being left in an exhausted state until the following morning, and which, it is probable, may not prove more fortunate; whereas, if administered in the evening, it refreshes them after the preceding day's drought, and having sufficient time to penetrate to the roots, they have the night to recruit themselves against the following day. Besides, in syringing, there is much more danger of having the leaves scorched by the sun's rays, if done in the morning, than if done as here recommended: but as either extreme is dangerous, care must be taken to use no more water than is evidently necessary for the health of the plants: for if used to that degree that the earth becomes sour and deprived of its vegetative powers, the consequences may be rather unpleasant.

" By thus setting the plants in the green-house, it tends to prevent the increase of insects; also their too luxuriant growth during the summer months; and by hardening and ripening the wood, renders them strong and firm, and therefore more likely to bloom; which is, in these ornamental plants, the principal object of the cultivator: besides that they are not so liable to be injured by the severities of the succeeding winter.

1744. *Autumn Treatment.* "Towards the latter end of August the natural heat of the atmosphere will be on the decline; therefore, except on particular fine days, when a small portion of air may be given, the lights must be kept perfectly close; but more especially so at night: as we have frequently at this season heavy chilling dews, and are also often surprised with unexpected showers of rain or hail; to admit either of which might be very injurious to the plants; however, by shutting up the house before the sun has withdrawn its influence entirely from it, and thereby warming the enclosed air, they may safely stand here some days longer.

"As soon as the month of September commences, it is time to think of getting the stoves ready for their reception; first, a quantity of fresh tan should be provided, sufficient to raise the bed at least six inches above the kirb or wall of the pit, in conjunction with the best of the old already there, which is to be extracted by sifting. Let the new tan be spread out to dry in ridges, upon some clean airy spot, or convenient yard, for two or three days, where it should be regularly turned twice or thrice a day, and covered with mats at night; while this is preparing, let the flues of the house be well cleaned and the walls white-washed; an operation necessary to be done every year in these departments, where strong fires are kept for such a length of time; likewise, let the old tan be sifted in the common way, with a pretty coarse sieve or riddle: some gardeners throw it entirely away, but the part sifted being mixed with the new, prevents its heating so violently as it otherwise would when first put in; it also tends to preserve a more regular heat in the other longer than it naturally would if used by itself; as it would be very violent at first, and consequently, like most other things that are worked up above their pitch, liable to be sooner exhausted in proportion to the first foundation.

"Having sifted and got away all the refuse of the old tan, let the fresh, if well dried, be immediately carried in, and both well mixed together in the pit; still adding, until the bed is raised to the proper height; this done, let the wood and glass-work, kirbs, passages, &c. in short, every part of the house be diligently washed; for the twofold purpose of endeavouring to clear it as much as possible from insects, as well as to give it a cleanly appearance: being thus prepared, the plants may be removed from the green-house, observing to examine each of them diligently lest any of those plagues so often mentioned, should find their way back to the stove.

"The pots must not by any means be plunged in the tan at first; as well on account of the danger of the violent heat injuring the roots, as because this early plunging might start them into a fresh growth; which, at this late season, would not be at all to their advantage. They must, therefore, be set on the surface of the tan in regular order, where they may stand twelve or fifteen days, or perhaps longer; being guided in this particular by the state of the atmosphere abroad, as well as the internal temperature of the heat in the pit: by the first week in October, the heat of the external air will be considerably abated, and that in the pit sufficiently moderate.

"The time for plunging being fixed on, observe to have it done in the most exact manner, placing the tall plants towards the back or centre, and the lower ones to the front or sides of the pit in regular order; according to the form of the house, and the mode of arrangement adopted. If saw-dust is used, it will contribute much to their cleanliness, and also make a more agreeable appearance than the tan. All being set to rights, and the passages, &c. swept clean, give the plants a good syringing to wash off whatever dust they may have acquired during their removal, which will complete the business for this time.

"The principal care afterwards for a few weeks, is to give them a reasonable share of fresh air and water, according to the temperature of the weather; but it is more proper to perform the watering, syringing, and steaming, from this time to the beginning or middle of May, in the forenoon; observing to do it while the rays of the sun fall so obliquely as to insure the plants from being injured by it: should it be done in the evening, the air in the house would unavoidably get chilled, especially in frosty weather. It is even necessary that the water used for this purpose should be nearly of the same temperature as the air in the house.

"About the middle of October it will be necessary to add a little fire-heat at night, beginning with slow fires at first, and regularly increasing them as the severities of the weather increase.

"Although a circulation of fresh air is at all times requisite to the health of plants, yet the heat of the external atmosphere will at this season be so much diminished that it will not be found convenient to admit it in any considerable quantity, in fact, none should be given, except on particular fine days; when the front or end lights may be opened a few inches. They should be shut early in the day, seldom permitting them to remain open longer than one o'clock; thereby giving the sun time to warm the fresh admitted air before the chill of the night commences; even this little indulgence cannot be allowed from about the end of October until the beginning of April: as the strong cold winds which generally blow during the winter months, find of themselves but too many entrances.

" As to watering in the winter, discontinue it to those plants plunged in the pit, as the moisture of the tan, added to that which proceeds from the syringe, will be found quite sufficient for most of them; on the contrary, those over the flues, or on the shelves or kirbs near the fires, will require an additional portion on account of the strong fires necessary to be kept when the weather happens to be severe. The use of the syringe and steam must also be stopped in the severest frosts, lest by that means the house should get over chilled; however, they may both be used freely, when the weather proves moderately mild and fine; but by no means is it to be understood, that the house at this time is to be kept in a continual mist; or, on the other hand, that the plants are not to be carefully examined as usual, and watered liberally when in want of it.

" It is necessary to notice that those plants which are inclined to be deciduous, and also some of the more tender ones, will be occasionally dropping part of their leaves; these should be picked off as soon as they appear, otherwise they will have rather a disagreeable appearance among the plants.

1745. *Winter Treatment.* About the middle or end of December, it will be necessary to have the tan in the pit turned, and renovated with a little fresh well-dried bark to enliven the heat, as the severest part of the season is still to be expected; however, in performing this work, great care is required that the plants are not chilled or injured by being removed out of the tan-bed at this cold season: therefore, the mildest weather must be chosen for performing the operation.

" The pit being cleared, immediately proceed to turn over and mix the old and new tan well together, in which, as soon as it is completed and levelled fit to receive the pots, they may be plunged without delay; as there is not that certain danger of a burning heat ascending now as in the summer months, in which season the powerful action of the sun occasions it to ascend more violently.

" Should it not be convenient to have the whole plunged the same day, those left will require to be set on the surface of the tan during night; lest by being left near the glass, or extreme parts of the house, they might be severely injured ere the morning by the cold air: as it is therefore advisable to keep them as short a time as possible out of the tan at this season, they should without fail be plunged the next or following day at farthest: it will be also requisite to keep a pretty brisk fire-heat in the house, while the plants are out of the tan, and until the bottom-heat in the pit becomes sufficently strong: else they will be liable thereby to droop, and lose many of their leaves in consequence of being checked at this season.

" Should it happen that a series of clear, fine weather, follows this operation, the action of the sun may possibly occasion the heat to rise rather violent in course of a few days after being renewed: to this particular attention must be paid, and if any such symptom should appear, it must be immediately remedied by lifting the pots out of their places, and throwing into the holes a small quantity of the surface tan; on which the pots may be again set in a loose manner; thus, by permitting the heat to pass freely off by the sides of the pots, it prevents its burning the earth or roots, which would be certain death to the plants: when its violence has subsided, let the pit be levelled, and pots properly replunged; but unless the weather, as already noticed, happens to be particularly clear, in all likelihood this labor will not be encountered.

" They will require from this time until about the beginning of March, nothing more than the usual care of watering when necessary, and cleaning them from all dirt or insects as soon as they appear; also to keep the temperature of the enclosed air as near to its regular pitch as possible: to assist in compassing this object, when the weather sets in severe, it will be proper to use either shutters of canvas or bass mats to cover all the lowest parts of the house; and in particular those at the greatest distance from the entrance of the fires every night; otherwise the frost will easily enter these remote parts, and chill the air through the whole house; the consequence of which may be very injurious: on the other hand, if these precautions are r attended to, there will be a necessity of keeping up a very strong fire-heat, which will likewise be attended with pernicious effects.

" It is in these intervals that that destructive insect the red spider makes the most rapid progress, on account of the necessity there exists of keeping the houses close, and supporting a dry, warm air, both of which circumstances are particularly congenial to its nature; therefore on all fine mild mornings, observe to raise a powerful steam in the house as already directed; by the frequent repetition of which there will be a possibility of keeping them under control.

"As the internal strength and heat of the tan will now be much on the decline, in consequence of the length of time it has been in use, it will be requisite to turn it more frequently, so that about the beginning of March, it should be again stirred to at least half its depth; which will afford a temperate heat, until the time in which the plants are usually sifted, when it is generally renewed.

"Some gardeners make it a practice to have merely the upper half of their tan-pits stirred at any time throughout the year, when the heat happens to be on the decline; this is certainly a very proper method where there is plenty of time and hands to perform it; as there is no danger of a burning heat arising; but it requires to be done so much the oftener, such heat seldom lasting above a month or six weeks; it consequently will not answer where these conveniences are not to be had. The plants being regulated in proper order as before, let them have the usual treatment until the time of sifting." *Exotic Gard.* p. 70.

Sect. II. *Climbing Bark-stove Plants.*

1746. CLIMBING BARK-STOVE PLANTS.

MAY.	JUNE.	JULY.	AUGUST.	SEPTEMBER.
Pergularia odoratissima	Aristolochia triloba, p.	Aristolochia odoratissi. p. Crateva fragrans Gronovia scandens, p. Pergularia minor Roxburghia gloriosoides Thunbergia fragrans, p.	Abrus precatorius, p. Convolvulus speciosus, p. Jasminum hirsutum — multiflorum — sambac — — flo. pleno — — monstrum Passiflora biflora — quadrangularis	Convolvulus Jalapa Jasminum auriculatum

The *Propagation* and *Culture* adopted for green-house climbers, is equally so for those of the bark-stove, the difference of temperature being taken into consideration. See 1048, and 1719.

Sect. III. *Bulbous rooted Bark-stove Plants.*

All the plants in this section may, no doubt, be kept in the dry-stove; but if it is wished that they should flower in any degree of perfection, they must be plunged in the bark-bed, when newly planted. The same remark will apply indeed to most of the dry-stove bulbs.

1747. BULBOUS-ROOTED BARK-STOVE PLANTS.

MAY.	JUNE.	JULY.	AUGUST.	SEPTEMBER.
Allium gracile Amaryllis falcata — flexilis — — angustifolia — — minor — reginæ — reticulata Hæmanthus coarctatus Ornithogalum arabicum — caudatum Pancratium amboinense	Amaryllis advena — branda — cruciata — radiata — radula Hæmanthus albiflos — carinatus — pilosus — pubescens Ornithogalum latifolium	Amaryllis Brunswigii — ciliata — curvifolia — disticha — — undulata — josephinæ — longifolia — zeylanica Crinum americanum — asiaticum — australe — erubescens Hæmanthus longifolius — multiflorus Pancratium carolineanum — mexicanum	Amaryllis aurea — crocea — equestris — latifolia — orientalis — ornata — undulæfolia Crinum amabile — giganteum — latifolium Hæmanthus coccineus — orbicularis Pancratium amœnum — calythinum — fragrans — littorale	Amaryllis brasiliensis — marginata — spectabilis Hæmanthus quadrivalvis

Sect. IV. *Perennial Herbaceous Bark-stove Plants.*

1748. HERBACEOUS BARK-STOVE PLANTS.

MAY.	JUNE.	JULY.	AUGUST.	SEPTEMBER.
Ærides odoratum, p.	Lobelia surinamensis, p. Peliosanthes teta	Buttneria scabra, p. Lobelia longiflora, p. Tacca integrifolia — pinnatifida	Achyranthes porrigens Dionæa muscipula, p. Elephantophus scaber Gloriosa superba, p.	Columnea hirsuta, p. — scandens Leea crispa — macrophylla Lobelia assurgens

The *Propagation* and *Culture* of these need not be entered on, being essentially the same as for hardy or green-house herbaceous plants, the difference of temperature being taken into consideration. See 1656, and 1719.

Such as have tuberous roots must be treated on the same principle as tubers in the open garden, as for example, those of *Fumaria cava*, *Erythronium*, &c. which have their regular seasons of rest. That grand, beautiful tuberous-rooted stove-plant, the *Gloriosa superba*, for want of attention to the nature of its roots and its habits of growth, seldom produces flowers in this country. "Its failure," J. Sweet observes, "arises chiefly from the defective method in which its roots are preserved during their inaction, and from the want of proper treatment, when they first vegetate in the spring. Injured at these periods, the plants generally continue through the summer, weak and unpromising, throwing up only a few small stems, which do not flower in sufficient strength and beauty." Under the following management, J. Sweet has had perfect success, and has known a single root grow ten feet in the course of a season, with numerous blossoms upon it.

"When the stalks and foliage have decayed in the autumn, and left the root, like a well-ripened potatoe, in a dormant state, the pot containing it must be removed from the bark-bed to the top of the hot-house flue, at some distance from the fire, all the warmth at this time necessary being merely what is sufficient to keep the earth in the pot free from damp; and to prevent the waterings of the house, or other moisture, falling on the earth in the pot, it should be covered, by inverting upon it in another pot of the same size; or if larger, it will hang over its edges and more effectually exclude the wet. If the roots are small, two or three may be placed together in the same pot, whilst in their dormant state; but if they are thus shifted, the mould must be well shaken down in the pot, in order to prevent the access of air to them; the old mould in which they grew must also be used; for fresh earth or sand would stimulate them to move too early.

"About the second week in March, the roots must be planted, putting one or two, according to their size, into pots measuring six inches over. The best compost for them is fresh loam, mixed with an equal quantity of bog earth of good quality: the loam should be good, not over rich with dung, nor too heavy. The roots are to be covered about two inches deep, and care must be taken not to break them, unless nature has shown where it is practicable to divide them easily. The pots, when filled, must be plunged into the bark-bed, where the heat should be equal to ninety-five degrees of Fahrenheit's scale. Water is to be given very sparingly at first, and though, as they grow, they will require a more liberal supply, yet it is necessary, at all times, to be very moderate in giving it. The heat must be well kept up, and as the shoots extend, they must be supported by sticks, or trained in any direction on wire or cords." (*Hort. Trans.* vol. iii. 23.)

Sect. V. *Annual Herbaceous Bark-stove Plants.*

1749. BARK-STOVE ANNUALS.

MAY.	JUNE.	JULY.	AUGUST.	SEPTEMBER.
		Amethystea cærulea, p. Calceolaria pinnata Campanula capensis Cassia chamæchrista — tora Cleome pentaphylla, p. — spinosa — viscosa Convolvulus pes capræ Crotolarea juncea Hedysarum gangeticum — vespertilio Heliophila integrifolia Heliotropium indicum, p. Impatiens balsamina — — flesh-col.dble — bizar, tall, dble. — — dwarf, dble. — — pur.str.dble. — — scarl.str.dble Mesembryanthemum glabrum — pinnatifidum Physalis prostrata, p. Sida dilleniana — hastata Solanum melongena — — fructu purp.	Amaranthus bicolor — cruentus — rubricaulis — tricolor Browallia demissa — elata cœrulea — — flo. albo Buchnera capensis, p. — fœtida Campanula debilis Cardiospermum halicacabum Convolvulus nil. p. — tridentatum Ipomæa phœnicea — quamoclit — — flo. albo Lobelia gracilis, p. Mimosa pudica — sensitiva Sida cordifolia, p.	Celosia argentea — cernua — cristata rub. — — dwarf, red — — tall, buff — — dwarf — — imperial, red — — purple — — buff — — variegat. Clitoria brasiliana, p. — ternatea — — flo. albo Crotolaria verrucosa Datura fastuosa, pl. — — flo. albo Gomphrena globosa — — flo. albo — — flo. stri. Martynia proboscidea Mesembryanthemum crystallinum Pentapetes phœnicea, p.

Propagation and Culture. They are all propagated from seeds, most of which ripen in this country; but some few sorts are continued by cuttings for the sake of preserving particular variations. Sow in February or March in pots, to be plunged in a hot-bed; prick out the plants into the smallest sized pots, when they have attained one or two proper leaves, and shift them once or twice into pots a size larger in the manner recommended for the balsam (1653); keeping the plants in hot-beds or pits till ready to blossom, when they may either be removed to such of the houses as are empty at the time, as the bulb-house, green-house, &c. or assembled in a house devoted to annuals. Some few of them, as the ice-plant (*Mesmbryanthemum crystallinum*), and egg-plant (*Solanum Melongenum*) may be plunged in a warm situation in the open garden.

Sect. VI. *Aquatic Stove Plants.*

1750. HOT-HOUSE AQUATIC PLANTS.

MARCH.	JUNE.	JULY.	AUGUST.	SEPTEMBER.
Arum venosum Cyperus alternifolius	Menyanthes indica — ovata Nymphæa pubescens — pygmæa Pontederia dilatata	Aponogeton angustifolium — distachyon Euryale ferox Nelumbium speciosum Nymphæa cærulea — rubra — stellata — versicolor Philydrum lanuginosum Sagittaria lancifolia	Aponogeton monostachyon Damasonium indicum Nymphæa lotus Pontederia cordata Sagittaria obtusifolia	Cyperus papyrus Thalia dealbata

1751. *Propagation and Culture.* Being all herbaceous plants they are to be propagated as these generally are; some are raised from seeds, which in general should be sown as soon as ripe, and the pots plunged in shallow water; when the plants come up, they may be transplanted into other pots, and shifted as they advance in growth, till in a pot of sufficient size to admit their flowering, which will generally take place the same season. Instead of being kept in pots, the plants may be inserted in a bed of earth on the bottom of the aquarium. The most beautiful of the exotic aquatics, are the nymphæas and nelumbiums; these, with other genera, have been cultivated to a high degree of perfection by N. Kent, who, instead of a regular aquarium employs pans and small cisterns, plunged in hot-beds. Where a regular aquarium is not formed to be heated by flues, (*figs.* 422. and 423.) we would suggest the idea of a cistern (*fig.* 462.) to be placed on pillars in the open air. When the season for forcing the nymphæas commenced, it may be surmounted by a hot-bed frame of the same diameter, and surrounded by linings of dung. By this means any required degree of heat might be produced during the flowering season, and if it were desired to continue any of the plants in a growing state during winter, the linings and frame could be continued; if not, the plants might be removed to a reserve aquarium, in the stove or propagation-house.

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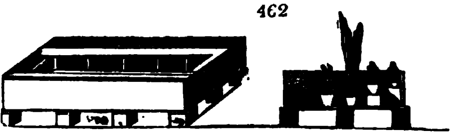

N. Kent finds that *Menyanthes*, *Nymphæa*, and *Euryale ferox* (an annual, with singularly constructed leaves, often of thirty inches diameter), thrive best in a close heat. Menyanthes requires only to be fresh potted in spring, and placed in a pan in a hot-bed, where it will flower the whole summer. The nymphæas having tuberous roots, he keeps, through the winter, in small pots, (sixties,) in a dormant state, in a small trough of water in the stove. Early in April, he prepares them for their summer culture, by placing them in small wooden cisterns, two feet long, fourteen inches wide, and six inches deep, and then placing these in any cucumber or melon frames which may be then in use. "In about a fortnight or three weeks a number of offsets or runners will be thrown from the bulbs. These are then separated and put into small pots; and in the course of ten or twelve days a strong plant of each species is selected, and placed in the cisterns for flowering.

"The tender aquatics, especially the *Nymphæas*, grow in a brick, three-light frame, thirteen feet long, and six feet broad; inside depth at back, five feet, and above the ground, four feet: which is filled with tan. I have four wooden cisterns, lined with lead, four feet long, two feet six inches wide, and fifteen inches deep: they are plunged in the tan, and filled with strong rich loam, about six inches deep, the bottom part of which is rammed down; and the plants placed in them, one or two in each, according to their habit of growth. The cisterns are then filled with water by degrees. As the plants advance in size, they must be replenished and cleared from confervæ as often as necessary; and if the plants are occasionally watered over their leaves, from a watering-pot, through a rose, their vigor will be greatly increased. It is important to keep them in a constant state of growth: for if checked, they will form bulbs; and grow no more during the season. This will be caused by cold; but this year (1817), the heat in June produced the effect, although they were shaded from the sun's rays by matting, and the lights considerably raised. Where dung is used, there is like danger, from its heating. After being planted out, they will show flowers in the course of a month, and some of them will continue blooming through the season. As soon as the plants have done flowering, and perfected their seeds, they disappear, and form bulbs in the mud. These, in the month of October, I put into small pots (sixty to the cast,) and place them in a trough of water, in the stove, where they remain dormant until the ensuing spring. The seeds are most likely to vegetate, if sown at the same time, and treated in the same manner. *Nymphæa cerulæa* will flower in the stove; but not so freely as in the frame. *Nymphæa stellata* seeds freely, but the root does not easily divide; indeed it is best grown, when treated as an annual. *Euryale ferox* does well under similar treatment to that of the *Nymphæas*; its seed should be sown about Christmas, and kept in the cistern of the stove." *Hort. Trans.* iii. 34.

Nelumbium speciosum "is easily raised from seed, which will retain its vegetative power for forty years, and with every advantage, in a fair season, produce blossom the first summer. It is generally grown in large tubs, with a few inches depth of water over the surface of the mould, placed in the tan-bed of the stove. By these means, I raised a fine plant last year: the seed was sown in May, and threw up several flower-buds, which did not come to perfection, but most probably would have done so, had the seed been sown two months earlier. The leaves produced were about two feet in diameter; but the plant went off in the winter, notwithstanding it was treated in the manner hitherto found the most successful; which has been, to allow the tub to remain in the tan, and become nearly dry, giving it no more water than the other plants around it. At Canton, it seems, they drain the ponds wherein it grows, and use the roots for food; but whether fibres of it are the parents of the ensuing crop, or the pots are replenished by seedlings, does not appear. Both are probable, as the roots, which have been kept nearly dry in our hot-houses, if but a very small piece has remained alive, have become vigorous blooming plants, as well as those from seed." *Hort. Trans.* iii. 36.

Sect. VII. *Scitaminous or Reedy Stove Plants.*

1752. MARSH, OR REEDY HOT-HOUSE PLANTS.

MAY.	JUNE.	JULY.	AUGUST.	SEPTEMBER.
Alpinia allughas, March, p.	Costus spicata, p.	Canna glauca, p.	Costus arabicus, p.	Globba marantina, p.
— occidentalis	Curcuma zedoaria	— indica	— speciosus	— sessiliflora
— racemosa	Strelitzia augusta, p.	Heliconia bihai	Curcuma longa	Maranta arundinacea
Amomum afzelii	— angustifolia	Olyra paniculata	Hedychium angustifolium, p.	Musa coccinea, Dec.
Kæmpfera angustifolia	— parvifolia		— coronarium	— paradisiaca, Nov.
Strelitzia reginæ, p.			Heliconia psittacorum	— sapientum
— ovata, March			Kæmpfera galanga	Alpinia calcarata
— farinosa			— rotunda	Zingiber officinale
Urania speciosa, March			— speciosa	— purpureum
			Alpinia nutans	— zerumbet

Propagation and Culture. No plants are more easily propagated than those enumerated. In respect to culture, they may for the most part be considered as marsh or bog plants, for even the sugar-cane (*Saccharum officinarum*), and ginger (*Zingiber officinale*), are found in a wild state by rivers and in moist woods, and thrive best in the stove, when their roots are liberally supplied with water.

Sect. VIII. *Selections of Stove Plants for particular Purposes.*

As in the case of green-house plants, these purposes can be but few. A collection may be made of such as are or have been most used in the arts; of curious or botanists' species; of such as are highly odoriferous, as *Asclepias, Bignonia, Clerodendron*; or night-smelling, as *Cestrum nocturnum, Cactus grandiflorus*; of palms, as of the sago palm (*Cycas*); of the cocoa-nut (*Cocos*); of the date palm, *Phœnix*, &c. or of any of the natural orders; of such rare sorts as have not yet flowered.

1753. The following are some of the most remarkable of the œconomical, tropical plants used either in their native countries or imported into this country.

Food.

Bengal quince, *Ægle marmelos.*
Sour-sop, *Annona muricata.*
Alligator apple, *Annona Palustris.*
Cabbage tree, *Areca oleracea.*
Bread-fruit tree, *Artocarpus incisa.*
Jaca tree, *Artocarpus integrifolia.*
Akee tree, *Blighia sapida.*
Bread-nut tree, *Brosimum alicastrum.*
Cocoa plumb tree, *Chrysobalanus icaco.*
Star apple, *Chrysophyllum cainito major.*
Cocoa nut tree, *Cocos nucifera.*
Coffee tree, *Coffea arabica.*
Garlic pear, *Crateva tapia.*
Calabash tree, *Crescentia cucurbitina*, tree.
Sago palm, *Cycas revoluta.*
Lee-chee, *Dimocarpus litchi.*
Smooth-fruited lee-chee, *Dimocarpus longan.*
Date plum, *Diospyrus kaki.*
Malay apple, *Eugenia jambos* (*fig.* 463.)
Banyan tree, *Ficus indica.*
Mangosteen, *Garcinia mangostana.*
Anchovy pear, *Grias cauliflora.*
Eatable okro, *Hibiscus esculentus.*
Otaheite chestnut, *Inocarpus edulis.*
Barbadoes cherry, *Malpighia angustifolia.*
Mammee tree, *Mammea americana.*
Mango tree, *Mangifera indica.*
Saffron fruit, *Mimosa dulcis.*
Date palm, *Phœnix dactylifera.*
Guava, P. sidium, *pyriferum* and *pomiferum.*
Lotus tree, *Rhamnus lotus.*
Tamarind tree, *Tamarindus indica.*
Chocolate-nut tree, *Theo'roma cacao.*
Sweet potatoe, *Convolvulus battatas, a climber.*
Granadilla, *Passiflora quadrangularis, climb.*
Melon thistle, *Cactus mammilaris, suc.*
Barbadoes gooseberry, *Cactus Pereskia, suc.*
Black pepper, *Piper nigrum, suc.*
Salsilla, *Alstræmeria salsilla*, herb.
Eatable arum, *Arum esculentum*, herb.
Otaheite salop, *Tacca integrifolia*, herb.
Sacred Indian bean, *Nelumbium speciosum*, aquat.
Cardamom, *Amomum Cardamomum, reed.*
Grains of Paradise, *Amomum granum paradisi, reedy.*
Arrow-root, *Maranta arundinacea, reedy.*
Plantain tree, *Musa paradisiaca, reedy.*
Banana tree, *Musa sapientum, reedy.*
Sugar-cane, *Saccharum officinarum, reedy.*
Ginger, *Zingiber officinale.*

Medicine.

Cashew nut, *Anacardium occidentale*, t.
Areca nut tree, *Areca catechu.*
Ipecacuanha, *Asclepias curassavica.*
Papaw tree; remarkable for its property of intenerating raw meat. *Carica papaya.*
Jesuits'-bark, *Cinchona officinalis.*
Balsam of Capevi, *Copaifera officinalis*, t.
Gum guaiacum, *Guaiacum officinale.*
Cassava, *Jatropha manihot.*
Cinnamon, *Laurus cinnamomum.*
Cassia, *Laurus cassia.*
Medicinal mimosa, *Mimosa catechu.*
Gum Arabic tree, *Mimosa nilotica.*
Pimento tree, *Myrtus pimento*, t.
Bitter of porter, *Quassia amara*, t.
Poison nut, *Strychnos nux vomica.*
Wild liquorice, *Abrus precatorius, climb.*
Jalap root, *Convolvulus, Jalapa, climb.*
Gum-elastic, *Echites elastica, climb.*
Vanilla, *Vanilla aromatica, climb.*
Contrajerva root, *Dorstenia contrajerva*, herb.
Balsam herb, *Justicia comata*, herb.

Arts.

Jamaica ebony, *Amerimnum ebenus.*
Bambu, *Bambusa arundinacea.*
Silk-cotton tree, *Bombax ceiba.*
Tallow tree, *Croton sebiferum.*
Oily palm tree, *Elais guineensis.*
Olive-wood. *Elæodendron orientale.*
Indian-rubber tree, *Ficus elastica.*
Cotton tree, *Gossypium arboreum.*
Logwood, *Hæmatoxylon campechianum.*
Manchineel tree, *Hippomane mancinella.*
Sandbox tree, *Hura crepitans.*
St. Helena red-wood, *Melhania erythroxylon.*
St. Helena ebony, *Melhania melanoxylon.*
Sponge tree, *Mimosa farnesiana.*
Supple-jack, *Paullinia polyphylla.*
Ground ratan, *Raphis flabelliformis.*
Japan sumach, *Rhus succedaneum.*
Soapberry, *Sapindus saponaria.*
Mahogany tree, *Swietenia mahogani*, t.
Indian oak, *Tectona grandis*, t.
Lance wood, *Uvaria lanceolata*, t.
Indian madder, *Oldenlandia umbellata*, herb.

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Some minds relish nothing that is not either immediately useful, or has some relation to utility : to such the foregoing list will be of some value as pointing out plants of great importance to mankind in other countries. From our connection with these countries, and the number of young persons that annually leave Britain to pass great part of their lives in them, it is desirable those plants should be known here also; and hence a rational object for the patriot, who has wealth and leisure, to display them in a conservatory (say *fig.* 464.) of suitable elevation and extent.

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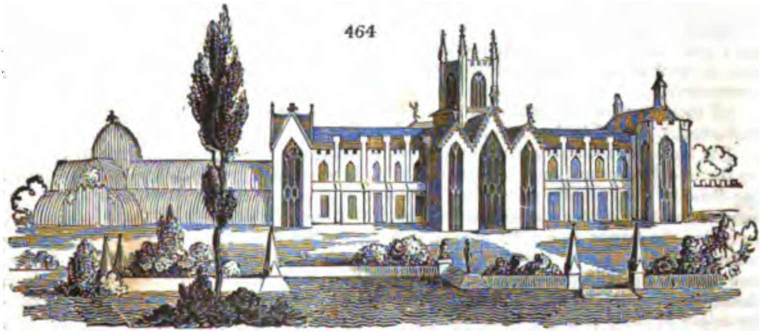

In selections of rare or curious plants, or such as are sought after chiefly by botanists, the parasites, or air plants as they are sometimes called, and the exotic ferns will be included; and on the culture of these, we shall select some remarks from the *Horticultural Transactions.*

1754. *Parasitic Stove Plants.* Maria Graham (*Letters from India*) remarks, that she saw many of these flourishing in great luxuriance on the rough trunks of palms in the

Calcutta botanic garden. At Kew, Springrove, and in the garden of the Horticultural Society, they have been generally grown in rough tan, closely pressed together in small pots or baskets, and suspended from the roof of the hot-house. Messrs. Loddiges' have established some specimens on the trunks of palms in the Indian or natural manner, and the Hon. and Rev. W. Herbert appears to have been equally successful. "I am informed," he says, "by a friend at Calcutta, that he cultivated with great ease, all the *Dendrobia*, *Aerides*, and other parasitical plants, by tying them, with twine, to the stem of a tree, or to the under-side of a branch, and placing above them a pot of water, with a hole at the bottom, through which a string passed, nearly as large as the aperture, by which the water was gradually and continually conducted to the upper part of the parasitical plant, which requires to be constantly moist and shaded; and that a tree with smooth bark answered the purpose best. He mentions that *Dendrobium Pieradii*, fastened to a tree and irrigated in this manner, will, in a little more than a year's time, produce pendulous racemes of flowers, from two to six feet long, and it appears likely to thrive with me under the same treatment. I had previously found no difficulty in establishing epidendra on the stems of trees in the stove, by cutting a notch in the bark and inserting the plant like a graft, and tying moss about it to support it, till the young roots had attached themselves to the bark; but from want of sufficient moisture, they have not made much progress, or flowered with me. I have now adopted the above mentioned mode of irrigating them, with full confidence that it will succeed in our stoves, as well as it does at Calcutta; and very soon after its application to a sickly epidendron, growing on the stem of *Sterculia balanghas*, vigorous young fibres began to sprout from it on all sides. I am very much inclined to think, that most of such plants would attach themselves to the sides of a porous stone or vessel, or of a dead root, if constantly irrigated, and thrive upon them as well as upon a living tree, especially if the stone or root were covered with growing moss, for I have observed the fibres of more than one sort attach themselves strongly to the outside of the pot in which they are planted; and I conceive that they might be beautifully cultivated, upon an ornamental cone of porous pottery, filled with water and furnished, on the outside, with niches, in which the plants might be fixed, with a little moss or peat to promote their growth in the first instance.

"I have found the parasitical plants in danger of perishing, from want of moisture, on a deciduous tree, during its season of inactivity, but that deficiency would probably be removed by constant irrigation. The neatest and most convenient vessels for that purpose, perhaps, would be little tubs, such as are sold at toyshops, which might be easily tied to a branch, and perforated with a small gimblet. A short string, of which one end is twisted round, or at least in contact with the plant, and the other inserted into a phial of water, will also be found to convey a regular, though less plentiful supply of moisture, acting in manner of a siphon. I have used it advantageously to nourish a graft, and promote its union with the stock. For the cultivation of parasitical plants in pots, I recommend placing the pots on a back flue, in a tin tray, about two inches deep, and half filled with wet sand, giving an abundant supply of water, but not sufficient to produce rottenness by its stagnation. I find the growth of crinums, which also like a moist heat, to be prodigiously rapid, with that treatment; I should suggest a mixture of porous stones, or bits of broken pots, with old tan, or such peat as contains a portion of half-decayed wood, and a garnish of moss to the pot, as preferable, for parasitical plants, to the loam which some of our books have recommended." *Hort. Trans.* iv. 243.

All these parasites are included under the natural order of Orchidæ (278, see *Hort. Suburban.*), are of herbaceous habits, and readily propagated by suckers or cuttings.

The most extraordinary parasite known to botanists is *Rafflesia Arnoldi*, discovered by the late Dr. Arnold, in Sumatra, in 1818. It was found in a jungle or thicket growing close to the ground under the bushes, and attached to the roots of a species of cissus or vites. The plant consists of the flower only, having neither leaves, branches, or roots; the flower is a yard across; the petals, which are subrotund, being twelve inches from the base to the apex, and it being about a foot from the insertion of the one petal to the opposite one; the petals are from a fourth to three-fourths of an inch thick, and the nectarium, it is supposed, would hold twelve pints. It appears to take its origin in some crack or hollow of the stem, and soon shows itself in the form of a round knob, which, when cut through, exhibits the infant flower enveloped in numerous bracteal sheaths, which successively open and wither away as the flower enlarges. A singular change takes place in the vessels of the root or stem on which it grows; their ramifications are multiplied, and they take a direction so as to unite with and accommodate themselves to the base of the parasite to which they convey nourishment. The general apppearnce of the flower is that of Stapeliæ, and its smell is also fœtid. It is diœcious, and supposed by R. Brown to belong to the natural order of Asarinæ. There is another species *R. Horsfieldii* with the flowers not above three inches in diameter. Both, it is probable, may in time be introduced to our stoves. See *Lin. Trans.* xiii. 201.

1755. *Exotic Ferns.* The tree ferns, Humboldt informs us, are of singular beauty in their native sites. Only a few species of these, as *Dicksonia arborescens, Davallia pyxidata, Pteris aculeata,* &c. have been introduced; but the number of berbaceous ferns which are stove-plants is considerable. They are propagated from seeds which generally ripen freely in this country, and such as are received from abroad generally grow, however long kept; they are also multiplied by dividing the roots. The best collection of exotic ferns is considered to be in the Liverpool garden: many of these have been raised from seed by J. Shepherd, the assistant curator; and the following are his directions for this purpose:

" Having provided a common garden-pot, four and a half inches in depth and three and a half wide, let the bottom part, to the height of one inch, be filled with fragments of broken pots by way of drain. Over these should be spread a stratum of such soil as is commonly used for potting green-house plants, of the depth of two inches; the remaining half inch should be filled with brown loamy earth sifted through a hair-sieve, the surface being made perfectly smooth, and on this the seeds are to be scattered as evenly as possible. Care must be taken that the wind be not suffered to blow the seeds away, leaving nothing but empty capsules. The seeds being sown, no other covering is requisite than a bell-glass, which should just fit within the rim of the pot, so as to exclude all air. The pot is then to be kept in a pan always half full of water, and set in a shady part of the stove or hot-house, being always regularly watered as above directed. When the young plants have acquired their second leaf, it is proper to give them a little air by placing a small piece of wood under the edge of the glass, at one side. In a short time afterwards the glass may be entirely removed." *Hort. Trans.* iii. 338.

The seeds come up in two or three months; and the plants flower the following year. It is not known how long these seeds retain their vegetative quality, but two plants of *Acrostichum calomelanus* were raised from seeds brushed from a specimen of that fern in the herbarium of J. R. Foster, supposed to be near fifty years old. But the same success did not attend similar attempts with any other specimens from this herbarium. The soil for ferns should be of a soft fine texture to suit the very small fibres of their roots; it requires also to be kept constantly moist in imitation of the native habitations of these plants, which is generally under the shade of trees or rocks. Hence also they may be set in dark parts of the stoves where nothing else will thrive.

1756. Sect. IX. *Selection of Dry and Bark-stove Plants, for such as have only one Hot-house to contain them.*

Woody Plants. Bambusa arundinacea, Barringtonia speciosa, Carica papaya, Catesbæa spinosa, Clerodendrum fragrans, Coccoloba cerifera, Cocos nucifera, Corypha umbraculifera, Chamærops humilis, Cycas revoluta, Phœnix dactylifera, Coffea arabica, Crotolaria pulchra, Datura arborea, Dillenia speciosa, Dracæna draco, Ficus indica, Hibiscus rosa-sinensis, Ixora coccinea, Lagerstroemia reginæ, Mimosa nilotica, odoratissima, Myrtus pimenta, Nerium coronarium, odorum, Nyctanthes arbor tristis, Portlandia grandiflora, Robinia violacea, Solandra grandiflora, Sterculia platanifolia, Tectona grandis, Vinca rosea, Volkameria aculeata.

Climbing. Convolvulus speciosus, Cratæva fragrans, Dolichos urens, Ipomæa digitata, Jasminum sambac, Passiflora coccinea, alata, racemosa.

Succulents. Agave vivipara, Aloe pellucens, Cactus grandiflorus, melocactus, speciosus, Euphorbia clava, Pandanus odoratissimus, Piper nigrum, Stapelia grandiflora.

Bulbs. Amaryllis reginæ, josephinæ, Crinum amabile, erubescens, latifolium, Hæmanthus cocccineus, Pancratium amœnum.

Herbaceous. Ærides odoratum, Arum bicolor, Epidendrum cochleatum, Gloriosa superba, Gloxinia maculata, Limodorum tankervillii, Phytolacca octandra, Polypodium aureum, Pteris grandiflora.

Aquatics. Cyprus papyrus, Euryale ferox, Menianthes indica, 'Nelumbium speciosum, Nymphæa lotus, pubescens, rubra, Thalia dealbata.

Reedy. Alpina racemosa, Canna glauca, indica, Heliconia bihai, Maranta arundinacea, Musa paradisiaca, sapietnum, Saccharum officinarum, Strelitzia reginæ, Zir[illegible]inale.

Chap. XV.

Monthly Catalogue of the leading Productions of Ornamental Horticulture.

1757. This enumeration extends only to a few of the more generally known flowering plants and trees; what respects the hot-house department is to be understood as referring to flower-gardens, which contain at least a bark-stove, a dry-stove, one or more green-houses, and an adequate number of reserve-pits and frames. Those plants are marked (*) which may be produced from a small garden, where there is a green-house, flued-pit, and hot-beds; not in any quantity, but sufficiently so to keep up a hope and a fear for every month. The keeping up of this sort of hope and fear is much more conducive to the sort of happiness or interest which those who have small gardens expect to derive from them, than a grand display of two or three species of flowers, occurring only once or twice in the year.

	FLOWER-GARDEN.	SHRUBBERY.	HOT-HOUSE DEPARTMENT.
JANUARY.	The crocus, tulip, and some alliums, beginning to emerge from the ground. If mild weather, perhaps some choice plant in flower, as the Christmas rose, daisy*, but generally no flower is to be seen at this season.	Evergreens display themselves to advantage, especially the holly* with its coral berries. Calycanthus precox, red and white, and lauristinus* in flower.	In the *green-house*, the camellias* in full bloom, and some heaths and australasian plants. In the *stove*, streletzia*, seven species, and some other plants. From the *pits* and *hot-beds* in the reserve-garden, forced roses, hyacinths, and other bulbs, mignionette, &c. placed in the conservatory, plant, cabinet, or drawing-room.
FEBRUARY.	The snow-drop*, Christmas rose*, and winter aconite*, in flower; the crocus, crown imperial, and other bulbs, fast advancing, if the weather be favorable.	The male flowers of the hazel*, yew tree*, erica carnea, and some shrubs appear. The lark sings about the beginning of the month, and the thrush about the middle.	In the *green-house*, camellias* and heaths in great beauty, and also some species of oxalis, protea, &c. In the *stove*, strelitzea*, and some bulbs and succulents. Forced articles from the *pits*, as before.
MARCH.	Among *florists'* flowers, the crocus*, scilla*, some hyacinths* and crown imperials*, and also the primrose* and polyanthes are in bloom in the latter half of the month; saxifraga oppositifolia* among the alpines; and viola odorata* in a warm border, or on rock-work.	Some pines, poplars, and willows*, shew their catkins; the sloe*, cornelian cherry*, mezereon*, different varieties, daphne pontica and collina, the lonicera nigra*, and rosemary in flower. The ring-dove begins to coo in the first week.	In the *green-house*, some camellias * still in flower; numerous heaths* in great beauty; also aletris*, lachinalia*, oxalis*, some geraniæ*, and above a dozen other genera. In the *stove*, some scitamineæ and bulbs; solandra, grandiflora, plinia, eugenia, and justicia. *Forced* articles as before.
APRIL.	The hyacinth*, narcissus*, auricula*, and polyanthus*, four of the most valued florists' flowers are in perfection in the course of this month. Also, the scilla, fritillaria *, wall-flower *, daisy *; pulmonaria officinalis, cynoglossum *, omphalodes, various saxifragas, and other alpines.	Most of the wild fruit trees, as crabs*, pears*, cherries*, and their allied species, are now in flower: most of the willows, birches, elms, and oaks, shew their catkins. Among shrubs, the honey-suckle, some robinias *, andromedas*, daphnes, ericas*, and xanthorhiza, are in flower.	In the *green-house*, above thirty species of ericæ*, and nearly as many of the ixiæ* family, with lachenalia, oxalis, acacia, and various other genera in perfection. In the *stove*, dracæna*, bromelia*, kæmpferia, stapelia, and some bulbs in flower. Abundance of forced articles, including annuals, as sweet pease, larkspurs, &c. in flower.
MAY.	The auricula stage still a fine object in the first week; and the polyanthi narcissi not yet over. The collections of tulips*, anemones*, and pæonies*, in full beauty from the middle of the month. Many shewy herbaceous plants, as statice*, lychnis*, phlox*, &c. coming into flower. Among the aquatics, hottonia, palustris, and ranunculus aquatilis*.	The horsechestnut*, hawthorn*, sorbus*, mespilus*, and snowdrop-tree*, in great beauty. Among the American shrubs, several species of magnolia*, azalia*, kalmia*, andromeda*, &c. And among common shrubs, the lilac*, spirea*, guelder rose*, honeysuckle*, the cinnamon, Scotch burnet-leaved, and monthly roses. Most of the singing birds in full note.	In the *green-house*, a fine display of erica*, ixiæ*, and gladioli*. Also several geraniæ, salvia, protea, &c. In the *stove*, phytolacca decandra, passiflora*, racemosa, and other species, justicia, heliconia, and various others. From the *forcing* department, geraniums and other green-house plants, hydrangeas*, balsams*, and other tender annuals.
JUNE.	The collections of pæonies and anemonies not yet faded; those of ranunculus*, iris xiphium*, and xiphioides; and of the hardy, gladioli* and ixia, in full beauty. Assortments of pink* and sweetwilliam*, in flower towards the end of the month; hemerocalis*, aquilegia*, campanula*, veroniea*, and many showy herbaceous perennials; some biennials, as agrostemma, alyssum*, &c.; annuals, as crepis cucubalus; aquatics, as butomus*, hydrocharis, potamogeton; viola, saxifraga*, and various alpines.	The lime, laburnum, and fringe-tree*, in flower; towards the middle of the month a number of the roses*; of Americans*, andromeda, magnolia, rhododendron, maximum, and ponticum, azalea, &c. Of common shrubs, cistus*, helianthemum, erica, vulgaris*, dogwood, elder, cytisus, spirea, lonicera, &c. The goat-sucker, or fern owl (caprimulgus europeus), heard in the evening of the first week; Most singing birds leave off singing about the end of the month.	In the *greenhouse*, chiefly tender annuals from the reserve garden; the proper inhabitants being in the open garden, and there the heaths, geraniæ, citrus tribe*, diosma, protea, &c. in great beauty. In the *stove*, amaryllis*, and other bulbs, aloe, piper, and other succulents; eugenias, epidendrons, cassia, castrum, &c. The pits filled with tender annuals, or other plants, in the course of propagation and rearing.
JULY.	The florists' flowers for this month are, the pink * and carnation *; the white martagon* and tyger lillies*; the Brompton stock*, larkspurs*, lupins, and other biennials and annuals. More herbaceous plants are now in flower than in any other month, as chelone*, delphinium*, dictamnus*, gentiana *, statice *, phlox *, silene *, salvia, veronica, saxifraga, &c. The most showy of the aquatics, as, nymphea*, nuphar*, villarsia*, alisma, calla, stratiotes, myosotis*, &c. are now in flower, and various alpines.	The tulip-tree*, magnolia*, kalmia*, andromeda*, azalea*, erica*, several sorts, and some rhododendrons*, and other American or peat-earth shrubs in flower. Among the commoner sort, the roses * are now in full splendour. The white jesamine*, honeysuckles*, clematis*, spartium, gleditschia, triacanthos, cistus, lycium, and a great variety of others of less note. Showy butterflies and moths appear in the beginning, and the dragon-fly towards the end of the month.	The *green-house* is now filled with tender annuals, as balsams, globe amaranthus, coxcombs, ice-plants, sensitive mimosas, &c. and probably with some of the stove plants. In the open air, the geraniæ will be in great beauty, and also erica*, mesembryanthemum*, melaleuca*, metrosideros*, protea, and numerous other genera. There are numerous *stove plants* now in flower, as canna*, nelumbium, gloriosa*, amaryllis*, pancratium, cactus, euphorbia, myrtus, ipomœa*, justicia, &c. The reserve hot-houses as before.

AUGUST.

FLOWER-GARDEN.	SHRUBBERY.	HOT-HOUSE DEPARTMENT.
The florists' flowers of this month are, the hollyhocks*, pyramidal bell-flowers*, lobelias, annual stocks*, and the poppies*, with lilium*; canadense, and four other American species. Numerous herbaceous plants are now in flower that first appear in July, and others, as aster*, various species, astrantia, helianthus, anthericum*, ossifragum, and numerous others first bloom in this month. Among the aquatics may be mentioned lobelia dortmanna*, polygonum hydropiper, and several species of potamogeton.	Scarcely any trees are now in bloom; but of American shrubs there are various sorts of azalea*, clethra*, and magnolia*, in perfection; and of select common shrubs, the hibiscus*, with its numerous and beautiful varieties. The rose*, the honeysuckle*, yellow jesamine*, clematis*, spiræa*, and dwarf esculus, form a greater show in the shrubbery and rosary than in any other month. Robin-red-breast, (motacilla rubicula), sings about the last week, and butterflies, moths, and dragon-flies abound during the whole month.	The green-house as before. In the open air the plants growing vigorously; but excepting geranias*, ericas*, and some succulents not many species in flower. In the *stove*, asclepias, convolvulus*, pancratium, lagerstroemia*, passiflora*, plumbago, and numerous other genera in flower. Tender annuals from the reserve hot-houses as before.

SEPTEMBER.

The florists' flowers of this month are the dahlia*, which flowers also when excited by artificial heat previously to planting in the open ground in July and August; but planted in the usual way, it is now in perfection. Among the bulbs there are only leucojum autumnale*, narcissus autumnalis*, and scilla autumnale; the china aster, in all its varieties, is now in perfection. Among the herbaceous perennials, aster*, solidago, helianthus, gentiana*, phlox*, and asphodelus, are the chief sorts.	Aralia spinosa, some azaleas* and kalmia*, Lord Macartney's rose, and one or two other roses are in flower during the greater part of this month. But the chief ornament of the shrubbery is the fruits of the mountain ash*, viburnum*, mespilus*, crategus*, Siberian crab*, sorb*, lonicera*, apple, rose*, elder, &c. Spiders, flies, and insects of all kinds, very numerous; few birds in song; but the feldfare appears about the end of the month.	The *green-house* plants generally returned to their winter habitation in course of this month; some heaths*, and pelargoniums*, and a few other species in flower. There are not many *stove* plants in flower at this season; amaryllis*, passiflora, and some succulents may be mentioned. Tender annuals supplied from the forcing department of the reserve-garden, for decorating the plant, cabinet, conservatory, or drawing-room.

OCTOBER.

The florists' flowers of this month are the Chinese chrysanthemums*, some of the hardier of which will now flower in the open air, and the others under a glass-case or in the green-house; the colchicum*, autumn crocus, cyclamen, europeum*, and amaryllis lutea *. The principal herbaceous plants are, aster and solidago*, with asphodelus altissimus* helianthus, gentiana*, and some other genera.	Arbutus unedo* is the only beautiful shrub in flower, and also in fruit, at this season, Gordonia, rhamnus, baccharis, clematis, and the common ivy are also in flower.	Any spare room in the *green-house* is now occupied with chrysanthemums*, and some dahlias* raised in pots, and placed out of the reach of frost, to prolong their bloom. A few ericas*, statice*, and geranias, still in bloom. In the *stove*, vinca*, stapelia*, and a few others. The reserve pits in preparation for forcing bulbs and roses.

NOVEMBER AND DECEMBER.

The remains of last month in greater or less beauty, according to the weather, and, perhaps, a few plants unnaturally in bloom. In the present mild and humid winter, there are now (December 31 1821), in bloom in many gardens about London, stocks of several sorts, larkspurs, violets, Indian-pinks, pot marygolds, polyanthuses, primroses, gentians, monthly roses, yellow amaryllis, daisies, and various other plants. By a letter we have just received from a horticultural friend at Göttingen, (H. Herring,) we find many of the same kinds of flowers were (Dec. 10th) in bloom in his garden.	The remains of last month, according to the weather. Clematis calycina*; and, perhaps, a few plants unnaturally in bloom.	Dryandra*, ericas*, lantana*, and camellias*, about the middle of December, in the *green-house*. In the *stove*, all the species of strelitzia*, stapelias, amaryllis*, aletris*, and one or two other bulbs. From the *forcing department*, hyacinths*, Persian* iris, and other bulbs*; monthly roses*, and, about Christmas, the Provence rose*, and other shrubs and flowers.

BOOK III.

ARBORICULTURE, OR PLANTING.

A Tree is an object which has at all periods been held in a certain degree of admiration by mankind, from its grandeur, its beauty, and its use: a few trees have accordingly been associated with the dwellings of civilized nations in every country. The Persians, Greeks, and Romans were particularly attached to trees: some of their greatest men were proud to acknowledge that they had made plantations with their own hands; and fine specimens, whether planted by nature or art, were held sacred, or specially protected (159.) The Romans, besides the ornamental plantations of their villas, planted occasionally for useful purposes; they had live hedges, osier plantations, and rows of poplars and elms as props for their vines (23.) The planting of extensive tracts for timber or fuel, however, does not appear to have been practised by them, or any other people, till the beginning of the sixteenth century, when the insufficiency of the natural forests, which had hitherto supplied civilised society in England with timber and fuel, rendered planting a matter of necessity and profit. In the century succeeding, the improved practice of agriculture created a demand for hedges and strips for shelter; and the fashion of removing from castles in towns and villages, to isolated dwellings surrounded by verdant scenery, led to the extensive employment of trees both as objects of distinction and value. For these combined purposes planting is now universally practised: what relates to the effect of plantations as parts of rural scenery belongs to landscape gardening; and what relates to their use and culture is the subject at present under consideration. We must however keep both objects in view, as well in contriving what shall be most profitable, as in designing what shall be most ornamental or picturesque. We shall therefore consider the uses of trees and plantations with a view both to profit and ornament; the kinds of plantations, their formation, their management, the formation of a tree-nursery, the surveying and valuing of trees and plantations, and the catalogue of timber-trees and hedge-plants.

Chap. I.

Of the Uses of Trees and Plantations, and the Profits attending their Culture.

The purposes for which plantations are made, may be reduced to those which respect the actual consumption or employment of the tree or shrub individually; and those which respect their collective influence relative to surrounding objects. The first considers trees as affording timber, fuel, bark, and other products; and the second views plantations of trees as affording shelter, shade, fences, ornament, or otherwise conferring value on territory.

Sect. I. *Of the Uses of Trees individually, as Objects of Consumption.*

A tree, after it has attained a certain age, bulk or dimension, may be cut down and employed either in civil, military, or naval architecture; in the construction of machines, implements, and utensils; as fuel; or as affording tanning or dyeing matter; food, or medicine, for men or animals; or poison for vermin.

1758. For *Civil Architecture* the matured timber of the pine and fir tribe is in greatest demand, and foreign deal is generally preferred to British produce, as being of larger growth, and more resinous and durable in quality and texture. That which approaches the nearest to the pine and fir timber of the north is the Scotch pine (*Pinus sylvestris*), when grown in the north highlands, and the larch fir (*Pinus larix*), when grown in hilly or poor districts; resinous timber of the species indigenous in cold countries, when grown on rich soils, and in warm climates, being found deficient in durability. Oak and elm are also used in buildings, especially the former, as being of great durability and suitable for wooden bridges, break-waters, joists in damp situations or on ground-floors, sills, wall-plates, staircases, door and window frames, sashes, &c. Elm is not much used in buildings of magnitude, as being apt to twist, and not very durable; but it makes curiously variegated floors and steps of stairs, and very good weather boarding for sheds and agricultural buildings. Besides timber and timber-like trees for the general purposes of civil architecture, there are some departments of rural construction, as the formation of fences, drains, embankments, trellis-work, arbors, and the supporting of plants in gardens, which consume branches, spray, thinnings of young plantations, and shoots even of a year's growth. Almost any species of tree may be used for these purposes; but the branches and spray of the oak, elm, and beech, the *weedings* of ash or larch plantations, the shoots of a few years' growth of the oak, sweet chestnut, ash, and hazel, and of one year's growth of certain species of willow are greatly preferred.

1759. For *Military Architecture*, by which we mean chiefly the outworks of fortifications, any tree is taken; but the pine and fir tribe are greatly preferred, as requiring less labour in cutting and preparing. Besides trees of a timber size for constructing bridges, portals, and others of less dimension for palisadoes, cheveaux de frises, &c.; branches, spray, and shoots are used for *fascines*, and fixed works *en haie*, *en corbeille*, &c.

1760. In *Naval Architecture* the oak is chiefly used. According to Marshall, " the keels are now pretty generally laid with elm or beech; and part of the upper decks of men of war is of deal: but these woods bear no proportion, in respect of the quantity used, to the oak. The timbers of a ship are principally crooked, but the planking is cut out of straight pieces. In a seventy-four gun ship, the crooked and straight pieces used are nearly equal, but the planking under water is of foreign oak: therefore, of English oak, the proportion of crooked to straight pieces is almost two to one. Masts and yards are of deal. The blockmakers use elm, lignum vitæ, box, and other hard woods. Upon the whole, it may be said, that, in the construction of a ship, oak is the only English wood made use of; and that, of this English oak, nearly two-thirds are requisite to be more or less crooked." *Planting and Rural Ornament*, i. 49.

In the construction of merchant vessels, Monteath, in 1820, states, that " the outer keel commonly used is of beech or elm, and made generally of two or three trees or pieces joined together to whatever length is required; these require to be nearly straight. The keel-stone, or inner keel, requires trees of nearly the same description, but chiefly oak. Floor timbers are sometimes used of elm and beech, and are a little crooked. First crooks are a good deal crooked towards the one end, as they begin to ascend up the vessel, and are more valuable than the floor timbers, but are also used sometimes of elm and beech. Upright timbers are always made of oak, and are considerably crooked, for elm or beech is seldom put into a good vessel, except the lower part, where the vessel is always under water when light. Top-timbers are also of oak, but not so valuable, as they are mostly straight. Beams go under the deck of the vessel, and are also all oak, and have but a small crook, but require trees of considerable length. Knees are always of oak, and are the most principal crooks in the vessel. The stem-piece is a very particular crook. Breast-hooks also have particular crooks. Stern-posts and windlass are straight pieces. Trees that will cut up for planking are used of as great a length as they can be got, and are the better for having a considerable crook or curve one way; these are used of elm or beech for planking under water, but four planks of oak are required for one of beech or elm for this purpose." *Forester's Guide*, p. 111.

By the use of steam, and other recent improvements in ship-building, straight timber is bent to any form; and thus the larch or any sound resinous timber may be employed, and is so to a certain extent for commercial ships. Sir A. Grant, an experienced planter, is of opinion, that " the larch will, in a short period, instead of the oak, bear the thunder of Britain on her element, the ocean." *Gen. Rep. of Scot.* ii. 270.

" In a communication to the President of the Board of Agriculture, by C. Wilson, of London, dated in 1797, the idea is suggested of *combining* small timbers for all the purposes of ship-building. He suggests, that oak of only thirty-three years' growth, by this mode of combining, may be employed where trees of a hundred years old would be requisite by the old method: and he maintains, that ships so built sail faster, and are less liable to accidents." *Gen. Rep.* ii. 199.

The use of timber of small growth has been already introduced in the construction of masts for the largest vessels, either by splicing pieces properly adapted together; or, by forming hollow masts from small timber, which uniting strength with lightness, have advantages which solid ones do not possess. *Perring* and *Money on Shipbuilding*.

1761. In the *Construction of Machines*, the millwrights' chief material is oak, beech, and crab-tree for cogs, alder, and sometimes willow, for float-boards, and fir and oak for shafts and frame-work. The waggon and cart-wright uses oak and ash for bodies, axles, and spokes; elm for naves, fellies, and linings; sometimes also the softer woods for linings, as poplar, willow, lime, and horse-chestnut. The coach-maker and plowright use more ash than any other sort of timber. Gates are made of oak and deal, and their posts of oak or larch; the soft woods are sometimes used, but are far from being durable. Ladders are formed chiefly of deal, or of poplar and willow, as being light; pumps and water-pipes generally of elm and alder; beech and sycamore are used in making calendars and cheese-presses, &c. For all these purposes the timber must be full grown, with some exceptions, as young or *root-cut* oak and ash for spokes and shafts.

1762. For *Implements*, root-cut ash is in general use for the handles of such as require to bear great stress, as of the spade, fork, mattock, forge-hammers, &c.; willow or deal, of the lighter tools, as the hoe, rake, scythe; beech and sycamore for the common tools, and instruments of carpenters; box, holly, elder, &c. for the more select tools of artisans, and for mathematical and gaugers' instruments.

1763. For *Utensils*, under which is included household furniture, the chief British wood used by the cabinet-maker is beech for bed-frames, chairs, and sofas; next, birch and broad-leaved elm, for the same purposes; oak for gothic furniture; the cherry, plum, holly, yew, box, walnut, lime, poplar, and a great variety of woods for occasional purposes; and deal enters more or less into the construction of almost every thing he makes. The musical instrument-maker uses lime, box, yew, holly, plum-tree, and poplar. The carver uses chiefly lime, and next, pine deal; the cooper uses oak, and some chestnut for large casks and vessels, corn-measures, &c.; birch and alder for herring-barrel staves, sycamore for herring-barrel ends; these, since a law passed authorising herrings to be put into barrels made from British timber, have been in great demand (*Monteath*); ash for dairy utensils, butter-firkins, flour-barrels, &c.; oak for well-buckets and water-pails, and, in some places, for milk pails and other dairy utensils; beech is occasionally used for the same purpose, and for soap firkins, and willow, oak, ash, and hazel for hoops. The brush-maker uses beech, sycamore, birch, and some holly and box, and also poplar and lime-tree; locksmiths, the soundest oak, from the *root-cut* or *butt-end* of the trunk; the block-maker, for printing and bleaching-works, uses sycamore; the turner, beech, sycamore, box and holly; trunk and packing-case makers, deal, poplar, elm, or whatever soft wood may be cheapest at the time; coffin-makers use chiefly elm, sometimes oak; basket-makers, the root-shoots of the willow and sometimes of the hazel; bee-hive and straw utensil makers use the bramble and willow; besom-makers the spray of the birch, broom, heath; last and patten-makers, alder and birch; the toy-maker, lime, and other soft woods, and also box, holly, and yew. For most of these purposes, the trees must have attained a timber size, and for some of them, they should be full grown.

1764. For *Fuel*, any ligneous vegetable may be used at any age, and either the body or trunk and root of the plant, or its branches and spray. Resinous trees, excepting the larch, afford most flame, and may be used the soonest after being cut; the ash next in order, then the birch, whose oily bark burns clear; oak and elm burn the slowest; and the roots of trees are generally of more slow combustion than their tops. To produce fuel in a short time, the most rapid growing tree is the common tree acacia (*Robinia pseud-acacia*). Charcoal, as fuel, is prepared by subjecting roots, or the more ligneous parts of branches, to a smothering combustion.

1765. For affording the *Tanning* principle, the bark of the oak is chiefly used; but that of the Huntingdon willow (*Salix alba*), larch, black poplar, birch, chestnut, hazel, thorn, and some other trees are found to afford it in such quantities as renders it worth while to disbark them for that purpose. *Agr. Chem.* 89. and *Com. to Board of Agr.*

The bark is most powerful when taken from the tree at an early age, and hence the oak is cut down before it attains a timber size, for that purpose, as in copse woods; but the bark of old trees is also used.

1766. For *Dyeing*, the bark of several trees was formerly in use, as of the crab-apple, pear, ash, alder, &c. The bark of the quercitron, (*Quercus tinctoria*,) is used for dyeing yellow in North America; but in this country, foreign materials, as indigo, logwood, madder, &c. have superseded the use of indigenous, or home-grown vegetables. The berries of some trees, as of the elder, and berry-bearing alder; and the leaves of others, as of the walnut and sloe, have also been used as dye stuffs.

1767. In *various Arts and Manufactures* some of the products of trees are used, as the charcoal (of the dogwood principally) in that of gunpowder; the pitch of the pine, the resin of the spruce fir, and the turpentine of the larch, for a great variety of purposes. The ashes of the burnt branches of all trees, but especially of the ash, afford alkali for the laundress; the spray of the beech and other trees affords, on distillation, the pyrolignous acid, an excellent preservative of timber, and, when purified, a substitute for salt in preserving butcher-meat; the bark of the holly affords bird-lime; and the leaves of all trees, excepting the resinous kinds, rot into excellent manure for the field, and highly-prized vegetable mould for the garden.

1768. For *Food* to man, in his present state, the timber trees afford but little resource; but nuts of the sweet chestnut, walnut, and hazel are still esteemed, and our ancestors used the acorn, beech-mast, haw, roan, hip, and bramble. A very agreeable drink is made from the sap of the birch-tree in Sweden, Russia, and some parts of Britain; and, in America, sugar is obtained from the sugar-maple (*acer saccharinum*) in sufficient quantities to be used in domestic economy. Mast and acorns are esteemed excellent food for swine, haws for deer, and the leaves and spray of many sorts of trees are, or may be, eaten during winter both by domestic and wild animals.

Game, which, in every cultivated country, is one of the greatest luxuries of the table, is localised by plantations, in which both birds and quadrupeds find at once shelter, security from their enemies, and food.

1769. For *Medicine*, the products of scarcely any British tree is in use; but the bark, blossoms, and berries of the alder; the fruit of the sloe and crab, and the leaves of the walnut were formerly in considerable repute, and are occasionally used.

1770. As *Poisons* for vermin, the leaves of the walnut, elder, and ash are used by infusion for destroying, or rather annoying, worms by their bitter, acrid quality; a glutinous snare for entrapping birds is obtained from the holly and miseltoe.

From the above outline it may be inferred, that the timber trees in most general demand as such, are the oak, pine, and fir tribe; and next the ash, elm, beech, poplar, willow, birch, sycamore, &c. In the greater number of cases, *cæteris paribus*, the oak, larch, Scotch pine, ash, abele, poplar, and willow, will be found the most profitable trees that can be planted with a view to timber or bark produce.

Sect. II. *Of the Uses of Trees collectively as Plantations.*

A tree or trees, in a growing state, may be useful by affording shelter, and improving the local climate, improving bad soils, producing shade, by separation, seclusion, distinction, appropriation, concealment of disagreeable objects, heightening the effect of agreeable objects, creating beauty, and adding value prospectively.

1771. *Shelter and Climate.* The umbrageous roof of the forest afforded shelter, and a secure retreat to our savage forefathers; and their civilised descendants still resort to the nearest tree as a place of shelter during a casual storm; to the thick forest as a place of security, when he sets the laws of his country at defiance, or has committed crime. Considered agriculturally, "the advantages to be derived from subdividing extensive tracts of barren country by plantations, are evidently great, whether considered in the light of affording immediate shelter to the lands, or in that of improving the local climate. The fact that the climate may be thus improved, has, in very many instances, been sufficiently established. It is, indeed, astonishing how much better cattle thrive in fields even but moderately sheltered than they do in an open exposed country. In the breeding of cattle, a sheltered farm, or a sheltered corner in a farm, is a thing much prized; and, in instances where fields are taken by the season for the purpose of fattening them, those most sheltered never fail to bring the highest rents, provided the soil be equal with that of the neighbouring fields which are not sheltered by trees.

"If we inquire into the cause, we shall find, that it does not altogether depend on an early rise of grass, on account of the shelter afforded to the lands by the plantations; but, likewise, that cattle which have it in their power, in cold seasons, to indulge in the kindly shelter afforded them by the trees, feed better; because their bodies are not pierced by the keen winds of spring and autumn; neither is the tender grass destroyed by the frosty blasts of March and April." *Plant. Kal.* p. 121.

In gardening, as we have already seen (1077.), shelter is not less important than in general economy.

An Italian author (*G. Gautieri*) has enumerated and illustrated the advantages, in point of climate, which entire tracts of country derive from extensive woods and forests. "These," he says, "are the arresting the progress of impetuous and dangerous winds; maintaining the temperature of the air; regulating the seasons; lessening intense cold; opposing the formation and increase of ice; moderating intense heats; producing abundance of rain and snow; giving origin to springs, and producing abundance of water in the rivers; discharging the electricity of the atmosphere; dispersing hail, snow, and watery clouds; preserving from inundations; lessening the width and depth of torrents; opposing a barrier to the undermining of banks, and the formation of precipices; preserving the soil on mountains, by which their external figure is maintained; and, finally, retaining within bounds, or disturbing the formation of avalanches, or accumulations of snow." He illustrates each of these propositions by references to what has taken place in Italy and Germany, in consequence of alterations that have been made in the woody surfaces of these countries. *Dello Influsso de' Boschi*, &c. *Milano*, 1817.

Williams, an English author (609.) has endeavoured to show that the climate of Britain is deteriorating by the increase of plantations. These, whether in masses or even in hedge-rows, increase the evaporating surface, and consequently render the atmosphere more humid; an open country, he says, would be more dry, airy, and wholesome. This is, no doubt, correct; and, perhaps, some valleys and plains are more thickly studded with hedge-rows and strips, than a strict regard to the culture of corn, or the salubrity of the atmosphere, would justify: but the same objection will not apply to elevated situations and bleak hilly tracts, which every one allows are greatly improved by planting, both in climate, agricultural produce, and general effect.

1772. *Improving bad Soils.* "It certainly is not one of the least recommendations of planting," observes W. Pontey, "that it may be made to contribute essentially to the improvement of a bad soil, as is the case on steril heaths and commons, *where three* means, the consequences of the planting, act together in promoting such improvement. The first is, the shade of the trees, which, by decomposing the vegetable matter on the surface soil, renders it at once more fertile, and easily penetrable by the roots. The second is, that by the decompositon of the annual fall of leaves, an addition is made to the vegetable soil, and that of the very best description. The third circumstance is, that as the roots collect a great deal of their support from a depth much lower than field vegetables are used to reach, they hence convert the *useless* into *useful*. In short, instances are not wanting, where land previously producing little besides heath, has, after producing a crop of trees, more especially firs, proved without further means very tolerable pasture." *Profitable Planter*, p. 231.

In the *Agricultural Report for Perthshire* (p. 243.) a heathy tract is referred to, between Cupar and Perth, containing 2000 acres, which, after being twenty years under a crop of Scotch firs, was profitably subjected to aration.

1773. The *shade* of trees is highly grateful to man, whether reposing under a single tree, or in a state of recreation under the shadow of a row, or in an avenue, grove, or woodland path. "Shelter," Sang observes, "is not more useful in cold seasons, than the shade of trees is gratifying to cattle in hot ones. In an exposed, open field, under a burning sun, the torture which cattle often endure is truly distressing." *Plant. Kal.* 122.

In *garden* culture, shade is of great value; but walls are occasionally preferred to trees for this purpose; and next to walls, hedges or trees cut in the hedge manner.

1774. The *separation* produced by ligneous vegetables, in the form of hedges, is of long use in gardening, and of great and acknowledged importance in agriculture. In the latter art it may be considered as a criterion of improved culture; for when land lies intermixed, and is cultivated in what is called the common-field manner, the want of sufficient individual interest precludes all extraordinary exertion, and the country so cultivated has the same appearance now, that it had many centuries ago. Even on entire properties lying open, the want of the power of separating and classing cattle, and regulating their mode of grazing, and protecting particular fields for particular purposes, &c. is found so great a disadvantage as to be quite incompatible with the practice of improved farming.

1775. The *seclusion* afforded by trees, either as hedges, rows, strips, or groupes to dwellings of limited surrounding territory may be desired from taste, or rendered necessary by personal infirmity, political, local, or pecuniary circumstances. Trees, by their elevation and foliage, shut out external objects; obstruct the gaze of the over curious, and do not invite the visits of any one; while they leave the occupant in the centre of a little world of his own, in which he may enjoy himself in his own way.

1776. The *distinction* any sort of trees afford to a dwelling in a naked solitary country, or exotic species in one already wooded, is often desirable, as conveying chearful and social ideas to the passing stranger, and procuring for the owner that applause for improvement which he feels to be his due. In extensive domains the outlines, or prominent parts of them, may be indicated by particular sorts of trees; so as, from the house or from a prospect-tower, in a central part of the estate, to render the contour of the whole distinguishable. Where common, or any one kind of trees abound, uncommon or exotic kinds may be made use of; or a common tree, pruned in a particular way, will have an adequate effect.

1777. To *appropriate*, harmonize, or render apparently a part of a near estate, distant woody territory which does not belong to it, may be considered as a selfish principle under the disguise of a social one; but it is, at all events, harmless in a moral point of view, and is valuable as a device in improving the beauty of real landscape. Whatever may be the kinds of trees, or the forms in which they are planted in the distant or adjoining property, which we may wish to appropriate (*fig.* 465. *a a*); the principle is, to plant the same sorts of trees in corresponding forms (*b b*), in the property which we can call our own.

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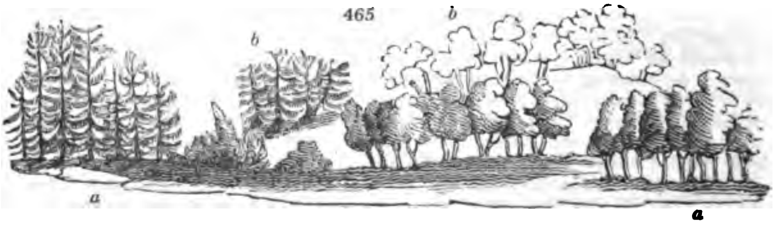

1778. The *concealment of disagreeable objects* by trees is too obvious, useful, and universal an improvement to require being enlarged on. This is one of the most important uses to which they are applied in small domains in a populous country, or near large towns. The desire of shutting out the houses of others, and especially of our poorer neighbours, does not so much arise from dislike either to the objects or the inhabitants, as from love of verdant scenery, and from a wish to have a country-seat as much like the country as possible. The desire of shutting out manufactories, steam-engines, coal-works, workhouses, &c. is still greater, because these objects excite ideas by no means in harmony with rural quiet; but no one ever thinks of shutting out a distant farm-house, solitary cottage, church, water-mill, bridge, monument, or ruin; for these are all interesting and agreeable objects, which are either characteristic of the country, or very generally occur there.

1779. Trees *heighten the effect of agreeable objects* by associating or grouping with them; and thereby forming a more perfect whole. Every whole consists of a number of parts, and the more varied the parts, provided they are allied among themselves, and not confused or redundant, the greater must be the effect of that whole. Trees contribute to the beauty of objects already beautiful; by lending new forms, new colors, varied light and shade; by their own motion, by inviting birds, and even by their smell. All these qualities are interesting to the moral and picturesque observer, and of great importance to the improver, whether he displays water, or erects buildings, or harmonises rocks and mountains. A country house without trees is felt by every one to be but a part of a whole.

1780. Trees may *direct the eye to objects* that would otherwise escape notice, or whose beauties would be lost in a general view. By employing them in the foreground of a scene to shut out uninteresting distance or mere sky, the eye may be led to repose on some agreeables near, or interesting distant object, which it had before wandered over unnoticed. By this sort of indication, accompanied by a seat, the dome of St. Paul's of London, of St. Peter's at Rome, and the cupola of the Iwan Wilika of Moskwa, are seen from the grounds of residences at twenty or thirty miles distance from these capitals; and in this way the worthy and amiable Shenstone, pointed out the wrekin, and church spire of Halesowen, from the rustic paths of the Leasowes.

1781. Trees *render indifferent objects interesting* when judiciously grouped with them, so as to seem to conceal, by accident, that which we should desire or imagine to be there. Thus, a fragment of a wall, or of a tower, emerging from a thicket, may, by imagination be considered as an index to the main body of the ruined mansion or castle concealed by the wood. A broken gothic arch immerging from a thick wood may seem the commencement of a cloister or the aisles of a ruined abbey. A large stone lying on a naked surface is an object of little interest in a picturesque point of view, but surrounded by a few trees and bushes, it may be taken for part of a stratum of rock. A few yards of brick-wall, standing naked and bare in a field would be considered as a deformity; partially cover it with ivy, which may first ascend and then mantle over its top, and add a holly or thorn, a briar, and an oak or ash, and a beautiful group is produced.

In scenery, where great deformities or featureless extent is mixed with beauty or grandeur, trees will conceal the latter, and display the former to advantage. Ranges of naked mountains often present this kind of mixture of feature, dullness and want of grouping (*fig.* 466.), which no improvement but planting could ameliorate and render tolerable.

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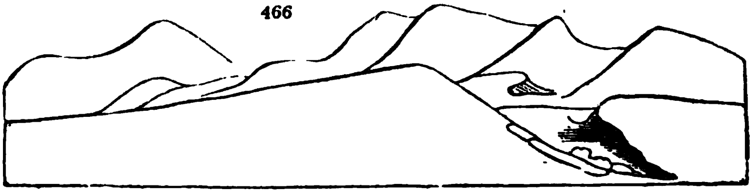

Gilpin, in his "*Tours to the Lakes and Highlands, &c.*" has some excellent observations on this subject; and there are various instances in the Pentland and Grampian ranges of hills where improvements of this sort have been executed with the happiest effect (*fig.* 467.)

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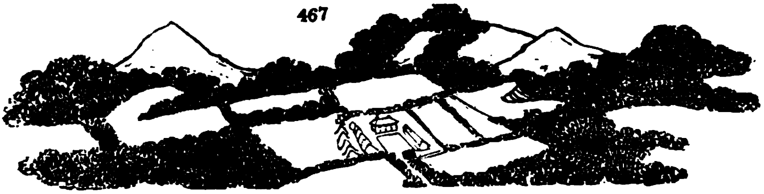


1782. *Beauty may even be created by trees* independently of all other objects. A dull flat surface will be rendered more interesting by scattering a few trees over it, of any sort, and in almost any manner: but it may be grouped or massed by one, a few, or by many sorts; or laid out in avenues, stars, platoons, and other modern or ancient forms of planting, so as to become a scene of positive beauty. Every species of trees has its particular form, bulk, mode of growth, flowering, &c. which constitute its character; this character varies with the age of the tree, and its situation, relative to other trees, or to soil, climate, &c. Now, as every tree may be grouped, or combined with those of its own species, or with any or all of the others, in an endless variety of ways the beauty that may thus be created by trees alone, can only be limited by the extent of surface on which they are to be grown.

1783. It cannot be surprising that all these properties of trees, individually and in masses, should *enhance the value of landed property containing plantations prospectively*. "It is very generally known," Sang observes, "that such estates as have a quantity of well-arranged, healthy timber upon them, when brought to sale, bring an extra price, according to the quality and value of the wood, not only at the time of sale, but, counting forward on its value, to the period of its perfection. Thus, supposing the half-grown timber on an estate to be valued at ten thousand pounds at the time of the sale, instances are to be found where thirty thousand pounds have been given, over and above the valuation of the lands. The purchasers of such estates wisely foresee the increase of value which will arise from healthy timber growing, where it may not only be cherished, till of full maturity, but where, probably, it can then be turned to the best advantage by reason of its local situation. But, besides the real value of grown timber, there is most generally an ideal value attached to it, namely, that of its ornamental appearance." *Plant. Kal.* 124.

A landed proprietor, who is a parent, looks on a thriving plantation as capital laid out at compound interest, and on the most undoubted security, for the benefit of his offspring; and he values it in this respect the more, because no man can determine the ratio in which, from the progress of the trees, and the future prosperity of the country, it may encrease in value. It does not happen to many to plant trees and cut them down at a mature age; but this only renders planting a more interesting performance to the man who is in secure enjoyment of an estate; for in his full-grown trees he finds a link which connects him with his ancestors, and in his young plantations another which carries him down with his posterity to the next age. In this way he may imagine himself a being "having neither beginning of days nor end of life."

Sect. III. *Of the Profits of Planting.*

1784. From the *seemingly distant advantages* of planting has arisen the practice, by authors, of presenting statements of the profits, pleasures, and honours attending it, with a view to excite the selfish or patriotic feelings of their readers. "The profits of planting," says Marshall, "are great, when properly executed, and this idea adds solidity to the enjoyment. Pleasure alone may satiate; but profit and pleasure united seldom fail of producing a lasting gratification." Every one who has the least taste for country matters, must be alive to the agreeable and satisfactory feelings with which plantations are formed; and certainly there is something disinterested and respectable in incurring a present expence for what in most cases is to benefit a future generation; but as to the extraordinary profits, either of a near or far distant period, they are by no means to be depended on. With respect to the absolute profit to be derived from trees or plantations, considered independently, it is easy, by a calculation founded on a seemingly very moderate data, to make the clear gain attending the raising of any crop appear considerable; and, accordingly almost every speculative cultivator, whether of corn or trees, calculates on making a fortune in a very few years, as soon as he can get possession of a farm or a tract of waste. The truth is, however, that though accidental circumstances may render it more profitable to cultivate one kind of crop, either of trees or corn, at one time and place rather than another; yet, on the whole, the profits of capital employed in any way in agriculture or planting must, on the general average, be nearly the same. The certain lapse of time which must ever intervene between the planting of trees and their attaining a disposable size, must alone render any calculation made at the time of planting, extremely problematical. In planting, as in every other branch of culture, extraordinary profit is attended by extraordinary production, which soon sinks the market value of the article; add also, that in a commercial, free and highly-taxed country, whenever any article attains a very high price, substitutes are found at home, or imported from abroad; so, that no particular crop should be considered as exclusively the best to cultivate, and no extraordinary profits ever calculated on from any crop. Plantations should be made with a joint view to all or part of the advantages which we have shown to be attendant on them; but no more ultimate profit calculated on, from the disposal of the trees, than what is expected from capital laid out on any other territorial improvement; indeed, the safest principle on which to act, is to consider capital employed in planting, as on a par with that laid out in the purchase of landed property.

1785. With respect to the *value of trees as plantations*, or in masses, that is entirely relative; and must be sought for in the additional value conferred on the adjoining lands by the improvement of their climate, or their beauty. This sort of value cannot easily be subjected to any general rules of estimation; but unquestionably capital employed in planting and cultivating trees for such purposes, especially for the former, or when they are both united, may be considered as likely in the end to yield a greater interest than that employed in the ordinary routine of tree or corn culture. In bleak, exposed situations, the advantages which have arisen from screen plantations have in some cases been so great as to be estimated at a third of the value of the land, and in every case where shelter is wanted they must be considerable. These, however, should be looked on by the prudent man rather in the light of extraordinary cases, attended by unforeseen risks, and though depending chiefly on skill, yet in some degree also on chance.

Chap. II.

Of the different kinds of Trees and Plantations.

Having considered the different objects for which trees and plantations are cultivated, our next step shall be to arrange trees and plantations, according to their qualities, for fulfilling these objects.

Sect. I. *Of the classification of Trees relatively to their use and effect in Landscape.*

1786. *Timber* is the grand object for which trees are cultivated, and it is either straight or crooked in form, large or small in dimension, hard, soft, or resinous in quality, brittle or flexible in texture, smooth or rough grained, and plain colored or variegated in appearance.

Straight Timber is chiefly produced by the pine and fir tribe, and such other trees whose lateral branches do not generally acquire a timber size, as the Lombardy poplar, hornbeam, deciduous cypress.

Crooked Timber may be produced by any branching tree; but chiefly by the oak, sweet chestnut, broad-leaved elm, walnut, &c.

Timber of *large dimension*, in regard to *length*, is produced by the spruce fir, larch, Lombardy poplar, ash, narrow-leaved elm; in regard to *diameter* by the oak, sweet chestnut, and elm; magnitude in both dimensions is united in the narrow-leaved elm, beech, oak, and larch fir.

Timber of *small dimensions*, is produced by the yew, holly, thorn, ash, maple, laburnum, &c.

Timbers, *hard in quality*, or, what are called the *hard woods*, are the oak, chestnut, sycamore, ash, beech, plane, walnut, box, holly, yew, &c. *Softer timbers*, or the soft woods, are the poplar, willow, lime, horse-chestnut. *Resinous timbers* are, the pine and fir tribe. *Brittle timber* is exemplified in acacia, hornbean, and spindle tree; *flexible*, in the ash, broad-leaved elm, and chestnut; *smooth grained*, in the lime, poplar, willow, hornbean; *coarse grained*, in the ash, oak, and chestnut; *plain colored*, in the willow, lime, holly; and *variegated*, in the yew, thorn, walnut, elm, plum, and many others.

1787. *Bark*, which contains the tanning principle, is an important product of trees. That which affords it in greatest quantity is the oak; and next, as far as chemists have yet ascertained, the Leicester willow (*Salix alba var.*), Spanish chesnut, ash, sloe, Lombardy poplar, hazel, elm, common willow, sycamore, beech, horse-chesnut, birch, and larch, (see 366.) *Agr. Chem.* 89.

Charcoal, which is made from either branches, trunk, or roots, has been afforded by different trees at the following rates per cent.; laburnum, 24.5; chestnut, 23.2; oak, 22.6; walnut, 20.6; holly, beech, maple, 19.9; elm, 19.5; Norway pine, 19.2; sallow, 18.4; ash, 17.9; birch, 17.4; Scotch pine, 16.4. (*Agr. Chem.* 105.) Proust found the greatest proportion of charcoal to be afforded by the ash. (392.)

Ashes have been afforded by oak at the rate of 15; elm, 39; beech, 12; and poplar, 7 parts in ten thousand. (*Agr. Chem.* 113.) The result of Saussure's experiments, on procuring ashes from trees, have been already related. (395.)

1788. For *Fuel and Fencing*. The tendency of trees to produce lateral branches, and renew them when lopped off, is an important quality, and exists in an eminent degree in the ash, elm, oak, willow, poplar, lime, &c.; but not at all in the pine and fir tribe, and but slightly in the plane, walnut, and some others. Those which grow most rapidly are also to be desired as fuel trees, as the acacia, poplar, willow, in most soils; and the larch fir, Scotch pine, and birch, on such as are dry. The *Ailanthus glandulosus* may also be mentioned as a bulky and rapid growing tree. On the chalky hills at Mereville, (before the revolution one of the most extensive parks and magnificent seats in France,) this tree thrives, and attains a considerable size, where no others will grow.

1789. For *Hoops, Basket Willows, Besom Spray, Implement Handles, Poles, &c.* the renewal of trees or shrubs which have been cut down, or technically, their tendency to *stole* or shoot out from the collar, is an important consideration. This quality does not belong to the pine and fir tribe; and only slightly to the beech, sycamore, alder, plane, &c.; but liberally to all those mentioned above, as renewing their branches, and indeed to most trees not resinous. For the same objects, the tendency of trees to *send up suckers* or root-shoots, deserves also the attention of the planter. This never takes place with the resinous trees, and seldom with the oak, beech, chestnut, ash, plane, &c.; but it is general with the elm, poplar, acacia, prunus, pyrus, mespilus, lime, and several willows.

1790. For *Shelter*, rapid growing and evergreen trees are desirable, as the Scotch pine, and such as are at the same time clothed with branches from the ground upwards, as the spruce fir; the best of all trees for shelter, unless the situation is very elevated. Among the deciduous trees, the fast-growing branchy sorts are most desirable, as the larch, birch, poplar, willow; in very elevated situations, the birch, mountain-ash, and Scotch fir; exposed to the sea breeze, the elder and sycamore. To maintain a branchy, leafy screen from the ground upwards, intermix trees and shrubs which stole; or such as grow under the shade and drip of others, as the holly, hazel, dogwood, box, yew, &c. To produce shelter, and yet admit of the growth of grass below the trees, prune any sort to single stems, and use chiefly deciduous sorts.

1791. For *Shade*, close plantations are seldom desirable, a free circulation of air being necessary to coolness; therefore use trees with lofty stems and large heads, and prune them to single stems a certain height, as the oak, elm, chestnut, beech, for thick shade; the plane, acacia, poplar, for lighter shade; the birch, balm of Gilead fir, and lime, for odoriferous shade; and avoid the walnut, elder, and laburnum, the atmosphere under which is reckoned deleterious.

1792. For *improving bad Soils*, and for all the purposes of planting, the soil and situation, affected by or natural to trees, is an important study for the planter. Some are aquatics, or delight in moist situations near water, as most of the willow and poplar tribe, the alder and the elder; others are mountain trees, as the Scotch pine, larch fir, mountain ash, sorb; some delight in vallies or plains, as the narrow-leaved elm, horse-chestnut, plane, lime, oak; others, in craggy steeps and dells, as the ash, silver and spruce fir, most of the pines, and many more; some on chalky soils, as the beech; others on clays, as the oak; on sand, as the Scotch pine; and a few trees will grow in the most opposite situations and soils, as the elder, which is found on mountain tops and on the sea-shore; the birch on the highest mountains, on dry rocks, and on marshes. For the poorest soils, whether high or low, choose the birch, larch, and Scotch pine; and for the richest, the ash, elm, oak, chestnuts, limes, poplars, and willows.

1793. For the *purposes* of the *separation of*, or *defence from*, the inferior animals, the plantations called hedges, or close rows of shrubs, are adopted; when these are to be *low*, such shrubs as send out numerous branches from the root upwards, and are of great durability; are most desirable, as the holly among evergreens, and the hawthorn, sloe, crab, beech, buckthorn, and hornbeam, among deciduous sorts. For moist situations, the alder, elder, birch, and willow, are to be preferred; and for dry, upland sites, the juniper, whin, birch, and elder: avoid poisonous trees, as the yew. For tall or tree hedges, such trees as the elm, beech, hornbeam, lime, birch, and spruce fir, are desirable; but the holly excels all other plants for a hedge, whether low or tall, and is liable to no other objection than its slow growth, which occasions a considerable expence in protecting it till it is able itself to serve for defence.

1794. For *Seclusion* and *Concealment*, branchy, leafy trees, a number of which have been mentioned (1790), are obviously desirable; and, for distinction, either sorts different from what are already there, or ordinary sorts pruned and made to assume extraordinary forms.

1795. For the various purposes of *Ornament, Beauty*, or *Effect*, in landscape, the hardy trees may be arranged as to magnitude, form, mode of growth, duration, and expression. *Magnitude*. Trees of great height are, the English elm, ash, larch, Polish and Carolina poplar, &c.; but the laburnum, mountain ash, and evergreen oak, are very low trees. A medium in height may be found in the maple, pine, and birch. Some trees exceed in breadth, as the oak, Spanish chesnut, and Scotch elm; others of different heights are very slender, as the Lombardy poplar, cypress, and bird-cherry. *Form*. The oak and Spanish chestnut afford the most irregular and picturesque shapes with round heads; the English elm and ash have long, narrow forms, and round heads; the beech and horse chestnut, compact ovate forms, with obtuse heads; the spruce and pine tribe, in general, have conical shapes, and pointed spiry tops; the Lombardy poplar, cypress, and most willows, have long narrow shapes and oblong tops. *Color.* The Scotch pine, yew, and horse-chestnut, are dark greens; the larch and elm, a yellow-green; the abele, Huntingdon willow, a silvery-green, &c. *Mode and time of growth.* The nature of some trees is to lose their lower branches as they increase in height, as the fir tribe; and others have a tendency to retain them, as the wych elm. In some the branches descend, and often recline on the ground, as the lime-tree and platanus. Some are very compact in their foliage, as the horse-chestnut; others very open, as the ash and the acacia. Some have drooping spray, as the weeping-willow; that of others tends upwards, as in the Lombardy poplar; horizontally, as in the oak; and obliquely, as in the Scotch pine. Some grow with rapidity, as the Carolina and Athenian poplars; others very slowly, as the oak and the stone pine. *Duration.* The most durable of trees is the oak; the least so, some of the poplar and fir tribe. A medium is to be found in the elm and lime. *Expression.* Some trees convey ideas of utility in the arts, and mark the attention and industry of man, as having planted them for this purpose, as the oak, ash, elm, &c. Others are known, or supposed to be of little use, and convey ideas of neglect or of wildness, as the hornbeam, sorb, trembling poplar, &c. Some indicate general improvement and artificial plantations, as the larch, and spruce fir; others, garden scenery or plantations near a house, as the cedar, stone pine, and platanus. Some indicate rich, deep soil, as the oak; and rich thin soil, as the elm; others, chalk or gravel, as the beech; rocky ground, as the ash; marshy ground, as the alder; the proximity of water, as the willow. There are also natural expressions belonging to trees, partly from general, and partly from accidental association; as strength and stability to the oak, ease and elegance to the birch, sweetness to the lime, gloom to the cypress and yew, melancholy to the weeping-willow, &c.

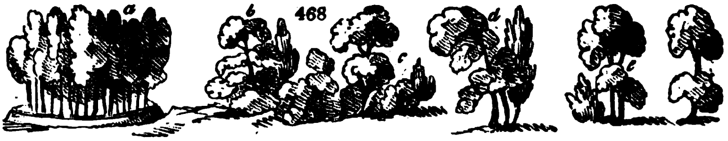
1796. The *common hardy shrubs* may be similarly arranged; but it will be sufficient to class them according to magnitude, mode of growth, evergreen, deciduous, native, naturalized, and exotic. *Magnitude.* Some shrubs are high, approaching to the character of trees, as the mespilus and common holly; others very low, as the butcher's broom and dwarf-birch. *Mode of growth.* Some are creepers, as the ivy; climbers, as the virgin's bower; trailers, as the bramble; compact forms, as that of the arbor vitæ; open airy branches, as in the tamarisk; and singular branches, as those of the stagshorn shumach. Some, as shrubs, soon acquire picturesque shapes, as the thorn, holly, and elder. Some are *evergreens*, as the holly, laurel yew, laurustinus, arbutus, &c. *Deciduous*, as the guelder-rose, lilac, syringa, &c. *Native*, as the holly, privet, hazel, thorn, briar, &c. *Naturalized*, as the rose, syringa, lilac, laburnum, &c. *Exotic*, or foreign, as the rhododendron, azalea, &c.

1797. These arrangements as to the *effect of Trees and Shrubs in Landscape*, as far as form, magnitude, mode of growth, and expression are concerned, refer to plants growing detached from other trees, and as nearly full-grown. It is less intended to comprehend every characteristic distinction than to suggest to the artist the principal light in which he ought to view trees and shrubs. Nor could he with confidence attempt planting, with even such a knowledge as could be obtained from the above arrangement, completed by inserting all the names under their proper heads; for unless he has seen the majority of the full-grown trees himself, both singly and connected in groups and masses, and is acquainted with the comparative rapidity of their growth in different climates and soils, he cannot well foresee the result of his labors, or look forward "with the prophetic eye of taste" to certain beauty. Of this there are numerous proofs, arising from the unjust preference given to exotics of unknown shapes and duration, in situations where the general form and situation of the tree, or even of one or two trees, is of the utmost consequence to the effect of a whole. How frequently on a lawn, or in a plantation near a house, do we see acacias, cut-leaved elders, variegated sycamores, &c. where the oak, birch, lime, or Spanish chestnut would have produced a much more impressive general effect!

Sect. II. *Of the Classification of Plantations, or Assemblages of Trees.*

Assemblages of trees, whether natural or artificial, differ in extent, outline, disposition of the trees, and kind of tree.

1798. In regard to *extent*, the least is a group (*fig.* 468. *e* and *d*), which must consist at least two plants; larger, it is called a thicket (*b c*); round and compact, it is called a clump (*a*); still larger, a mass; and all above a mass is denominated a wood or forest, and characterized by comparative degrees of largeness. The term *wood* may be applied to a large assemblage of trees, either natural or artificial; *forest*, exclusively to the most extensive or natural assemblages.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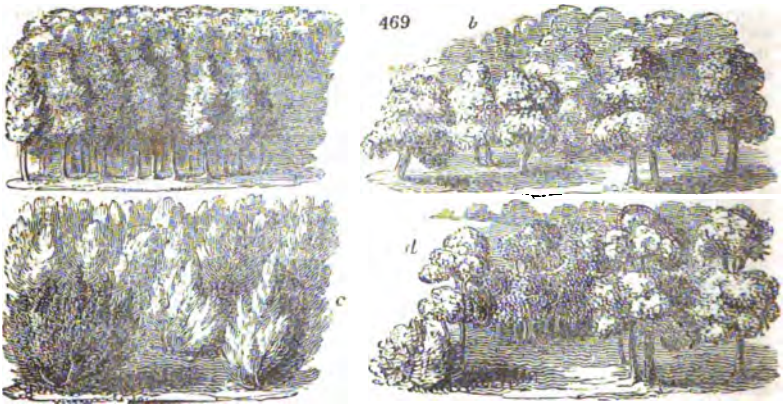
With respect to the *outline*, or ground-plan of a plantation, the simplest disposition is that of a row or line, which may be either straight or crooked, as in hedges or lines of trees; next that of any determinate shape, as round, exemplified in the clump; square, in the platoon; oblong, in either clump or platoon, and in strips, screens, or belts; irregular or indeterminate, in thickets, masses, and all larger plantations.

1799. With respect to the *disposition* of the trees within the plantation, they may be placed regularly in rows, squares, parallelograms, or quincunx; irregularly in the manner of groups; without undergrowths, as in *groves* (*fig.* 469. *a, b,*); with undergrowths, as in *woods* (*c*); all undergrowths, as in *copsewoods* (*d*). Or they may form *avenues* (*fig.* 470. *a*); double avenues (*b*); avenues intersecting in the manner of a Greek cross (*c*); of a martyr's cross (*d*); of a star (*e*); or of a duck's foot *paté d'oye*, (*f*).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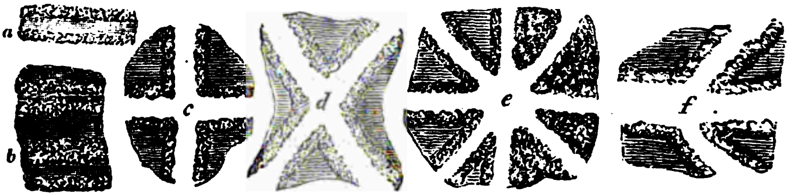

They may form regular *glades* (*fig.* 471. *a, b,*); or irregular glades (*c*); glades, as niches or cabinets (*d*); as open squares; glades, as squares, *en berceau* (*e*); or as squares, *en sallons* and *en allée* (*f*).

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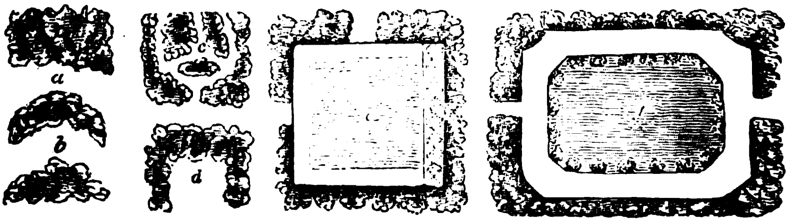

1800. With respect to the *character of tree* plantations, they may be as various as there are species; but for general effect and designation, woody plants are classed as large or small, trees or undergrowths, deciduous or evergreen, round-headed or spiry-topped; and plantations of every form and disposition may be planted with these, either separately or mixed. Thus we have groups of shrubs, groups of high and low growths, and of trees; plantations of round-headed trees; of round-headed and spiry-topped trees mixed; of trees and undergrowths; or of low growths only, as in copse-woods and osier plantations.

Chap. III.

Of the Formation of Plantations, in which Utility is the principal Object.

1801. This subject embraces the situation, soil, form, species of tree, fencing, and other considerations.

If the object of the planter is to obtain the greatest bulk of timber in the shortest time, then a sheltered *situation* and *deep rich soil*, would be the most proper for planting; but this would not be profitable planting, for such a soil would, in all probability, have made greater returns under common farming. The profits of planting do not depend on the absolute quantity of timber produced, but on that quantity relatively to the value of the soil for agricultural purposes. Such situations and soils as can be profitably subjected to aration or permanent pasture, will rarely be found to yield an equal profit, if planted with trees. Suppose a piece of ground to let at 20*s*. per acre for pasture or arable, to be planted at an expence of only 10*l*. per acre; then, in order to return the rent, and 5*l*. per cent. for the money expended, it ought to yield 30*s*. a-year; but as the returns are not yearly, but say at the end of every fifteen years, when the whole may be cut down as copse, then the amount of 30*s*. per annum, at 5*l*. per cent. compound interest, being 32*l*. 8*s*. every fall of copse made at the interval of fifteen years, ought to produce that sum per acre clear of all expences.

Hence, with a view to profit from the fall of timber, or copse wood, no situation capable of much agricultural improvement should be planted, unless a certain part with a view to sheltering the rest; or for the purposes of separation and fencing.

1802. Whatever may be the nature of the *soil*, if the plants are intended to thrive, the subsoil ought to be rendered dry. Large open drains may be used, where the ground is not to undergo much preparation; but where it is to be fallowed or trenched, under-drains become requisite. It is true, these will in time be choaked up by the roots of the trees; but by that period, as no more culture will be requisite, they may be opened, and left open. Many situations, as steep sides of hills and rocky irregular surfaces, do not admit of preparing the soil by comminution previously to planting; but wherever that can be done, either by trenching, digging, or a year's subjection to the plough, it will be found amply to repay the trouble. This is more especially requisite for strips, for shelter, or hedge-rows, as the quick growth of the plants in these cases is a matter of the utmost consequence. The general mode of planting hedges by the side of an open drain, renders preparation for them, in many cases, less necessary; but for strips, wherever it is practicable, and there is at the same time no danger of the soil being washed away by rains or thaws, as in some chalky, hilly districts; or blown about by the wind, as in some parts of Norfolk, and other sandy tracts, preparation by a year's fallow, or by trenching two spits deep, cannot be omitted without real loss, by retarding the attainment of the object desired. There are instances stated of promising oak plantations from oaks dibbled into soil altogether unimproved; and of plantations of Scotch pine, raised by merely sowing the seeds on a heath or common, and excluding cattle (*Gen. Rep. of Scotland*, ii. 269.); but these are rare cases, and the time required, and the instances of failure, are not mentioned. The practice is obviously too rude to be recommended as one of art. The best situations for planting, without any other culture but inserting the seeds or plants, are surfaces partially covered with low, woody growths, as broom, furze, &c. " The ground which is covered, or rather half covered, with juniper and heath," says Buffon, " is already a wood half made."

Osier Plantations are an exception to these remarks, as to the value of the situation and soil; they require a deep, strong, moist soil, but one not springy, or continually saturated with water; and it will be in vain to plant them without trenching it two or more feet deep.

1803. The *form* of plantation for profit or shelter must be determined jointly by the situation and the objects in view. In rocky abrupt sites (*fig*. 472.), the plantation will consist of a number of masses (*a*, *b*, *c*,), of forms determined by the rocks and precipices, among which some of the most valuable pasture may be left as glades (*d*, *e*,), for use, effect, and for the sake of game. Strips and hedges for sheltering, or separating

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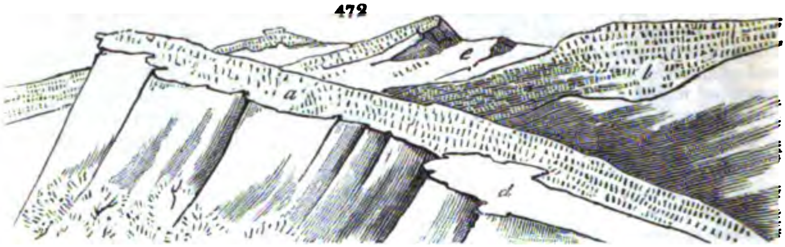

arable lands, should be formed as much as possible in straight and parallel lines, in order not to increase the expence of tillage by short and irregular turnings. Straight, parallel strips, on irregular surfaces, have a more varied appearance at a distance, than strips ever so much varied on a flat surface; for, in the former case, the outline against the sky is varied as much as that on the earth. In extensive, hilly pastures, in which it is often desirable to produce shelter, and at the same time to plant only the most rocky and unproductive spots, the forms may be of the most irregular description; and by planting chiefly on the eminences and slopes (*fig.* 473.), shelter will be most effectually produced, the pasture improved, the least valuable ground rendered productive in copse or timber, and the greatest richness and picturesque beauty conferred on the landscape. There are some fine examples of this on the hilly districts of Fifeshire; there, on many estates where nothing was sought for but profit and shelter, the greatest beauty has been produced; and the picturesque tourist now passes through glades and valleys, pastured by well-fed cattle and sheep, enlivened by rocks, thickets, hanging-woods, and occasional rills and lakes. Fifty years ago, scarcely a tree was to be seen, and only the most inferior descriptions of live-stock.

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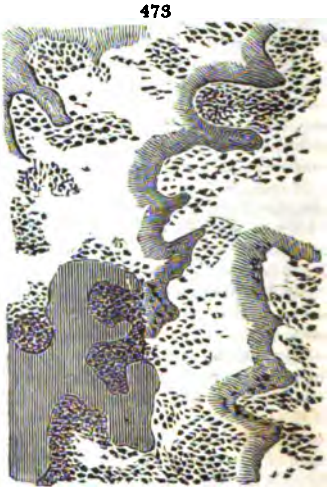

1804. The *enclosing* of plantations is too essential a part of their formation to require enlarging on. In all those of small extent, as hedges and strips, it is the principal part of the expence; but to plant in these forms, or any other, without inclosing, would be merely a waste of labor and property. The sole object of fencing being to exclude the domestic quadrupeds, it is obvious, that whatever, in the given situation, is calculated to effect this at the least expence, the first cost and future repairs or management being taken into consideration, must be the best. Where stones abound on the spot, a wall is the best and cheapest of all fences as such; but, in the great majority of cases, recourse is obliged to be had to a verdant fence of some sort, and generally to one of hawthorn. This being itself a plantation, requires to be defended by some temporary barrier, till it arrives at maturity; and here the remark just made will again apply, that whatever temporary barrier is found cheapest in the given situation will be the best. Hedge fences are in general accompanied by an open drain, which, besides acting in its proper capacity, furnishes, at its formation, a quantity of soil to increase the pasturage of the hedge plants; and an excavation (*fig.* 474. *a*), and an elevation (*f*), to aid in the formation of a temporary fence. A hedge inclosing a plantation, requires only to be

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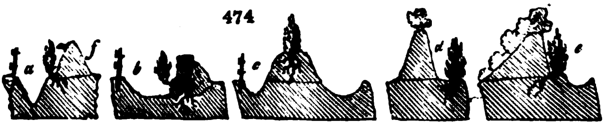

guarded on the exterior side, and of the various ways in which this is done, the following may be reckoned among the best and most generally applicable. By an open drain and paling, or line of posts and rails (*a*), the plants inserted in a facing of stone, backed by the earth of the drain (*b*); an excellent mode, as the plants generally thrive, and almost never require cleaning from weeds; an open drain and paling, and the hedge on the top of the elevation (*c*); no open drain, but the soil being a loam, the surface-turves formed into a narrow ridge, to serve as a paling, a temporary hedge of furze sown on its summit, and the permanent hedge of thorn or holly within (*d*); and an open drain, but on the inside, the exterior being protected by a steep bank sown with furze (*e*). The first of these modes is the most general, the second the best, and the fourth the cheapest, where timber is not abundant.

Separation fences are commonly formed in the first, second, or third manner, but with a paling on both sides.

1805. Many situations are so exposed that it is extremely difficult to rear trees without some mode of procuring *shelter* for them during their early growth. This is obtained either by walls, the extent of whose influence is only limited; by thick planting, or by planting the more hardy and rapid-growing species, to nurse up and protect such as are more tender, but ultimately more valuable. The proportion of nurses to principals is increased according to the bleakness of the site; Pontey says, "both authors and planters are in the habit of erring egregiously, in regard to the proportion of principals and nurses; as they generally use as many, or more of the former than the latter; though it is very easy to show, that they ought to use three times as many of the latter as the former. For instance, when trees are planted at four feet apart, each occupies a surface of sixteen feet; of course four of them will occupy sixty-four, or a square of eight feet; and therefore, if we plant three nurses to one principal tree, all the former might be displaced gradually, and the latter would still stand only eight feet apart.

"Nurse-plants should, in every possible case, be such as are most valuable at an early period of growth. The larch and spruce fir should be used liberally, in every case where they will grow freely; still it is not intended they should exclude all others, more particularly the birch, which has most of the properties of a good nurse, such as numerous branches and quick growth, on any tolerable soil or situation. It is not, however, like the others, a wood of general application." *Profitable Planter*, p. 113.

Sang also adopts the proportion of three nurses to one principal, and employs chiefly the resinous tribe, and looks to them for reimbursement till the hard timber has attained to a foot in diameter, under which size hard timber is seldom of much value. His principals are planted at from six to ten feet apart, according to the soil and situation. *Plant. Kal.* p. 166.

In procuring shelter much depends on the mode of commencing and continuing plantations on bleak sites. Sang, who has had extensive experience on this subject, observes, that "every plain, and most fields and situations for planting, in this country, have what may be called a windward side, which is more exposed to the destructive blast than any other. It is of very great importance to be apprized of this circumstance; and to be able to fix upon the most exposed side of the proposed forest plantation. Fix, then, upon the windward side of the plain which is to be converted into a forest; mark off a horizontal stripe, or belt, at least a hundred yards in breadth. Let this portion of ground be planted thick, say at the distance of thirty inches, or at the most three feet, with a mixture of larch, sycamore, and elder, in equal quantities, or nearly so, if the soil be adapted for rearing these; but, if it be better adapted for Scots firs, then let it be planted with them at the distances prescribed for the above mixture. We have no other kinds that will thrive better, or rise more quickly in bleak situations, than those just mentioned. When the trees in this belt, or zone, have risen to the height of two feet, such hard wood trees as are intended ultimately to fill the ground should be introduced, at the distance of eight or ten feet from each other, as circumstances may admit. At this period, or perhaps a year or two afterwards, according to the bleak or exposed situation of the grounds, let another parallel belt, or zone, of nearly equal breadth, be added to the one already so far grown up, and so on, till the whole grounds be covered. It is not easy here to determine on the exact breadth of the subsequent belts or zones: this matter must be regulated by the degree of exposure of the grounds, by the shelter afforded by the zone previously planted, and by such like circumstances." *Plant. Kal.* p. 29.

In situations exposed to the sea-breeze a similar plan may be successfully followed, and aided in effect, by beginning with a wall (*fig.* 475.), the first zone (*a*) having reached the height of the wall, plant a second (*b*), a third and fourth (*c* and *d*), and so on till you cover the whole tract to be wooded. In this way the plantations on the east coast of Mid-Lothian, round Gossford-house, were reared; and in Sang's manner, the mountains of Blair and

Dunkeld were cloathed; and examples, we are informed, might be drawn even from the Orkney and Shetland islands.

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1806. The *species* of tree to be planted must ever depend chiefly on the situation and soil, but partly also on the sort of product desired as the most profitable, and on the importance attached to shelter. As a general principle it may be observed, that the tree which will thrive the best, will turn out the most profitable; for, though its timber may not be of the highest priced kind, yet there will be quantity as compensation for inferior quality. In rocky irregular surfaces there is generally great variety of situation and depth of soil; and here a corresponding variety of trees may be introduced, and the more valuable sorts, as the oak, ash, elm, poplar, &c. will no where thrive better than at the foot of precipices, and in narrow dells and other sinuosities, where there is at once shelter and a good depth of dry soil. The thriving of trees and plants of every kind, indeed, depends much more on the quantity of available soils, and its state in respect to water and climate, than on its constituent principles; moderately sheltered and on a dry subsoil, it signifies little whether the surface strata be a clayey, sandy, or calcareous loam; all the principal trees will thrive nearly equally well in either so circumstanced; but no tree whatever in these, or in any soil saturated with water, and in a bleak exposed site. For hedge-row timber, those kinds which grow with lofty stems, which draw their nourishment from the subsoil, and do least injury by their shade, are to be preferred. These, according to Blaikie, are oaks, narrow-leaved elm, and black Italian poplar; beech, ash, and firs, he says, are ruinous to fences, and otherwise injurious to farmers. *On Hedges and Hedge-row Timber*, p. 10.

1807. The common practice in planting is to *mix* different species of trees together, which is unavoidable where nurse or shelter plants are introduced; where these are not wanted, the opinions of planters are divided on the subject. Mixing different sorts is most generally approved of; Marshall advises mixing the ash with the oak, because the latter draws its nourishment chiefly from the subsoil, and the former from the surface. Nicol is an advocate for indiscriminate mixture (*Practical Planter*, p. 77), and Pontey says, “ both reason and experience will fully warrant the conclusion, that the greatest possible quantity of timber is to be obtained by planting mixtures.” (*Prof. Planter*, p. 119). “ We are clearly of opinion,” says Sang, “ that the best method is to plant each sort in distinct masses or groups, provided the situation and quality of the soil be properly kept in view. There has hitherto been too much random work carried on with respect to the mixture of different kinds. A longer practice, and more experience, will discover better methods in any science. That of planting is now widely extended; and improvements in all its branches are introduced. We, therefore, having a better knowledge of soils, perhaps, than our forefathers had, can, with greater certainty, assign to each tree its proper station. We can, perhaps, at sight, decide, that here the oak will grow to perfection, there the ash, and here again the beech; and the same with respect to the others.

“ If, however, there happen to be a piece of land of such a quality, that it may be said to be equally adapted for the oak, the walnut, or the Spanish chestnut, it will be proper to place such in it, in a mixed way, as the principals; because each sort will extract its own proper nourishment, and will have an enlarged range of pasturage for its roots, and consequently may make better timber trees.

“ Although, by indiscriminately mixing different kinds of hard-wood plants in a plantation, there is hardly a doubt that the ground will be fully cropped with one kind or other; yet it *very often happens*, in cases where the soil is evidently well adapted to the most valuable sorts, as the oak perhaps, *that there is hardly one oak in the ground for a hundred that ought to have been planted.* We have known this imperfection in several instances severely felt. It not unfrequently happens, too, that even what oaks, or other hard-wood trees, are to be met with, are overtopped by less valuable kinds, or perhaps such, all things considered, as hardly deserve a place.

Such evils may be prevented by planting with attention to the soil, and in distinct masses. In these masses are insured a full crop, by being properly nursed, for a time, with kinds more hardy, or which afford more shelter than such hard-wood plants. There is no rule by which to fix the size or extent of any of these masses. Indeed, the more various they be made in size, the better will they, when grown up, please the eye of a person of taste. They may be extended from one acre to fifty, or a hundred acres, according to the circumstances of soil and situation: their shapes will accordingly be as various as their dimensions.

"In the same manner ought all the resinous kinds to be planted, which are intended for timber trees; nor should these be intermixed with any other sort, but be in distinct masses by themselves. The massing of larch, the pine, and the fir of all sorts, is the least laborious and surest means of producing good, straight, and clean timber. It is by planting, or rather by sowing them in masses, by placing them thick, by a timeous pruning and gradual thinning, that we can, with certainty, attain to this object." *Plant. Kal.* 162 and 166.

Our opinion is in perfect consonance with that of Sang, and for the same reasons; and we may add as an additional one, that in the most vigorous natural forests one species of tree will generally be found occupying almost exclusively one soil and situation, while in forests less vigorous on inferior and on watery soils, mixtures of sorts are more prevalent. This may be observed in comparing New Forest with the natural woods round Lochlomond, and it is very strikingly exemplified in the great forests of Poland and Russia.

1808. Whether extensive plantations should be *sown* or *planted*, is a question about which planters are at variance. Miller says, transplanted oaks will never arrive at the size of those raised where they are to remain from the acorn. (*Dict. Quercus.*) Marshall prefers sowing when the ground can be cultivated with the plough. (*Plant. and Rur Orn.* i. 123.) Evelyn, Emmerich, and Speechly are of the same opinion; Pontey and Nicol practice planting, but offer no arguments against sowing where circumstances are suitable. Sang says, "It is an opinion very generally entertained, that planted timber can never, in any case, be equal in durability and value to that which is sown. We certainly feel ourselves inclined to support this opinion, although we readily admit, that the matter has not been so fully established, from experiment, as to amount to positive proof. But although we have not met with decided evidence, to enable us to determine on the comparative excellence of timber raised from seeds, without being replanted, over such as have been raised from replanted trees, we are left in no doubt as to the preference, in respect of growth, of those trees which are sown, over such as are planted." (*Plant. Kal.* 43.) He particularly prefers this mode for raising extensive tracts of the Scotch pine and larch (p. 430.), and is decidedly of opinion, "that every kind of forest tree will succeed better by being reared from seeds in the place where it is to grow to maturity, than by being raised in any nursery whatever, and from thence transplanted into the forest" (p. 344). Dr. Yule (*Caled. Hort. Mem.* II.), in a long paper on trees, strongly recommends sowing where the trees are finally to remain. "It is," says he, "a well ascertained fact, that seedlings allowed to remain in their original station will, in a few seasons, far overtop the common nursed plants several years older."

The opinion of Dr. Yule, and in part also that of Sang, seems to be founded on the idea that the tap-root is of great importance to grown-up trees, and that when this is once cut off by transplanting, the plant has not a power of renewing it. That the tap-root is of the utmost consequence for the first three or four years is obvious from the economy of nature at that age of the plant; perhaps for a longer period; but that it can be of no great consequence to full-grown trees, appears highly probable from the fact, that when such trees are cut down, the tap-root is seldom to be distinguished from the others. The opinion, that young plants have not the power of renewing their tap-root, will, we believe, be found inconsistent with fact; and we may appeal to Sang and other nurserymen, who raise the oak and horse-chestnut from seed. It is customary when these are sown in drills, to cut off their tap-roots without removing the plants at the end of the second year's growth, and when at the end of the third or fourth year they are taken up, they will be found to have acquired others, not indeed so strong as the first would have been had they remained, but sufficient to establish the fact of the power of renewal.

We may also refer to the experiment recorded by Forsyth, which at once proves that trees have a power of renewing their tap-roots, and the great advantages from cutting down trees after two or three years' planting. Forsyth "transplanted a bed of oak plants, cutting the tap-roots near to some of the side-roots or fibres springing from them. In the second year after, he headed one half of the plants down, and left the other half to nature. In the first season, those headed down made shoots six feet long and upwards, and completely covered the head of the old stem, leaving only a faint cicatrix, and produced new tap-roots upwards of two feet and a half long. The other half of the plants that were not headed, were not one-fourth the size of the others. One of the former is now eighteen feet high, and fifteen inches in circumference, at six inches from the ground: one of the largest of the latter measures only five feet and half in height, and three inches and three quarters in circumference, at six inches from the ground." *Tr. on Fruit Trees*, 4to. edit. 144.

The pine and fir tribe receive most check by transplanting; and when removed at the age of four or five years, they seldom arrive at trees afterwards; those we should, on most occasions, prefer to sow, especially on mountainous tracts. But for all trees which stole, and in tolerable soils and situations, planting strong plants, and cutting them down two or three years afterwards, will, we think, all circumstances considered, be proved preferable to sowing.

1809. There are different opinions also on the subject of *disposing* the plants in plantations; some advising rows, others quincunx, but the greater number planting irregularly. According to Marshall, "the preference to be given to the row, or the random culture, rests in some measure upon the nature and situation of the land to be stocked with plants. Against steep hangs, where the plow cannot be conveniently used, in cleaning and cultivating the interspaces, during the infancy of the wood, either method may be adopted; and if plants are to be put in, the quincunx manner will be found preferable to any. But in more level situations, we cannot allow any liberty of choice: the drill or row manner is undoubtedly the most eligible." *Plant. and Rur. Orn.* p. 123.

Pontey considers it of much less consequence than most people imagine, whether trees are planted regularly or irregularly, as in either case the whole of the soil will be occupied by the roots and the surface by the shoots. Sang and Nicol only plant in rows where culture with the horse-hoe is to be adopted. In sowing for woods and copses, the former places the patches six feet asunder and in the quincunx order. "It has been demonstrated (*Farmer's Mag.* vii. 409.), that the closest order in which it is possible to place a number of points, upon a plain surface, not nearer than a given distance from each other, is in the angles of hexagons with a plant in the centre of each hexagon. Hence it is argued, that this order of trees is the most economical; as the same quantity of ground will contain a greater quantity of trees, by 15 per cent. when planted in this form than in any other." *Gen. Rep.* ii. 287.

It is almost needless to observe, that hedge-plants should be placed at regular distances in the lines, and also the trees, when those are introduced in hedges. Osier plantations, and all such as, like them, require the soil to be dug every year, or every two years, during their existence, should also be planted in regular rows.

1810. The *distances* at which the plants are placed must depend on different circumstances, but chiefly on the situation and soil. Planting thick, according to Nicol, is the safer side to err on, because a number of plants will fail, and the superfluous ones can be easily removed by thinning. "For bleak situations," he observes, "that from thirty to forty inches is a good medium, varying the distance according to circumstances. For less exposed situations, and where the soil is above six inches in depth, he recommends a distance from four to five feet. For belts, clumps, and strips, of a diameter of about one hundred feet; the margin to be planted about the distance of two feet, and the interior at three feet. In sheltered situations of a deep good soil, he recommends a distance of six feet, and no more." *Pract. Plant.* 142.

According to Sang, "The distances at which hard-timber trees ought to be planted are from six to ten feet, according to the quality of the soil, and the exposed or sheltered situation. When the four first four oaks are planted, supposing them at right angles, and at nine feet apart, the interstices will fall to be filled up with five nurses, the whole standing at four and a half feet asunder. When sixteen oaks are planted, there will necessarily be thirty-three nurses planted; and when thirty-six oaks are planted, eighty-five nurses; but when a hundred principal trees are planted in this manner, in a square of ten on the side, there will be two hundred and sixty-one nurse plants required. The English acre would require five hundred and thirty-six oaks, and one thousand six hundred and ten nurses. *Plant. Kal.* 163.

Pontey says, "In general cases, a distance of four feet is certainly close enough; as at that space the trees may all remain till they become saleable as rails, spars, &c."

The following table shows the number of plants which may be planted on a statute acre = 160 rods, or poles, = 4840 yards = 43,560 feet:

Feet apart.	No. of Plants.	Feet apart.	No. of Plants.	Feet apart.	No. of Plants.
1	43560	6	1210	15	193
1½	19360	7	889	16	170
2	10890	8	680	17	150
2½	6969	9	537	18	134
3	4840	10	435	19	120
3½	3556	11	360	20	108
4	2722	12	302	25	69
4½	2232	13	257	30	48
5	1742	14	222		

1811. The *size* of the plants depends jointly on the site and the kind of tree; it is universally allowed that none of the resinous tribe succeed well when removed at four or more years' growth; but if the soil is of tolerable quality, prepared by digging or summer pitting, and the site not bleak, plants of such hard-woods as stole may be used whose stems are an inch or more in diameter.

Nicol is of opinion,* "That generally trees three, or at most four years old from the seed, and which are from twelve to twenty-four inches high, will, in any situation or soil, outgrow those of any size under eight or ten feet, within the seventh year." *Pract. Plant.* 130.

"The size of plants for exclusive plantations," Sang observes, "must, in some measure, depend on their kinds; but it may be said, generally, that the plants being transplanted, they should be from a foot to eighteen inches in height, stiff in the stem, and well rooted. Plants for this purpose should seldom be more than three years from the seed; indeed never, if they have been raised in good soil. Many of them may be sufficiently large at two years from the seed; and if so, are to be preferred to those of a greater age, as they will consequently be more vigorous and healthy.

"The larch, if properly treated, will be very fit for planting out at two years of age. A healthy seedling being removed from the seed-bed at the end of the first year, into good ground, will, by the end of the second, be a fitter plant for the forest, than one nursed a second year. The next best plant for the purpose, is that which has stood two years in the seed-bed, and has been transplanted for one season. This is supposing it to have risen a weakly plant; for, if the larch rise strong from the seed the first season, it should never stand a second in the seed-bed.

"The ash, the elm, and the sycamore, one year from the seed nursed in good soil for a second season, will often prove sufficiently strong plants. If they be weakly, they may stand two years in the seed-bed; and then being nursed one season in good soil, will be very fit for planting out in the forest.

"The oak, the beech, and the chestnut, if raised in rich soil, and well furnished with roots at the end of the first year, and having been nursed in rows for two years, will be very fit to be planted out. But if they be allowed to stand two years in the seed-bed, and be planted one year in good ground, they will be still better, and the roots will be found well feathered with fine small fibres.

"The silver fir, and common spruce, should stand two years in the seed-bed. If transplanted into very good soil, they may be fit for being planted out at the end of the first year; but, more generally, they require two years in the lines. The Scots pine should also stand for two years in the seed-bed, and should be nursed in good ground for one year; at the end of which they will be much fitter for being planted, than if they were allowed to stand a second year in the lines. They are very generally taken at once from the seed-bed; and in land bare of heath or herbage, they succeed pretty well; nevertheless, we would prefer them one year nursed. The above are the hardy and most useful forest trees; and from the observations made, whatever respects the age or size of other kinds may easily be inferred." *Plant. Kal.* 158.

According to Pontey, "the best general rule is, to proportion the size of the plants to the goodness of the soil; the best of the latter requiring the largest of the former. Still on bleak exposures this rule will not hold good, as there the plants should never be large, for otherwise the greater part would fail from the circumstance of wind-waving, and of those that succeeded, few, if any, would make much progress for several years; firs of a foot, and deciduous trees of eighteen inches, are large enough for such places. As in extensive planting, soils which are good and well sheltered but seldom occur, the most useful sizes of plants, for general purposes, will be firs of a foot, and deciduous trees of eighteen inches, both transplanted.

None but good rooted plants will succeed on a bad soil, while on a good one, sheltered, none but very bad rooted plants will fail; a large plant never has so good a root, in proportion to its size, as a small one; and hence we see the propriety of using such on good soils only. Small plants lose but few of their roots in removal; therefore, though planted in very moderate-sized holes of pulverised earth, soon find the means of making roots, in proportion to their heads. It should never be forgotten, that, as in being removed a plant of two feet loses a greater proportion of its roots than a tree of one, and one of three feet a greater proportion than one of two, and so on, in proportion to its former strength and height, so the larger plants, so much greater is the strength of languor or weakness into which they are thrown by the operation of transplanting." *Prof. Plant.* 161.

1812. The *Seasons for planting* are autumn and spring; the former, when the soil and situation are moderately good, and the plants large; and the latter, for bleak situations. Necessity, however, is more frequently the guide here than choice, and in extensive designs, the operation is generally performed in all moderately dry open weather from October to April inclusive. "In an extensive plantation," Sang observes, "it will hardly happen but there will be variety of soil, some parts moist and heavy, and others dry and light. The lightest parts may be planted in December or January; and the more moist, or damp parts, in February or March. It must be observed, however, that if the ground be not in a proper case for planting, the operation had better be delayed. The plants will be injured, either by being committed to the ground when it is in a sour and wet, or in a dry parched state. At a time when the soil may be termed neither wet nor dry, the operation of planting is most successfully performed. The mould does not then adhere to the spade, nor does it run in; it divides well, and is made to intermingle with the fibres of the plants with little trouble; and in treading and setting the plant upright, the soil is not worked into mortar, which it necessarily must be, if in a wet state, evidently to the great detriment of the plants. It is therefore improper to plant on a retentive soil in the time of rain, or even perhaps for some days afterwards, nor after a fall of snow, until it has for some days disappeared. Whereas, on a dry absorbent soil, it may be proper to plant in the time of gentle showers, immediately after heavy rains, or as soon as the snow is dissolved." *Plant. Kal.* 157.

Pontey is a decided advocate for autumn preparation of the soil and spring planting. "Autumn planting," he says, "is advisable only in few cases, while spring planting may properly apply to all."

According to Sang, the proper time for planting the pine and fir tribe, and all evergreens, is April, or even the first fortnight of May. "Attention should be paid, that no greater number of plants be lifted from the nursery than can be conveniently planted on the same day. Damp weather is the best. When very dry, and the plants rise destitute of earth at their roots, their roots should be dipped in mud (puddled) so as to be coated over by it. In all cases, care should be taken not to shake off any adhering earth from plants at the time of planting. *Plant. Kal.* 341.

1813. The *Operation* of inserting the plants in the soil is performed in various ways; the most general mode, and that recommended by Marshall and Nicol, is pitting; in which two persons are employed, one to operate on the soil with the spade, and the other to insert the plant and hold it till the earth is put round it, and then press down the soil with the foot. Where the plants are three feet high or upwards, this is the best mode; but for smaller plants modes have been adopted in which one person performs the whole operation.

Sang describes three kinds of manual operation employed by him in planting, and in part in sowing trees: by pitting; by slitting simply, or by cross, or T slitting; by the diamond dibber; by the planting-mattock, and by the planter. In filling an area with plants, he first plants those intended as the final trees, and afterwards the nurses; or one set of operators plant the former, while another follow with the latter, unless the time for removing the nurses, as in the case of evergreen pines and firs, should be later than that for planting the principals (1812.) "The plants, if brought from a distance, shoul be *shoughed;* or they may be supplied daily from the nursery, as circumstances direct. All the people employed ought to be provided with thick aprons, in which to lap up the plants; the spadesmen, as well as the boys or girls; the latter being supplied by the former as occasion may require. All of them should regularly fill their aprons at one time, to prevent any of the plants being too long retained in any of the planters' aprons. One man cannot possibly set a plant so well with the spade, unless in the case of *laying*, as two people can; nor, supposing him to do it as well, can he plant half as many in the same space of time as two can. A boy ten years of age is equal, as a holder, to the best man on the field, and can be generally had for less than half the money. Hence this method is not only the best, but the least expensive." *Plant. Kal*, 167.

1814. *By Pitting.* "The pit having been dug for several months, the surface will therefore be incrusted by the rains, or probably covered with weeds. The man first strikes the spade downwards to the bottom, two or three times, in order to loosen the soil; then poaches it, as if mixing mortar for the builder; he next lifts out a spadeful of the earth, or, if necessary, two spadefuls, so as to make room for all the fibres, without their being anywise crowded together; he then chops the rotten turf remaining in the bottom, and levels the whole. The boy now places the plant perfectly upright, an inch deeper than when it stood in the nursery, and holds it firm in that position. The man *trindles* in the mould gently; the boy gently moves the plant, not from side to side, but upwards and downwards, until the fibres be covered. The man then fills in all the remaining mould; and immediately proceeds to chop and poach the next pit, leaving the boy to set the plant upright, and to tread the mould about it. This, in stiff wet soil, he does lightly; but in sandy or gravelly soil he continues to tread until the soil no longer retains the impression of his foot. The man has by this time got the pit ready for the next plant, the boy is also ready with it in his hand, and in this manner the operation goes on.

"On very steep *hangs* which have been pitted, the following rule ought to observed in planting: to place the plant in the angle formed by the acclivity and surface of the pit; and in finishing to raise the outer margin of the pit highest, whereby the plant will be made to stand as if on level ground, and the moisture be retained in the hollow of the angle, evidently to its advantage." *Plant. Kal.* 167.

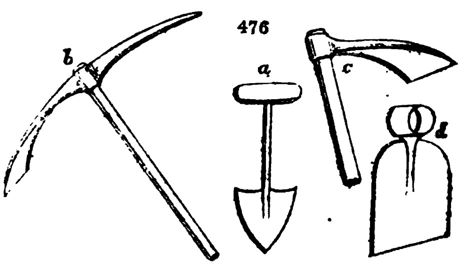
The slit method, either simply (935.) or by the T method, is not recommended by

Sang; but necessity may justify its adoption occasionally. "We would not recommend planting by the slit, unless where there is no more soil than is absolutely occupied by the fibres of the herbage which grows on the place. Excepting on turf, it cannot be performed; nor should it be practised, if the turf be found three or four inches thick. By pitting in summer, turf is capable of being converted into a proper mould in the space of a few months; and the expence of pitting, especially in small plantations, can never counterbalance the risk of success in the eyes of an ardent planter.

"The most proper time to perform the operation of slitting-in the plants, is when the surface is in a moist state. On all steeps the plant should be placed towards the declivity, that the moisture may fall to its roots; that is to say, in planting, the spadesman should stand highest, and the boy lowest on the bank; by which arrangement the plant will be inserted at the lower angle of the slit." *Plant. Kal.* 170.

1815. Planting with the *Diamond Dibber*, he says, "is the cheapest and most expeditious planting of any we yet know, in cases where the soil is a sand or gravel, and the surface bare of herbage. The plate of the dibber (*fig.* 476. *a*), is made of good steel, and is four inches and a half broad where the iron handle is welded to it; each of the other two sides of the triangle is five inches long; the thickness of the plate is one-fifth part of an inch, made thinner from the middle to the sides, till the edges become sharp. The length of the iron handle is seven inches, and so strong as not to bend in working, which will require six-eighths of an inch square. The iron handle is furnished with a turned hilt, like the handle of a large gimlet, both in its form and manner of being fixed on.

"The planter is furnished with a planting-bag, tied round his waist, in which he carries the plants. A stroke is given with the dibber, a little aslant, the point lying inwards; the handle of the dibber is then drawn towards the person, while its plate remains within the ground: by this means a vacuity is formed between the back of the dibber and the ground; into which the planter, with his other hand, introduces the roots of the seedling plant, being careful to put them fully to the bottom of the opening: he then pulls out the dibber, so as not to displace them, and gives the eased turf a smart stroke with the heel; and thus is the plant completely firmed. The greatest error the planter with this instrument can run into, is the imperfect introduction of the roots. *Green*, or unpractised hands, are apt to double the roots, or sometimes to lay them across the opening, instead of putting them straight down, as above directed. A careful man, however, will become, if not a speedy, at least a good planter in one day; and it is of more importance that he be a sure hand, than a quick one. A person who is of a careless or slovenly disposition, should never be allowed to handle a dibber of this kind."



1816. Planting with the *Planting-mattock* (*fig.* 476. *b*) is resorted to in rocky or other spots where pitting is impracticable. "The helve or handle is three feet six inches long; the mouth is five inches broad, and is made sharp; the length from it to the eye, or helve, is sixteen inches; and it is used to pare off the sward, heath, or other brush that may happen to be in the way, previous to easing the soil with the other end. The small end tapers from the eye, and terminates in a point, and is seventeen inches long." By this instrument the surface is skimmed off "for six or eight inches diameter, and with the pick-end dig down six or eight inches deep, bringing up any loose stones to the surface; by which means a place will be prepared for the reception of the plant, little inferior to a pit. This instrument may be used in many cases, when the plants to be planted are of small size, such as one-year larch seedlings, one year nursed; or two-year Scots firs, one year nursed; and the expense is much less than by the spade." *Plant. Kal.* 385.

1817. Planting with the *Planter* (*fig.* 476. *c*). "The helve is sixteen inches long, the mouth is four inches and a half broad, and the length of the head is fourteen inches. The intrument is used in planting hilly ground, previously prepared by the hand-mattock. The person who performs the work carries the plants in a close apron; digs out the earth sufficiently to hold the roots of the plant; and sets and firms it, without help from another: it is only useful when small plants are used, and in hilly or rocky situations." *Plant. Kal. Pref.* xxiv.

1818. Pontey prefers planting by *pitting*, in general cases; the holes being made during the preceding summer or winter, sufficiently large, but not so deep into a retentive subsoil as to render them a receptacle for water. When the plants have been brought from a distance he strongly recommends puddling them (1812.) previously to planting; "if they seem very much dried, it would be still better to lay them in the ground for eight or ten days, giving them a good soaking of water every second or third day, in order to restore their vegetable powers; for it well deserves notice, that a degree of moisture in soil sufficient to support a plant recently or immediately taken from the nursery, would, in the case of dried ones, prove so far insufficient, that most of them would die in it. The puddling here recommended may also be of great service in all cases of late planting where small plants are used; my method is (after puddling) to tie them in bundles, of two or three hundreds each; and thus send them, by a cart-load at once, to where wanted; where such bundles, being set upright close to each other, and a little straw carefully applied to the outsides of them, may remain without damage in a sheltered situation any reasonable time necessary to plant them. Where loose soil happens to be convenient, that should be substituted in the place of straw.

"A puddle for trees is made by mixing water with any soil rather tenacious, so intimately as to form a complete puddle, so thick that when the plants are dipped into it enough may remain upon the roots to cover them.

"The process of puddling is certainly simple, and its expense too trifling to deserve notice: its effects, however, in retaining, if not attracting moisture, are such that, by means of it, late planting is rendered abundantly more safe than it otherwise would be. It is an old invention, and hence it is truly astonishing that it is not more frequently practised. If we could but persuade people to adopt it generally in spring planting, I believe the prejudice in favor of autumn practice would soon be done away." *Prof. Plant.* 167.

His methods of planting are in general the same as those of Sang: he uses a mattock and planter of similar shapes; and also a two or three-pronged instrument, which we have elsewhere denominated the *planter's hack* (616. *fig.* 14.) "This instrument," he says, "has been introduced of late years as improvements on the mattock and planter (*fig.* 476. *b* and *c*), being better adapted to soils full of roots, stones, &c.; they are likewise easier to work, as they penetrate to an equal depth with a stroke less violent than the former: they are also less subject to be clogged up by a wet or tenacious soil. The length of the prongs of both should be about eight inches, and the distances between them, when with three prongs, one and a half; and with two prongs, about two inches; the two-pronged hack should be made somewhat stronger than the other, it being chiefly intended for very stony lands, or where the soil wants breaking, in order to separate it from the herbage, &c.

"These tools are chiefly applicable to plants of any size up to about two feet, or such as are generally used for great designs, where they are used as a substitute for the spade, in the following manner: the planter being provided with a basket holding the plants required, (the holes being supposed prepared, and the earth left in them), he takes a tree in one hand, and the tool in the other, which he strikes into the hole, and then pulls the earth towards him, so as to make a hole large enough to hold all its roots; he then puts in the plant with the other, and pushes the earth to its roots with the back of the planter; after which, he fixes the plant, and levels the soil at the same instant with his foot: so that the operation is performed by one person, with a degree of neatness and expedition which no one can attain to who uses the spade. It is known to all planters, that but few laborers ever learn to plant well and expeditiously in the common method, without an assistant: this method, however, requires neither help nor dexterity; as any laborer of common sagacity, or boy of fifteen, or even a woman, may learn to perform it well in less than half an hour. The facility with which these tools will break clods, clear the holes of stones, or separate the soil from herbage, the roots of heath, &c. (the former being previously mellowed by the frost), may be easily imagined." *Prof. Plant.* 173.

The adoption of a small mattock for inserting plants, we recollect to have seen recommended in a tract on planting in the Highlands, by Maclaurin, a nurseryman, published at Edinburgh upwards of twenty years ago.

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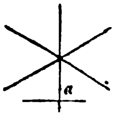

1819. In the *General Report of Scotland* an expeditious method of planting is described as having been practised for many years on the Duke of Montrose's estate. It is as follows: "The operator, with his spade, makes three cuts, twelve or fifteen inches long, crossing each other in the centre, at an angle of sixty degrees, the whole having the form of a star (*fig.* 477.) He inserts his spade across one of the rays (*a*), a few inches from the centre, and on the side next himself; then bending the handle towards himself, and almost to the ground, the earth opening in fissures from the centre in the direction of the cuts which had been made, he, at the same instant, inserts his plant at the point where the spade intersected the ray (*a*), pushing it forward to the centre, and assisting the roots in rambling through the fissures. He then lets down the earth by removing his spade, having pressed it into a compact state with his heel; the operation is finished by adding a little earth, with the grass side down, completely covering the fissures, for the purpose of retaining the moisture at the root; and likewise as a top-dressing, which greatly encourages the plant to push fresh roots between the swards." Vol. ii. p. 283.

Chap. IV.

On forming Plantations, in which Ornament or Effect is the leading Consideration.

Here the situation, form, the disposition of the trees, and the kinds employed, are the principal considerations.

1820. The *Situations* to be planted, with a view to effect, necessarily depends on the kind of effect intended; these may be reduced to three; to give beauty and variety to general scenery, as in forming plantations here and there throughout a demesne; to give form and character to a country residence, as in planting a park and pleasure-grounds; and to create a particular and independent beauty or effect, as in planting an extensive area of wood, unconnected with any other object, and disposing of the interior in avenues, glades, and other forms. In the two first cases, the choice of the situation must always be relative to other objects; as, for example, in ornamenting general scenery; to fields and inclosures, buildings, roads, &c.; and to the mansion-garden and other parts of a residence, in laying out a country-seat: but in forming independent plantations the choice may be absolute, and guided by no other consideration than the effect to be produced.

One of the greatest beauties produced by planting, either on general scenery, or on the grounds of a residence, is that of varying the form of the surface of the country, or increasing the variations already existing. To do this with most effect, it is an obvious and long-established principle, that, other circumstances being the same, the hills are to be more generally planted than the hollows, or even the plains. By planting a hill, or the least rise of ground, that hill or rise is increased in effect; but by planting the low grounds between hills or protuberances, their effect is destroyed. It is to be observed, however, that the latter practice is often what we observe in natural scenery. In hilly tracts in a state of nature, and under the dominion of no other animals than cattle or sheep, the vales or dells (*fig.* 478.), are generally filled with wood and the tops of the hills bare, which, however agreeable to those who view or study nature chiefly in detail, yet to the general observer it tends to confound form, and introduce monotony of surface. Art, therefore, when planting for general effect, or for heightening the character of surface, adopts a contrary practice (*fig.* 479.) to what is general

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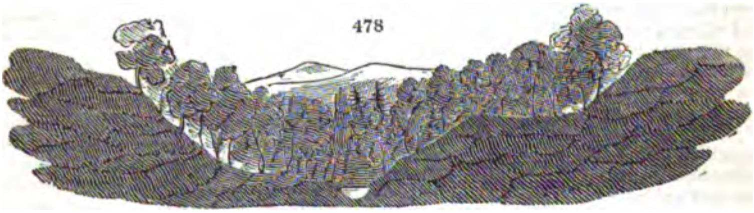

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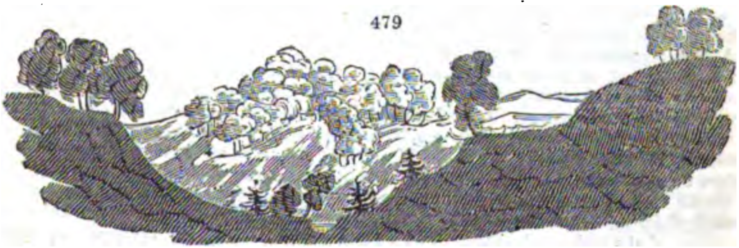

in wild nature; for few things in a wild state are suitable to the views of man in a state of civilization and refinement; and when he admires rude scenery, it is from views of its novelty or rarity in cultivated countries; or with reference to some other art or object; or state of the same object. At the same time, a hill crowned with wood occurs in nature occasionally, both with and without naked hollows or plains at its base, and never fails to excite a superior degree of satisfaction or pleasure in the spectator. To plant hills therefore in preference to vallies may justly be designated an imitation of one of the more interesting features of nature.

1821. With respect to *form*, it may be absolute, or independent of every consideration but the taste of the designer; or it may be relative. It is absolute in plantations intended to create particular beauties within themselves; as in labyrinths, woods pierced with stars, *pâtes d'oye*, &c., in the geometric style; or in compositions and groups, thickets, and glades in the interior of a wood, laid out in the modern manner. It is relative to the shapes of the ground and to existing objects in the forms adapted for improving general scenery; and to these considerations and to the situation and form of the mansion, gardens, waters, &c. in laying out the grounds of a country residence. For either of these objects the general principles of operation are, to heighten beauties already existing; to conceal defects; if possible, to create beauty; and to connect detached objects, either in reality or appearance, so as the scenery, from whatever point it may be viewed, may appear a whole; in short, the end is a harmonious and expressive whole, and the means are the grouping and connecting of the parts. Some tracts of country, or those parts of a demesne, exterior to the park, may be deficient in woodiness; there trees may be introduced in masses on elevated sites, or the sides of hills; in groups connected with buildings; in thinly scattered trees, in pastures, and by brooks; and in rows in hedges, and by other fences or roads. Where disagreeable objects are to be concealed, the course is evident; and where nothing is interesting attempts must be made to create interest. A road through a dreary country may often have much of its dullness taken away by one or two rows of trees on each side, the stems of which will break and vary the distant scenery. The lines may vary in form and direction, may swell into strips, or clumps, or thickets; form recesses, or be interrupted, according to circumstances. The route through some of the most dreary tracts in Germany and Russia, and the well-known *Strada di Campagna*, in Italy, are in this way rendered tolerable. In all this, though the main object may be beauty, yet, utility must never be lost sight of. All plantations by arable lands should, as much as possible, be bounded by straight, or at least not very irregular lines, and connected with the hedges or other fences already existing; few single trees or groups should be planted in the area of such fields. In pastures, the worst soils, and most exposed situations, should be chosen, and such forms adapted as may shelter the stock from all quarters, but especially from the storms and winds which more generally prevail. In planting near cottages and villages, care should be taken not to render the atmosphere unhealthy by stagnating the air, or to lessen the value of their yards and gardens by curtailing their extent, or by excess of shelter and shade. Roads or lanes should on no account be injured, nor the water of streams or ponds rendered dark, discolored by leaves, and unwholesome to men or cattle. In short, the planter, for effect, should never lose sight of utility, or plant in opposition to it; for though he may produce particular sorts of beauty, and especially that lately so fashionable and justly admired disposition of objects, called picturesque, which may be admired by a number for a time; yet there is a much more elevated and universal beauty, that of moral relation, or, in short, refined utility, which, while men retain their social feelings, must ever be the most interesting to mankind in general, and will therefore finally prevail.

The form, or outline of plantations, made with a view to the composition of a country residence, is guided by the same general principles; whether the trees are to be disposed in regular forms, avowedly artificial, (*fig.* 470.); or in irregular forms, in imitation of nature (*fig.* 480.). The first thing is, in both modes, to compose a principal mass, from which the rest may appear to proceed; or be, or seem to be, connected. In common cases it answers best to include or connect with this mass the house, kitchen and flower-gardens (*fig.* 480. *e*); from these other masses and groups should proceed, either connected, or better only seemingly so, when viewed horizontally. Their forms should be such and so disposed, relatively to the ground and other objects, and to each other, as to throw the pasture surface into broad masses (*a*, *b*, *c*, *d*,), which become wholes in their turn, and their connection and variation is heightened by the variety in the glades between the masses and groups of plantation. Such would be the mode of procedure on a flat to be formed into a modern park; regard being had to exclude or admit the view of certain parts of the distant scenery; never to shut in or leave without a third distance, (as the term is in landscape painting,) any of the scenes within the boundary of the park, and to other laws of perspective, optics, and composition, which will be more fully entered on in treating of landscape-gardening.

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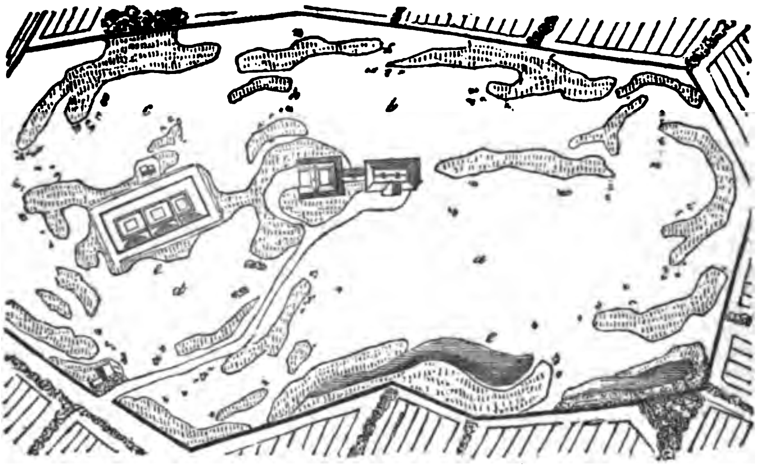

In the pleasure-ground, which, as far as respects the form or ground outline of plantations, is to be considered as a part of the park, the same principles are applicable. In neither the artificial or natural style, should their width be great; but their form may be varied at pleasure, subject to general principles. Where the ground is irregular (*fig.* 481.), only the modern style can be adopted with good effect, and there by

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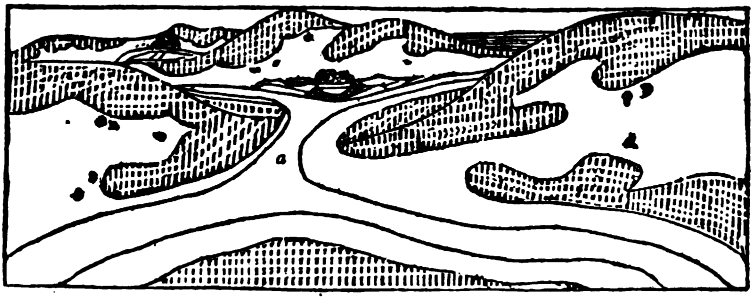

conducting the walks, forming the water chiefly in the hollows (*a*), and planting the eminences (*b*); varying the manner in which the outlines of these masses embrace the declivities; the happiest effects may be produced. Deviations from these general principles can only be justified by extraordinary circumstances.

1822. With respect to the *extent*, or area, occupied by ornamental plantations, as such, that need seldom be great. They are generally seen only in profile, and therefore a circuitous outline (*fig.* 482. *a.*), may on most occasions be contrived to have the same effect as planting a solid mass, which will occupy much more ground (*b*), show less exterior variety, and none within. The case is different, however, where the upper surface of a plantation is to be met by the eye, at a large angle, say upwards of 35°. In that case, to produce a grand and imposing effect, real extent is wanting. Examples occur in planting the steep sides of high hills, to be seen from below, or

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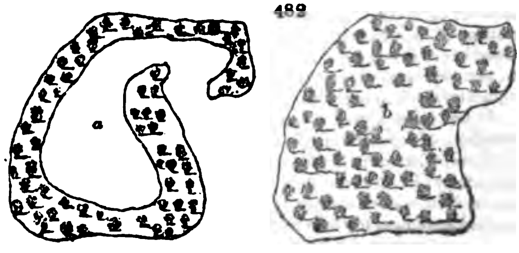

vallies or plains to be seen from great elevations. It must be confessed that these are among the grandest circumstances in which wood can be viewed; profiles of outlines, varied both as respects the sky and the ground, are beautiful and interesting; and avenues and long rows of trees, form imposing perspectives; but the side of a mountain cloathed with wood, seen at a certain distance from a plain below, is one of the most magnificent of rural objects.

1823. With respect to the *disposition* of trees in a plantation, where art is avowed or purposely displayed, the more regularly the plants are placed, the better is the end attained; but, where nature is to be imitated, irregularity will best sustain the character. This should be studied in the larger as well as the smaller plantations, in the natural style; but more especially in detached groups, which operate so powerful an effect in laying out the grounds of a residence. The greatest beauty of a group of trees, as far as respects their stems, is in the varied direction these take as they grow into trees (*fig.* 483.); but as that is for all practical purposes beyond the influence of art, all we can do is to vary as much as possible the ground plans of groups, or the relative position which the stems have to each other, where they spring from the earth. This is considerable, even where a very few trees are used, and of which any person may convince himself by placing a few dots on paper. Thus, two trees (*fig.* 484.), or a tree and shrub, which is the smallest group, may be placed in three different positions with reference to a spectator in a fixed point: if he moves round them they will first vary in form separately, and next (at *b*), unite in one or in two groups, according to the position of the spectator. In like manner three trees (*fig.* 485.), may be placed in four different positions; four trees may be placed in eight different positions (*fig.* 486.); five trees may be grouped in ten different ways as to ground-plan (*fig.* 487.) six may be placed in twelve different positions (*fig.* 488.); and so on.

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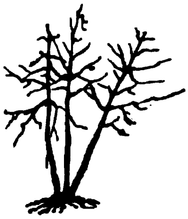

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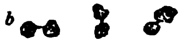

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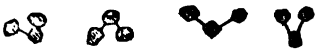

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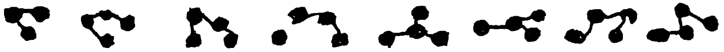

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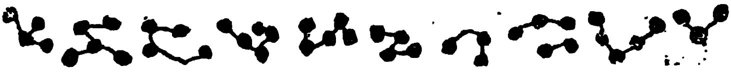

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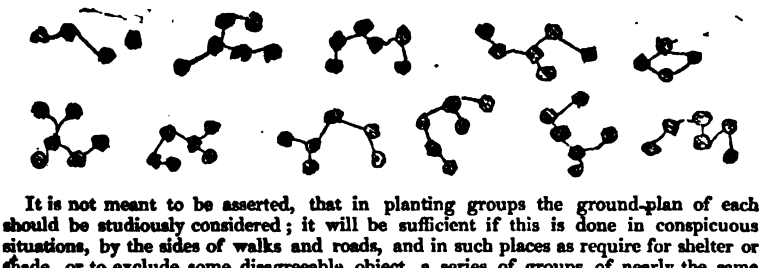

It is not meant to be asserted, that in planting groups the ground-plan of each should be studiously considered; it will be sufficient if this is done in conspicuous situations, by the sides of walks and roads, and in such places as require for shelter or shade, or to exclude some disagreeable object, a series of groups of nearly the same number of trees. For the ordinary purposes of grouping, such as varying the apparent outline of masses, connecting scattered objects, adding parts to such objects as are incomplete wholes, &c., it will be sufficient to introduce large and small groups; never to put two trees at exactly the same distance from each other; three in the angles of an equilateral triangle; four in those of a square; five in those of an octagon, and so on.

It has been a very common practice among planters to introduce, in parks, great numbers of detached single trees (in vulgar technology, dotting), with a view of effecting, by them, what can only be done by groups. Excepting the clump, there is not a greater deformity in the grounds of British country residences. Supposing these trees, planted on a level surface, all of the same sort, and all growing equally well, their insipid sameness of form and position must be evident to the mind's eye of every one. Suppose them on the same character of surface, but all, or chiefly, of different sorts (*fig.* 489.), it is equally evident they will grow with different degrees of vigor, and assume different characters of stem and head; and consequently produce an appearance of the most discordant kind.

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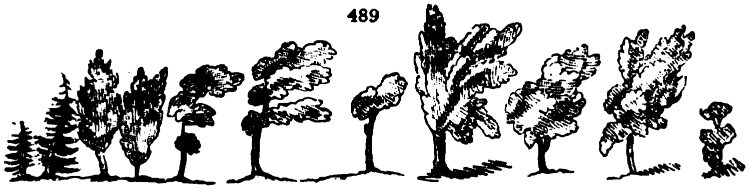

It is only necessary to analyze a group, to be convinced of the variety of general form produced, even by trees of one species, but more especially by two kinds, and this, even by specimens that would be unsightly apart; and to observe a portion of the scattered woody scenery, in the openings or glades of a natural forest, to be convinced how much more variety is produced by that manner of planting, than by distributing over a surface great numbers of single trees. It is observed by Uvedale Price, that in the numerous landscapes which compose the *liber veritatis* of Claude, there is not more than one single tree; so highly did this artist value the principle of connection. A single tree, however, is not always to be condemned, even as such, for its form, age, or blossom, or some other accidental circumstance may compensate for its isolated situation: and it may often exist singly as a tree, and yet in connection or grouped with other objects, as buildings, rocks, &c.; and in these cases it is not to be condemned, because the grand object of grouping connection, is maintained by the co-tangent object.

Another practice in the employment of groups, almost equally reprehensible with that of indiscriminate distribution, is that of placing the groups and thickets in the recesses, instead of chiefly employing them opposite the salient points. The effect of this mode is the very reverse of what is intended; for, instead of varying the outline, it tends to render it more uniform by diminishing the depth of recesses, and approximating the whole more nearly to an even line. The way to vary an even or straight line or lines, is here and there to place constellations of groups against it (*fig.* 490. *c*); and a line already varied is to be rendered more so, by placing large groups against the prominences (*a*) to render them more prominent; and small groups (*b*), here and there in the recesses, to vary their form and conceal their real depth.

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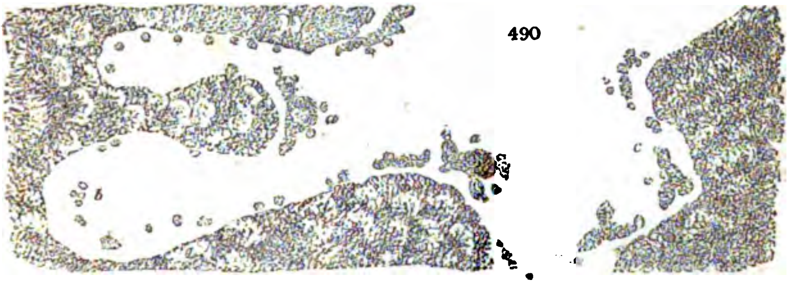

In disposing of trees in all plantations in the natural style above the size of a group, the same general principles are to be followed; the plants, whatever be their kinds, and whether the mass is finally to assume the character of a wood, grove, or copse, should be placed irregularly; here thick, and there thin, as if they had sprung up from the accidental semination of birds or winds. "The effect of this arrangement will not be that composition of low and high, oblique and upright stems, and young and old trees, and low growths, which we find in forest scenery; but it is all that can be done in imitation of it at the first planting; and subsequent thinning, pruning, and cutting down, moving, *renversing*, planting and sowing, must be used from time to time to complete imitation or allusion, unless the owner will rest satisfied with an inferior degree of beauty."

1824. Much of the effect of wood depends on the *general form of tree* employed. The capacities of different trees for producing effects in landscape, and the general division of trees into round-headed, oblong-headed, and spiry-topt, have been already pointed out (1795). It has also been observed (1822), that the greater number of plantations are seen chiefly in profile; and hence, that the outline which the tops of the trees form against the sky or the back-ground, is the most conspicuous feature in their aspect. The difference between this outline, when formed of *spiry-topt trees*, as the firs, pines, &c. (*fig.* 491.); of *oblong-headed* trees, as most of the willows, alders, poplars, (*fig.* 492. *b*); and the *round-headed* sorts, as the oak, ash, elm, and most trees (*fig.* 492. *a*), is so considerable, as to merit the particular attention of the planter. Nothing can be more harsh and unvaried than the serrated outline of the fir tribe, whether planted in rows, strips, or masses; whereas the rounded-headed trees, even in single rows, produce some variety of sky outline.

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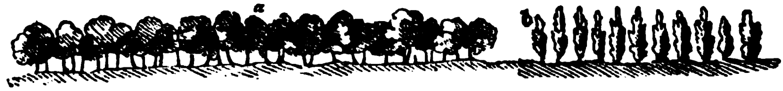

The difference is equally great between the face or front surface of a row or mass of spiry and round-headed trees; for the great regularity and similarity of the branches of the former, precludes the possibility of breaks in form, or light and shade, and presents one uniform surface of verdure, not unlike the side of a high hedge. The front surface of a row or mass of round-headed trees, on the contrary, from opposite qualities in the branches, produces prominences and recesses of different degrees of magnitude, and of different forms and relative positions. If we look on the upper surface of a plantation of each class, we shall find the difference equally great.

The situations where spiry-topt trees have most effect is among rocks, and in very irregular surfaces; and especially on the steep sides of high mountains (*fig.* 493.), where their forms, and the direction of their growth, seem to harmonize with their pointed, rocky summits. Fir and pine forests are dull, gloomy, and monotonous in the sandy plains of Poland and Russia, but among the broken rocks, craggy precipices, and otherwise endlessly varied surfaces of Sweden and Norway, they are full of variety. In tame countries they present most variety when planted so thin as barely to touch each other, and when a number of them are kept low, or where the whole are of different ages (*fig.* 494.). But the variety produced, even by this disposition, is still far short of what would be effected by a similar arrangement of round or oval-headed trees (*fig.* 495.), of different ages, or mixed with shrubs or low growths.

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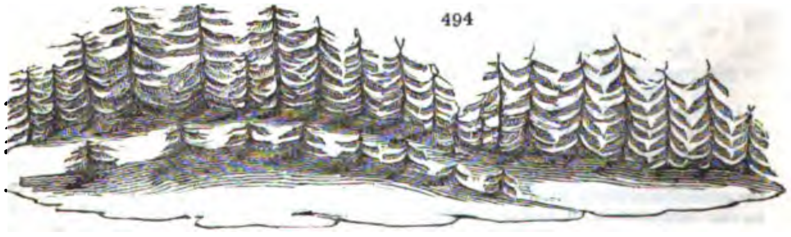
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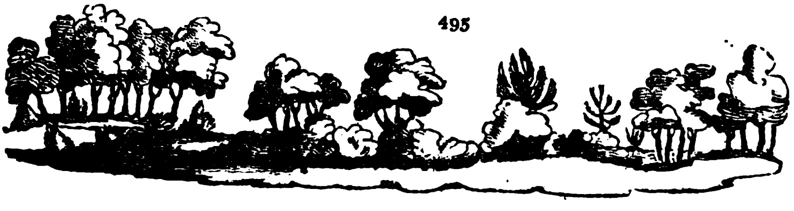
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The most suitable situation for spiry-topt trees, in ornamental scenery, is as single objects, or in small groups (*fig.* 496.), sparingly introduced in the margin of thickets or strips, or sprinkled along the bottoms of dells or dingles. In plantations which comprise masses of all the different species of hardy tree, there they may come in also in their proper place; and in mountain and rocky scenery, they are in the places which nature seems to have intended for them.

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The *oblong-headed* trees may be introduced much more frequently than the spiry-topt sorts; the more obtuse summits blend well with the round-headed trees, and the more acute-topt sorts, which terminate in flexible, flame-like shapes, as the Lombardy, poplar, and cypress, form excellent contrasts to the round trees, and serve as transition forms to the spiry tribe. The round-headed trees, it need hardly be observed, are the most general in nature, at least in temperate climates, and are the most universally applicable in ornamental planting.

These considerations on the forms of trees refer to them chiefly as in independent plantations; in connection with buildings, the choice, as to form, may often be influenced by that of the building, and also by the effect or object intended by planting them.

With respect to *magnitude*, the grand division of woody plants is into trees and shrubs. The bulk and heights of the common trees and shrubs of the country being generally known, the eye estimates the magnitude of other objects by theirs; consequently extraordinary magnitudes, whether large or small, should only be used under extraordinary circumstances. The apparent size, proportion, and distance of objects, might otherwise be deranged, and a discordant effect produced. Shrubs, which have the form of trees; and low trees, as the mountain-ash, the apple and pear; often produce this effect, when planted as single objects, and unless their fruit is prized above every thing else, they should, when introduced for the sake of their flowers, either be planted in the margins of plantations, or grouped with trees of the ordinary size. The finest small groups are of this description, or composed of common deciduous timber trees and hardy shrubs, as oaks, chestnuts, hollies, thorns, &c.

1825. The *choice of species* must be made subservient to general effect, and to the particular purposes for which different species are calculated. These have been already pointed out (Chap. II.), as well as their uses (Chap. I.), and both should be continually present in the mind of the planter. For the more general purposes of planting, the standard trees of the country, native or naturalized, are mostly to be preferred, as growing freely, and preserving harmony; for the purposes of distinction, foreign trees are more likely to answer the end. Foreign trees also contribute greatly to variety and interest, and therefore are indispensable in pleasure-grounds, or other scenes of much resort. "Any number of species may be admitted into improved grounds; commencing with the rare sorts near the house, as the centre of art and refinement, and ending with the common trees of the country, at such distances as the extent and style of the whole may suggest. The proportions of such trees as are only ornamental, and such as are valuable as timber, must be in some degree determined by the character of the place, but chiefly by the taste and view of the owner. Beauty alone, without utility, will not long please; and a few single groups and plants of the rarer species, in the grounds more immediately consecrated to man, will generally afford more satisfaction than a lavish display of exotics; the former will always present a more luxuriant and thriving display of scenery than the latter, and sooner attain the maturity of beauty." *Edin. Encyc. Landscape Gardening.*

Whatever number of species are used, one only should prevail in one place; or if there be high or low growths, then one of each kind should prevail. Great attention should be had that the species which compose the groups and thickets, or other scattered woodinesses which border on masses, should consist almost entirely of the species which prevail in the masses: if this precaution is neglected, instead of these appendages producing connection and harmony, they will have a tendency directly the reverse.

"Thickets may next be considered in regard to their form, that is, the form of their ground-plan; and with groups and single trees in regard to the choice of species. Thickets are produced by nature, by the inroads of cattle, or other animals, grazing or cropping the herbage, and with it the young trees in forest-scenery. On levels and sheltered situations, we find their form comparatively regular, because there appears no permanent or general reason to occasion their encroachment on one side more than on the other. But on varied surfaces and soils, a preference is given by depasturing animals to certain natural plants, and the side on which they abound is penetrated more deeply than the other. The plan of the thicket, therefore, varies accordingly. In elevated grounds, exposed to a particular wind, the thickets will exceed in length, which will be found generally to be in the direction of the storm. The cause is too obvious to be pointed out; but this effect, and every other observed in the groups and thickets of natural scenery, always merit study, and most frequently deserve imitation in creations of landscape scenery.

"The species of tree ought obviously to be those of the part of the mass to which they belong; for thickets, groups, and single trees, ought to resemble disjointed and broken fragments from those masses. But, in particular cases, for rendering a prominence still more prominent, or increasing the depth of a recess, a few plants of similar or not discordant growths, but of darker or lighter greens, may at a distance add to the effect of each. By the same process, with more contrasted species, where no other mode can be put in execution, the formality of a single row may in some degree be varied in its situation and contour." *Ed. Encyc.* art. *Landscape Gardening.*

1826. The *arrangement* of the species to effect variety must evidently be by grouping or collecting them in masses; for if all the species made use of were intimately mixed together in every part of a plantation, it is evident the eye would meet every where the same species; so that, as far as variation from that source was sought for, it would be entirely wanting. Uvedale Price has treated this subject with much ingenuity; and in reprobating the common practice of mixing as many different sorts as can be procured, in order to produce variety, observes, that "variety, of which the true end is to relieve the eye, not to perplex it, does not consist in the diversity of separate objects, but in the diversity of their effects when combined together, in a difference of composition and character. Many think, however, that they have obtained that grand object, when they have exhibited in one body all the hard names of the Linnæan system; but when as many plants as can be well got together are exhibited in every shrubbery, or in every plantation, the result is a sameness of a different kind, but not less truly a sameness than would arise from their being no diversity at all; for there is no having variety of character, without a certain distinctness, without certain marked features on which the eye can dwell." *Essays on the Picturesque*, vol. i.

"There is more variety," Repton observes, "in passing from a grove of oaks to a grove of firs than in passing through a wood composed of a hundred different species, as they are usually mixed together. By this indiscriminate mixture of every kind of tree in planting, all variety is destroyed by the excess of variety, whether it is adopted in belts or clumps, as they have been technically called; for example, if ten clumps be composed of ten different sorts of trees in each, they become so many things exactly similar; but if each clump consists of the same sort of trees, they become ten different things, of which one may hereafter furnish a group of oaks, another of elms, another of chestnuts or of thorns, &c. In like manner, in the modern belt, the recurrence and monotony of the same mixture of trees of all the different kinds, through a long drive, make it the more tedious, in proportion as it is long. In part of the drive at Woburn, in which evergreens alone prevail, which is a circumstance of grandeur, of variety, of novelty, and, I may add, of winter comfort, that I never saw adopted in any other place on so magnificent a scale. The contrast of passing from a wood of deciduous trees to a wood of evergreens must be felt by the most heedless observer; and the same sort of pleasure, though in a weaker degree, would be felt in the course of a drive, if the trees of different kinds were collected in small groups or masses by themselves, instead of being blended indiscriminately." *Enquiry into Changes of Taste, &c.* p. 23.

Sir W. Chambers and U. Price agree in recommending the imitation of natural forests in the arrangement of the species. In these nature disseminates her plants by scattering their seeds, and the offspring rise round the parent in masses or breadths, depending on a variety of circumstances, but chiefly on the facility which these seeds afford for being carried to a distance by the wind, the rain, and by birds or other animals. So disseminated, they spring up, different sorts together, affected by various circumstances of soil and situation; and arrive at maturity, contending with other plants and trees, and with the browsing of animals. At last, that species which had enjoyed a maximum of natural advantages is found to prevail as far as this maximum extended, stretching along in masses and angular portions of surface, till circumstances changing in favor of some other species, that takes the prevalence in its turn. In this way it will generally be found, that the number of species, and the extent and style of the masses in which they prevail, bears a strict analogy to the changes of soil and surface; and this holds good, not only with respect to trees and shrubs, but to plants, grasses, and even the mossy tribe.

The most perfect arrangement of species in regard to variety would be to employ every kind of tree and shrub that will grow freely in the open air, and arrange them according to the natural system. We have already suggested (1589) that a residence might be wooded in this way, so as in the smallest extent to obtain a maximum of variety and beauty. In most cases, where grouping or any systematic plan of arranging the species is to be adopted, the form of the groups (*fig.* 497. *a, b, c, d, e,*) should be marked on the plan of the plantation, and the kinds for each form written down in a corresponding list; the small detached masses intended as thickets (*f*) should be similarly marked, the situation of groups indicated either by letters simply (*g*), or by figures (6, 2, 3), referring to a list of kinds; and where shrubs are to be introduced in the groups, two figures may be used ($\frac{4}{4}$, $\frac{2}{7}$), one of which shall indicate the kind of tree, and the other the species of low growth or shrub. This mode we have always adopted in furnishing plans for ornamental planting, and find it enables gardeners to execute them with perfect accuracy.

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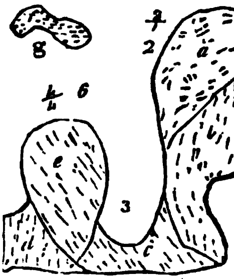

1827. The *size* of the plants used in ornamental planting should be as great as the soil and situation will admit, for two reasons; first, because an early effect is always desirable; and secondly, because in planting detached groups, large and small plants, and a varied inclination of their stem (*fig.* 483.) may be introduced in imitation of nature. Small groups on pastured lands, indeed, cannot be formed without trees whose stems are sufficiently high to raise their heads out of the reach of cattle, without inclosing so considerable a space round every tree as to render this mode both tedious, unsightly, and expensive.

1828. *Fences.* Masses, in the ancient style of planting, were generally surrounded by walls or other durable fences. Here the barrier was considered as an object or permanent part of the scene; and for that reason was executed substantially, and even ornamentally. They were generally walls substantially coped, and furnished with handsome gates and piers. The rows of avenues and small clumps, or platoons intended to be finally thrown open, were enclosed by the most convenient temporary fence.

In planting in the natural style, a regular fence either of verdant or masonic materials, can never be the final part of perfect imitation, since no such thing is to be found in nature. But in planting in farm-lands, or for the purpose of improving the general scenery, some permanent fence is requisite; and all that can be said is, that which promises in the end to be the most efficient and economical, will almost always be the best. The hedge, sunk fence, common wall, and wide water-course where it will be constantly nearly full of water, here present themselves as the most general kinds. Any fence, however, of which a large excavation, without water, forms a part, as the sunk fence, should be used with great caution; as there are none of this class but what look ill from at least one point of view, that is, when seen lengthways.

In planting to form a park or residence, with the exception of the boundary fence, and that which separates the lawn or mown surface from the grazed scenery, no permanent barrier of a formal nature should ever be admitted. In very bleak situations, walls or mounds of earth, however unsightly, may be necessary for a time to shelter and draw up the plants; but the final removal of these and all fences in parks, should be looked to as certain.

Light palings, the rails coated over with tar or pyrolignous acid, and the posts charred by burning at the lower end, to render them durable, may be used in the greater number of cases; and in many where the plants are larger, and the soil and other circumstances favorable to their growth, hurdles or other moveable rails or palings may be used. "The present improved state of the manufacture of iron offers a very desirable accommodation in this respect, affording the best guards for single plants and groups; and iron hurdles, or lines of cast-iron standards and half-inch wires, as rails for masses, have a light and temporary appearance, highly congenial to the idea of their speedy removal. The lines of the fences conforming to the irregular shapes of the masses will not be disagreeable to the eye, if those of the latter are arranged with any regard to apparent connection; for any objects, whether lines or forms, however deficient in beauty of themselves, acquire a degree of interest, and even character, when connected and arranged in such a way as to form a whole.

"When a plantation is finally to be composed both of trees and undergrowths; thorns, sloes, hollies, berberries, and briars, may, in many cases, prevail in the margin; which, when the fence is removed, will form a picturesque phalanx, and protect the whole.

Partial inroads, formed by cattle, will only heighten the variety and intricacy of such masses." (*Edin. Encyc.* art. *Landscape Gardening.*) In this way, as U. Price observes, (*Essays*, vol. i.) the planter may plant as thick as he chooses, and never think of thinning or future management, only taking care to introduce no more trees than what he intends to remain finally as timber. The great majority of the plants being shrubs will soon be overtopped by the timber-trees, which, having abundance of head-room, will grow up in free and unconstrained shapes. The future care of plantations is so generally neglected, that this suggestion, under certain circumstances, well merits adoption; though it certainly can have no pretensions to be called a scientific or profitable mode of planting. It is what it pretends to be, a picturesque mode.

CHAP. V.

Of the Culture and Management of Plantations.

1829. It is too common a case, as Pontey and Sang observe, to consider a tree, when once planted, as done with; though, as every one knows, the progress and products of trees, like those of other plants, may be greatly increased or modified by cultivating the soil, pruning and thinning.

With respect to *culture of the soil*, it is evident that young plantations should be kept clear of such weeds as have a tendency to smother the plants; and though this is not likely to take place on heaths and barren sites, yet even these should be looked over once or twice during summer, and at least those weeds removed which are conspicuously injurious. In grounds which have been prepared previously to planting, weeding, hoeing by hand, or by the horse-hoe, and digging or plowing, become necessary according to circumstances. The hoeings are performed in summer to destroy weeds, and render the soil pervious to the weather; the ploughing and diggings in winter for the same purpose, and sometimes to prepare the soil for spring crops. These, both Pontey and Sang allow, may be occasionally introduced among newly planted trees; though it must not be forgotten that relatively to the trees, the plants composing such crops are weeds, and some of them, as the potatoe, weeds of the most exhausting kind.

In preparing land for sowing woods, Sang ploughs in manure, sows in rows six feet apart, and crops the ground between, with low-growing early potatoes, turnip, lettuce, or other green crops. He does not approve of cropping the intervals with young trees, as a sort of nursery, as they prove more scourging crops than esculent vegetables, nor with grain, as not admitting of culture, and being too exhausting for the soil. Marshal, and some other authors, however, approve of sowing the tree seeds with a crop of grain, and hoeing up the stubble and weeds when the crop is removed.

Pontey observes, "that wherever preparing the soil for planting is thought necessary, that of cultivating it for some years afterwards will generally be thought the same; for where quick growth is essential, cleanliness of appearance is usually of consequence. Slight crops of potatoes, with short tops, or turnips, may be admitted into such plantations with advantage for two or three years, as they create a necessity for annually digging or stirring the surface, and tend very materially to accelerate the growth of the plants. It may be objected, that such crops must impoverish the soil, and no doubt but such is the fact, so far as common vegetables are concerned; but as to the production of wood, its support depends, in a great measure, on a different species of nutriment; and hence, I could never observe that such cropping damaged it materially." *Profit. Plant.* p. 153.

Osier plantations for basket-willows and hoops, require digging and cleaning during the whole course of their existence; and so do hedge-rows to a certain extent, and some ornamental plantations.

1830. *Filling up Blanks* is one of the first operations that occurs in the culture of plantations next to the general culture of the soil, and the care of the external fences. According to Sang, "A forest plantation after pitting, either in the mass form or ordinary mixture, should remain several years after planting, before filling up the vacancies, by the death of the hard-wood plants, takes place.' Hard-wood plants, in the first year, and even sometimes in the second year after planting, die down quite to the surface of the ground, and are apparently dead, while their roots, and the wood immediately above them, are quite fresh, and capable of producing very vigorous shoots, which they frequently do produce, if allowed to stand in their places. If a tree, such as that above alluded to, be taken out the first or second year after planting, and the place filled up with a fresh plant of the same kind, what happened to the former may probably happen to the latter; and so the period of raising a plant on the spot may be protracted to a great length of time; or it is possible this object may never be gained.

"The filling up of the hard-wood kinds in a plantation which has been planted after trenching, or summer-fallow which has been kept clean by the hoe, may be done with safety at an earlier period than under the foregoing circumstances; because the trees, in the present case, have greater encouragement to grow vigorously after planting, and may be more easily ascertained to be entirely dead, than where the natural herbage is allowed to grow among them.

"But the filling up of larches and pines may take place the first spring after the plantation has been made; because such of these trees as have died are more easily distinguished. In many cases when a larch or a fir loses its top, either by dying down, or the biting of hares or rabbits, the most vigorous lateral branch is elected by nature to supply the deficiency, which by degrees assumes the character of an original top. Pines and larches, therefore, which have fresh lateral branches, are not to be displaced, although they have lost their tops. Indeed, no tree in the forest, or other plantation, ought to be removed, until there be no room left to hope for its recovery.

"If the filling up of plantations be left undone till the trees have risen to fifteen or twenty feet in height, their roots are spread far abroad, and their tops occupy a considerable space. The introduction of two or three plants, from a foot to three feet in height, at a particular deficient place, can never, in the above circumstances, be attended with any advantage. Such plants may indeed become bushes, and may answer well enough in the character of underwood, but they will for ever remain unfit for any other purpose. It is highly improper, then, to commence the filling up of hard-wood plantations before the third year after planting; or to protract it beyond the fifth or the sixth. March is the proper season for this operation." *Plant. Kalend.* 295.

1831. The most important operation of tree culture is *pruning*, since on it, in almost every case, depends the ultimate value, and in most cases, the actual bulk of timber produced. In the purposes of pruning, as for most other practicable purposes, the division of trees into resinous or frondose branched trees, and into non-resinous or branchy-headed sorts, is of use. The main object in pruning frondose branched trees is to produce a trunk with clean bark and sound timber; that in pruning branchy-stemmed trees, is principally to direct the ligneous matter of the tree into the main stem or trunk, and also to produce a clean stem and sound timber, as in the other case. The branches of frondose trees, unless in extraordinary cases, never acquire a timber size, but rot off from the bottom upwards, as the tree advances in height and age; and, therefore, whether pruned or not, the quantity of timber in the form of trunk is the same. The branches of the other division of trees, however, when left to spread out on every side, often acquire a timber-like size; and as the ligneous matter they contain is in general far from being so valuable as when produced in the form of a straight stem, the loss by not pruning off their side branches, or preventing them from acquiring a timber-like size is evident. On the other hand, when they are broken off by accident, or rot off by being crowded together, the timber of the trunk, though in these cases increased in quantity, is rendered knotty and rotten in quality.

1832. "With respect to the *manner of pruning*, where straight timber is the object, both classes in their infancy," as Sang observes, "should be feathered from the bottom upwards, keeping the tops light and spiral, something resembling a young larch (*fig.* 498. *a.*) The proportion of their tops should be gradually diminished, year by year, till about their twentieth year, when they should occupy a third part of the height of the plant; that is, if the tree be thirty feet high, the top should be ten feet (*b*). In all cases in pruning off the branches, the utmost care must be taken not to leave any stumps sticking out, but to cut them in to the quick. It is only by this means that clean timber can be procured for the joiner; or sightly, smooth-stemmed trees to please the eye. It is a very general practice to leave snags or stumps (*c*); before the bole can be enlarged sufficiently to cover these, many years must elapse; the stumps in the mean time become rotten; and the consequence is, timber which when sawn up (*d*), is only fit for fuel.

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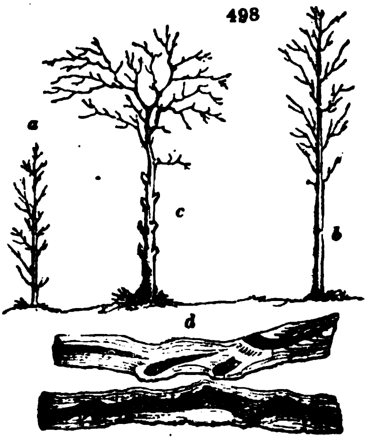
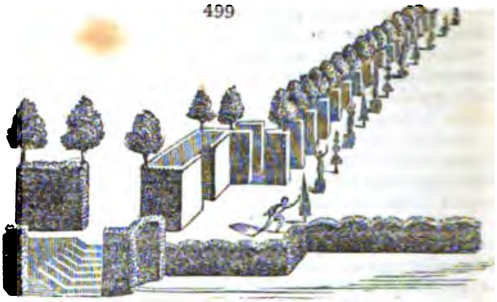


"The sap of a tree," Pontey observes, "may be considered as the raw material furnished by nature; and man, the manufacturer who moulds it into the form most useful for his purpose. A moderate quantity of leaves and small wood is necessary to every tree; but all above that quantity are of no use to the plant, and of little value to its owner. *Forest Pruner*, 152 and 153.



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1833. "Pruning for *ornament*, or beauty, must be guided in its operations by what that beauty is. If it is the beauty of art, then the trees may require to be cut or clipped into the shape of animals (*fig.* 235.), or inanimate natural objects, as mounds of earth, mushrooms; or geometric forms, triangles, globes, cones: or walls, columns, arcades, vases, arbors, temples, theatres, or other architectural or sculptural compositions (*fig.* 499.) The dwarfing of trees is also another kind of artificial beauty, much practised by the Chinese; and though the habit be kept up chiefly by withholding nourishment; yet the dwarf is produced by ringing a branch; enveloping it in a ball of loam; amputating it when it has made roots; and then pinching off all incumbrance of growth so as to keep it into shape." *Livingstone in Hort. Trans.* iv. 224.

If, on the contrary, natural beauty is desired, then the pruning must be rather negative than positive; the object being to let the tree assume its natural shape, or, as Sang describes it, "express its own nature." All that man can do, therefore, in the way of pruning for this object, is to assist a plant of the tree kind to express the characteristics of a tree; that is, a powerful trunk and ample spreading head, which distinguishes it from a shrub; and this he does by clearing a part of the tree of its side branches; and by avoiding to train up a shrub with a single stem like a diminutive tree.

In attending to these instructions the great importance of the use of leaves must never be lost sight of: this is not, as Pontey asserts, to attract the sap, but to elaborate it when propelled to them, and thus form the extract or food taken in by the plant, into a fluid analagous to blood, and which is returned so formed by the leaves into the inner bark and soft wood. It must be a very nice point, therefore, to determine the quantity of branches or leaves that should be left on each tree; and if no more are left than what are necessary, then in the case of accidents to them from insects, the progress of the tree will be doubly retarded. Experience alone can determine these things, and both Pontey and Sang agree that, "strength is gained as effectually by a few branches to form a head as by many."

1834. The general *seasons of pruning* are winter and spring, and for the gean midsummer, as it is found to gum very much at any other season. Pontey says, "as to the proper season for pruning, there is only one difficulty; and that is discovering the wrong one, or the particular time when trees will bleed. Only two trees have been found which bleed uniformly at certain seasons, namely, the sycamore and firs, which bleed as soon as the sap begins to move. In spring pruning, desist when this takes place." As a general rule, he thinks "summer preferable to winter pruning; because, in proportion as wounds are made early they heal so much the more in the same season." *Forest Pruner*, 236.

Sang suspends pruning from the end of February to the middle of July, but carries it on during every other month of the year; pruning the gean, or any other tree very apt to gum, only in July and August. *Plant. Kal.* 268.

1835. With respect to *the implements to be used*, Sang observes, "In every case where the knife is capable of lopping off the branch in question, namely, in the pruning of infant plants, it is the only instrument necessary. All other branches should be taken off by the saw. A hatchet, or a chissel, should never be used. Every wound on the stem, or bole, should be quite into the quick, that is, to the level and depth of the bark; nor should the least protuberance be left. The branch to be lopped off by the saw should, in all cases, be notched or slightly cut on the under side, in order to prevent the bark from being torn in the fall; and when the branch has been removed, the edges of the wound, if anywise ragged, should be pared smooth with the knife. If the tree be vigorous, nature will soon cover the wound over with bark, without the addition of any plaster to exclude the air. In the shortening of a strong branch, the position of which is pretty upright, it should be observed to draw the saw obliquely across it, in such a manner as that the face of the wound shall be incapable of retaining moisture; and afterwards to smooth the edges of the bark with the knife." *Plant. Kal.* 181.

In every case where the branches are too large for the knife, Pontey prefers the saw, as the best and most expeditious instrument; and one, the use of which is more easily acquired by a labourer than that of either the bill or axe. In "large work" he uses the common carpenter's saw; for smaller branches, one with somewhat finer teeth, with the plate of steel, and about twenty inches long.

Having stated what is general in pruning, the next thing is to submit some particular applications of the art to resinous and non-resinous timber trees, copse-woods, osier-holts, hedges, and hedgerows, and trees in parks.

1836. *Resinous Trees*, Pontey and Sang agree, should not be pruned at so early an age as the non-resinous kinds. Sang commences about the sixth or eighth year, according to their strength or vigor, and removes no more than one or two tiers of branches at once. Pontey, when the plants are about eight feet high, gives the first pruning by "displacing two or at most three tiers of the lower branches; after which, intervals of three years might elapse between the prunings; never displacing more than two tiers at once, except more shall prove dead." *Forest Pruner*, 204.

Sang judiciously observes, "Excessive pruning, either of firs, larches, or deciduous trees of any sort, is highly injurious, not only to the health of the plant, but to the perfection of the wood. If a sufficient number of branches are not left on the young plant to produce abundance of leaves, perfectly to concoct its juice, the timber will be loose in its texture, and liable to premature decay." *Plant. Kal.* 182.

The opinions of Nicol and Monteath are at variance with those of Pontey and Sang, as to pruning resinous trees. Nicol advises leaving snags, (*Pract. Pl.nt.* 213.) and Monteath (*For. Guide*, 45.) says, "never cut off a branch till it has begun to rot, as the bleeding of a live branch will go far to kill the tree."

1837. *Non-resinous Trees*, Sang observes, "should be pruned betimes, or rather from their infancy, and thenceforward at intervals of one or at most two years. If the pruning of young forest trees is performed only at intervals of eight or ten years, the growth is unnecessarily thrown away, and wounds are inflicted which will ever after remain blemishes in the timber; whereas, if the superfluous, or competing branches had been removed annually, and before they attained a large size, the places from which they issued would be imperceptible, or at least not hurtful to the timber, when it came to the hands of the artist."

"The pruning of all deciduous trees should be begun at the top, or at least those branches which are to be removed from thence should never be lost sight of. Having fixed upon what may be deemed the best shoot for a leader, or that by which the stem is most evidently to be elongated and enlarged, every other branch on the plant should be rendered subservient to it, either by removing them instantly, or by shortening them. Where a plant has branched into two or more rival stems, and there are no other very strong branches upon it, nothing more is required, than simply to lop off the weakest clean by the bole, leaving only the strongest and most promising shoot. If three or four shoots or branches be contending for the ascendancy, they should, in like manner, be lopped off, leaving only the most promising. If any of the branches which have been left further down on the bole of the plant at former prunings have become very strong, or have extended their extremities far, they should either be taken clean off by the bole, or be shortened at a proper distance from it; observing always to shorten at a lateral twig of considerable length. It is of importance that the tree be equally poised; and therefore if it have stronger branches on the one side than the other, they should either be removed or be shortened. Thus, a properly trained tree, under twenty feet in height, should appear light and spiral, from within a yard or two of the ground to the upper extremity; its stem being furnished with a moderate number of twigs and small branches, in order to detain the sap, and circulate it more equally through the plant.

"Trees of this size, standing in a close plantation, after being properly formed, will require much less attention; indeed, subsequent prunings will mostly consist in keeping their leading shoots single. From the want of air, their lateral branches will not be allowed to extend, but will remain as twigs upon the stem. These, however, frequently become dead branches; and if such were allowed to remain at all on the trees, they would infallibly produce blemishes calculated greatly to diminish the value of the timber: hence the impropriety of allowing any branch to die on the bole of a tree; indeed, all branches should be removed when they are alive; such a method, to our knowledge, being the only sure one to make good timber. From these circumstances, an annual pruning, or at least an annual examination, of all forests, is necessary." *Plant. Kal.* 180.

1838. *Heading-down* such non-resinous trees as are stole we have already (1808.) stated to be an important operation. After the trees have been three or four years planted, Sang directs that "such as have not begun to grow freely should be headed down to within three or four inches of the ground. The cut must be made with the pruning-knife in a sloping direction, with one effort. Great care should be taken not to bend over the tree in the act of cutting. By so bending, the root may be split, a thing which too often happens. The operation should be performed in March, and not at an earlier period of the season, because the wounded part might receive much injury from the severe weather in January and February, and the expected shoot be thereby prevented from rising so strong and vigorous. *Plant. Kalend.* 297.

Buffon, in a memorial on the culture of woods, presented to the French government, in 1742, says he has repeated this experiment so often, that he considers it as the most useful practice he knows in the culture of woods.

1839. Various modes of pruning have been proposed for the purpose of producing *bends for ship timber*, (1760.) as these always fetch the highest price. According to Pontey, "little is hazarded by saying, that if plenty of long, clean, straight, free-grown trees could be got, boiling and a screw apparatus would form bends." Monteath, a timber valuator of great experience, and in extensive practice, says, the value of the oak, the broad-leaved elm, and Spanish chestnut, depends a good deal on their being crooked, as they are all used in ship building. He says he has seen trees successfully trained into crooked shapes of great value, in the following manner: "If you have an oak, an elm, or chestnut, that has two stems, as it were, striving for the superiority, lop or prune off the straightest stem; and if a tree that is not likely to be of such value be standing on that side, to which the stem left seems to incline to a horizontal position, take away the tree, and thus give the other every chance of growing horizontally. At this time it will be necessary to take away a few of the perpendicular shoots off the horizontal branch; and, indeed, if these branches, which is sometimes the case in these trees, seem to contend, take away most of them; but if they do not, it is better at this time not to prune these trees over much, except the crooked shoots on the horizontal branch, till they arrive at the height of fifteen or even twenty feet. By this time it will be easily seen what kind of tree it is likely to form; and, if it inclines to grow crooked, lighten a little the top of the treee, by taking off a few of the crooked branches on the straighter side, allowing all the branches to remain on the side to which the tree inclines to crook, to give it more weight, and to draw most of the sap or juice that way, and it will naturally incline more to the crook; at the same time clearing away any other tree on the crooked side, that may be apt, with the wind, to whip the side of the tree to which it inclines to crook. Also taking away such tree of less value as may prevent it from spreading out to the one side more than to the other."

He adds, "I have myself tried the experiment with several oak trees at about twelve feet high that were a little inclined to crook, and that had also a main branch inclined to a horizontal position. In the course of less than twenty years I had the pleasure of seeing some of these very trees grow so very crooked that the branch would work in with the main stem or body of the tree, to a complete knee, or square, which is the most valuable of all trees. And as ten trees of crooked oak is required for one straight one, it is of the most essential consequence to have crooked oak trees; (and, besides, an oak tree, properly crooked, that will answer for a large knee — say the main branch, to be fit to work in with the body or trunk of the tree without much waste of wood,) is nearly double in value to the same number of straight trees; and, indeed, knees of oak are extremely scarce, and difficult to be got."

Pontey "knows of no way by which bends of tolerable scantlings (knees excepted), can be produced with certainty and little trouble, but from a side branch kept in a bent position by the branches of another tree or trees overhanging its stem." *Forest Pruner*, 174.

1840. *Coppice Woods*, in so far as grown for poles or bark, require pruning on the same principle as timber trees, in order to modify the ligneous matter into stem, and produce clean bark. In as far as they are grown for fence wood, fuel, or besom spray, no pruning is required.

Osier-holts only require the laterals to be pinched off the shoots intended for hoops; those for the basket-maker seldom produce any. The stools also require to be kept free from dead wood and stinted knotty protuberances.

1841. *Hedge-rows* require side pruning, or switching, from their first planting, so as gradually to mould them into "the wedge shape, tapering from bottom to top on both sides equally, till they meet in a point at the top. Two feet at bottom is a sufficient breadth for a five-feet hedge: a greater or a less height should have the bottom wider or narrower accordingly. In dressing young hedges, either of the deciduous or evergreen kinds, the sides only should be cut till the hedge arrive at the proposed height, unless it be necessary, for the sake of shelter, to cut their tops over, in order to make the hedge thicker of branches. Such cutting of the upright shoots, however, is not of any very great use in this respect; because every hawthorn hedge sends out a number of side shoots, which, if encouraged, by keeping the top narrow as above, will make it abundantly thick." *Sang*, 447.

In pruning hedges, some use shears; but the hedge-bill (*fig.* 38.) is the most proper instrument, and, pruning a smooth unfractured section, not so apt to throw out a number of small useless shoots as generally follow the bruised cut of the shears, (815.).

Hedge-row Trees require to be pruned to a tall, erect, clean stem, as at once producing more timber and doing least injury to the ground under their drip and shade.

1842. Trees in *strips for shelter*, or *screens for concealment*, ought to be furnished with branches from the bottom upwards; unless undergrowth supply this deficiency. Where this is not the case, care should be had that the trees be pruned into conical shapes, so as that the lower branches may be as little as possible excluded from the influence of the weather by the upper ones.

1843. Trees for *shade*, where shelter from winds is not wanting, should be pruned to ample spreading heads with naked stems; the stems should be of such a height that the sun's rays, at midday, in midsummer, may not fall within some yards of the base of the trunk; thus leaving, under the tree, as well as on its shady side, a space for the repose of men or cattle.

1844. *Trees in Parks* may be considered as chiefly ornamental; and for this purpose should be left with larger heads than such as are grown chiefly for timber. The height to which the stems are cleared of branches should vary according to the kind of tree (*fig.* 500. *a* to *e*), and hollies, thorns, and such shrubs as are left untouched, or that are protected by inclosure from the cropping of cattle (*f*, *g*.), should be left entirely to themselves. In parks, where no pruning whatever is given to the timber trees by man, we find they are all pruned or brouzed to a certain height by cattle: this adds to their character as trees, but in flat surfaces forms a disagreeable repetition of the horizontal line in which they stand. To break this *browsing line*, pruning is a simple, obvious, and effectual resource.

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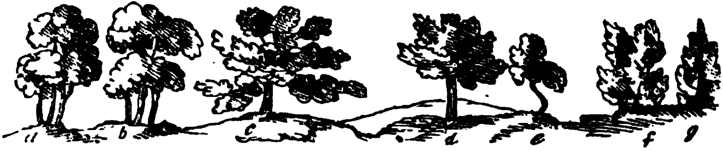

1845. Some *Trees in Pleasure Grounds and Lawns*, where no cattle ever come, may be allowed to extend their branches so as they may almost recline on the turf; others may be pruned to different heights, according to their natures. Limes, planes, cedars, and firs have a fine effect with their branches depending from their trunks; and give an idea of seclusion and exclusive consecration to man, highly characteristic of what is called pleasure-ground.

1846. "The properly *thinning* out of plantations," Sang observes, "is a matter of the first importance in their culture. However much attention be paid to the article of pruning, if the plantation be left too thick, it will be inevitably ruined. A circulation of air, neither too great nor too small, is essential to the welfare of the whole. This should not be wanting at any period of the growth of the plantation; but, in cases where it has been prevented by neglect, it should not be admitted all at once, or suddenly. Opening a plantation too much at once, is a sure way to destroy its health and vigor. In thinning, the consideration which should, in all cases, predominate, is to cut for the good of the timber left, disregarding the value of the thinnings. For, if we have it in our choice to leave a good, and take away a bad plant or kind, and if it be necessary that one of the two should fall, the only question should be, by leaving which of them shall we do most justice to the laudable intention of raising excellent and full-sized timber for the benefit of ourselves and of posterity? The worst tree should never be left, but with the view of filling up an accidental vacancy.

"In thinning mixed plantations, the removing of the nurses is the first object which generally claims attention. This, however, should be cautiously performed; otherwise the intention of nursing might, after all, be thwarted. If the situation be much exposed, it will be prudent to retain more nurses, although the plantation itself be rather crowded, than where the situation is sheltered. In no case, however, should the nurses be suffered to overtop or whip the plants intended for a timber crop; and for this reason, in bleak situations, and when perhaps particular nurse plants can hardly be spared, it may sometimes be necessary to prune off the branches from one side entirely. At subsequent thinnings, such pruned or disfigured plants are first to be removed; and then those which, from their situation, may best be dispensed with.

"At what period of the age of the plantation all the nurses are to be removed, cannot easily be determined; and, indeed, if the nurses chiefly consist of larches, it may w propriety be said, that they should never be totally removed, while any of the o kinds remain. For, besides that this plant is admirably calculated to compose pa a beautiful mixture, it is excelled by few kinds, perhaps by none, as a timber tree.

"But when the nurses consist of inferior kinds, such as the mountain-ash and the Sc pine, they should generally be all removed by the time that the plantation arrives at t height of fifteen or twenty feet, in order that the timber trees may not, by their mea be drawn up too weak and slender. Before this time, it may probably be necessary t thin out a part of the other kinds. The least valuable, and the least thriving pla should first be condemned, provided their removal occasion no blank or chasm; bu where this would happen, they should be allowed to stand till the next, or other su-sequent revision.

"At what distance of time this revision should take place, cannot easily be determined: as the matter must very much depend on the circumstances of soil, shelter, and the sta of health in which the plants may be. In general the third season after will be soo enough; and if the plantation be from thirty to forty years old, and in a thriving sta it will require to be revised again, in most cases, within seven years. But one in-variable rule ought to prevail in all cases, and in all situations; to allow no plant t overtop or whip another. Respect should be had to the distance of the tops, not to th distance of the roots of the trees; for some kinds require much more head-room tha others; and all trees do not rise perpendicular to their roots, even on the most level o sheltered ground.

"With respect to the final distance to which trees, standing in a mixed plantation should be thinned, it is hardly possible to prescribe fixed rules; circumstances of health vigor, the spreading nature of the tree, and the like, must determine. Whether the trees are to be suffered to stand till full grown; which of the kinds the soil seems best fitted for; whether the ground be flat or elevated; and whether the situation be exposed or sheltered, are all circumstances which must influence the determination of the ulti-mate distance at which the trees are to stand. It may, however, be said in general, that if trees be allowed a distance of from twenty-five to thirty feet, according to their kinds and manner of growth, they will have room enough to become larger timber.

"Plantations of Scots pine, if the plants have been put in at three, or three and a half feet apart, will require little care until the trees be ten or twelve feet high. It is neces-sary to keep such plantations thick in the early stages of their growth, in order that the trees may tower the faster, and push fewer and weaker side branches. Indeed, a fir or soft wood plantation should be kept thicker at any period of its growth than any of those consisting of hard wood and nurses already mentioned; and it may sometimes be proper to prune up certain plants as nurses, as hinted at above for nurses in a mixed plantation. Those pruned up trees are of course to be reckoned temporary plants, and are afterwards to be the first thinned out: next to these, all plants which have lost their leaders by accident, should be condemned; because such will never regain them so far, as afterwards to become stately timber; provided that the removal of these mutilated trees cause no material blank in the plantation.

"Care should be taken to prevent whipping; nor should the plantation be thinned much at any one time, lest havock be made by prevailing winds; an evil which many, through inadvertency, have thus incurred. This precaution seems the more necessary, inasmuch as Scots pine, intended for useful large timber, are presumed never to be planted except in exposed situations and thin soils. At forty years of age, a good medium distance for the trees may be about fifteen feet every way.

"It may be worthy of remark, however, that after a certain period, perhaps by the time that the plantation arrives at the age of fifty or sixty years, it will be proper to thin more freely, in order to harden the timber; and that, then, this may be done with less risk of danger, from the strength the trees will have acquired, than at an earlier period; but still it should be done gradually.

"Plantations of spruce and silver firs, intended for large useful timber, should be kept much in the manner above stated, both in their infancy and middle age. As already remarked, planting and keeping them as thick as is consistent with their health, is the best means of producing tall, straight, clean stems, and valuable timber. When planted for screens or for ornament, they require a different treatment; which will be noticed in the proper place.

"To larch plantations, the above observations will also apply; and indeed they are applicable to plantations of all kinds of resinous trees. It may be proper here to re-mark, that the exposed margins of all young plantations should be kept thicker than the interior. The extent to which this rule should be carried, must be regulated ac-cording to the degree of exposure of the situation, the age of the plants, the tenderness of the kinds, and other circumstances."

1847. Autumn, or very early in spring, are the proper *seasons for thinning* where the ees are to be taken up by the root and replanted elsewhere; winter for thinning for mber and fuel; but such trees as are valuable for their bark should be left untouched ll the sap rises in April or May. Copse woods require thinning when young, like ther plantations, and when once established the stools require to be gone over the econd year after cutting, and all superfluous suckers and shoots removed. This oper- tion should be repeated annually, or every two or three years, in connection with prun- ng, till within three or four years of the general fall of the crop.

Ornamental plantations require to be thinned on principles agreeable to the intention rith which they were planted. In the artificial forms, the figure must be carefully reserved, as the main object: and in plantations in imitation of nature, the principle of rouping and connection must be kept steadily in view. A thin part is to be rendered hinner, and a thick group, or constellation of plants not opened up, but merely de- prived of such trees as are becoming smothered by the rest.

1848. Improving *neglected Plantations.* Though it has been more or less fashionable, or upwards of a century, to form plantations; yet it has been also so generally the custom to neglect their future culture, that by far the greater proportion of the surface covered with trees in Britain may be considered as neglected or mismanaged. The artificial strips and masses, have generally never been thinned or pruned; and the natural woods and copse-woods, improperly thinned, or cut over. It is often a difficult matter to make much of such cases; and always a work of considerable time.

"Trees," Sang observes, "however hardy their natures may be, which have been reared in a thick plantation, and consequently have been very much sheltered, have their natures so far changed, that if they be suddenly exposed to a circulation of air, which, under different circumstances, would have been salubrious and useful to them, will become sickly, and die. Hence the necessity of admitting the air to circulate freely among trees in a thick plantation, only gradually, and with great caution.

"To prevent a misfortune of this kind, a plantation which has become close and crowded, having been neglected from the time of planting till perhaps its twentieth year, should have only some of the smallest and most unsightly plants removed; one perhaps, in every six or eight, in the first season; in the following season, a like number may be removed; and, in two or three years after, it should be gone over again; and so on, till it be sufficiently thinned. It will be proper to commence the thinning, as above, at the interior of the plantation, leaving the skirts thicker till the last; indeed, the thinning of the skirts of such a plantation should be protracted to a great length of time." With thinning, pruning to a certain extent should also be carried on. "If the plantation," Sang observes, "consists of pines and firs, all the rotten stumps, decayed branches, and the like, must be cut off close by the bole. It will be needful, however, to be cautious not to inflict too many wounds upon the tree in one season; the removing of these, therefore, should be the work of two or three years, rather than endanger the health of the plantation. After the removal of these from the boles of the firs and larches, proceed every two or three years, but with a sparing hand, to displace one or perhaps two tiers of the lowermost live branches, as circumstances may direct; being careful to cut close by the trunk, as above noticed. In a plantation of hard wood, under the above circumstances, the trees left for the ultimate crop are not to be pruned so much at first as might otherwise be required: only one or two of their competing branches are to be taken away, and even these with caution. If it be judged too much for the first operation to remove them entirely, they may be shortened, to prevent the progress of the competition; and the remaining parts may be removed in the following season; at which time, as often observed, they must be cut close by the bole." *Plant. Kal.* 467.

The operation of thinning and pruning, thickening or filling up, or renewing portions that cannot be profitably recovered, should thus go on year after year, as appearances may direct, on the general principles of tree culture. And for this purpose the attentive observation and reflection of a judicious manager will be worth more than directions which must be given with so much latitude. Pontey has noticed various errors in Kennedy's *Treatise on Planting*, and even in Sang's *Kalendar*, on the simple subject of distances, which have originated in their giving directions for anticipated cases, which had never come within their experience. "Most people," he says, "take it for granted, that if trees stand three feet apart, they have only to take out the half, to make the distances six feet, though to do that, they must take down three times as many as they leave. By the same rule again, most people would suppose, that twelve feet distance was only the double of six; but the square of the latter is only thirty-six, and that of the former one hundred and forty-four, or four times the latter; so that to bring six feet distances to twelve, three trees must be removed for every one left." *Profitable Planter*, 256. and *Forest Pruner*, 21.

Copse-woods are sometimes improved by turning them into woods, which requires nothing more than a judicious selection and reservation of those shoots from the stools which are strongest, and which spring more immediately from the collar. But a greater improvement of copse-woods consists in cutting over the overgrown and protuberant stools, by the surface of the soil (*fig.* 501. *a*, *b*, *c*, *d*.), which has been found by Monteath completely to regenerate them. The operation is performed with a saw, in a slanting direction, and the young shoots being afterwards properly thinned and pruned, soon establish themselves securely on the circumference of large, and perhaps rotten-hearted, roots. *Forester's Guide*, 60.

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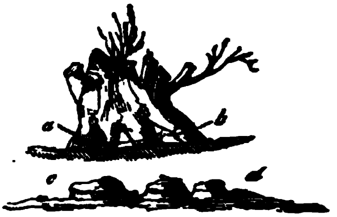

1849. *Hedge-rows* are often neglected, and, like larger plantations, require renovation by cutting down and filling in vacancies, and by cultivating the soil at their roots. "Hedges," Sang observes, "which have been long neglected, shoot up to a great height like trees, become naked at bottom, and occupy too much ground, at least for lands in a state of high cultivation. The best method of reducing such to a proper size, and of forming them into an immediate fence, is by plashing. This consists in selecting the strongest and straightest shoots. These are to be dressed up and headed down to four feet, and in such a way that the tops of the whole may range in a neat line. These are called the stakes; and, when they are deficient, either in strength or number, recourse must be had to artificial stakes, which must be driven in to stand firm, and supply the deficiency of natural ones. Having proceeded thus far in preparing the hedge for plashing, the hedger is to begin at one end, and bend down as close as possible the remaining pliable branches, crossing them in the manner of basket-work. Such as are too strong to be bent, may be cut half through with the bill, which will render them pliable enough to be used; and such as are not required for any of the above-mentioned purposes, must be cut off close to the ground. After the plashing is finished, the hedge should be dressed smooth on both sides by the switching bill or shears.

"There is another method of plashing, which has been suggested as an improvement upon the foregoing; and that is, by not cutting any of the stems over as stakes, but weaving in the tops along with the other branches. This method will not have so immediate a tendency to bare the lower parts of the hedge by the growth of the top, as when many of the plants are cut over for stakes; but still, at the bendings, the growth will rush out with vigor; besides, this plan is attended with more labor. Indeed, the best security against baring the bottom of a plashed hedge, is by cutting over by the surface as many of the plants as can be at all spared; and the shoots arising from these will soon thicken the hedge at bottom.

"Plashing can only be effectually and handsomely performed, when there is a good portion of long, pliable, and well-feathered branches, and where the hedge has, if not youth, at least vigor; on its side. After the plashing is completed, the ditch is to be scoured out, and the bottom of the hedge cleaned and dressed up, in the same neat manner as if all were new work.

"Cutting over old hedges is a much less expensive method of reclaiming or renewing, than any of the above; and, perhaps, in most cases, may be a more eligible one; saving when an immediate fence is the object. In cutting down an old hedge, there is certainly a very fit opportunity of laying the foundation of a complete and durable fence.

"The nature of the cutting must be regulated by circumstances, according to the age, the strength, or the closeness of the hedge, and whether it have been planted in single or double rows. If the hedge in question be pretty vigorous and branching towards the bottom, and if the stems stand regularly and closely together, it may be brought into due subjection, without being cut down to the ground. In this case, the sides are first to be switched up with the hook, not altogether close to the stems, but within about a foot of them on each side at bottom, tapering up close at top, which should be four or five feet high, according to the general height of the hedge: but if the hedge be thin at bottom, it will be advisable to cut more in, in order to make it bushy from the ground upwards.

"If the hedge is not regularly close from end to end, but ragged, and full of gaps, the best method is to cut it over, within eight or ten inches of the ground, and to fill up the gaps with stout, well-rooted plants of the same kind; or the gaps may be mended by the following method: — Let one of the stoutest thorn plants next to the gap be reserved uncut, and the space be digged over, or it may require to be filled up with rich earth to within three inches of the height of the top of the ditch. Then having cleaned the thorn plant of all side branches or twigs, cut it half through at the height of the earth in the gap, on the side farthest from it, and lay it down upon the earth, securing the most distant end from rising up by a hooked pin; then cover it all over with rich earth, so as to make it the general height of the top of the ditch: and the thorn plant so laid down and covered, will take root, and send up a profusion of shoots over its whole length. If one plant will not reach the whole extent of the gap, one at each side probably will. The surface of the bank should be pointed up, and the ditch scoured as above directed in plashing.

"In other cases, when the hedge is getting thin below, or too tall, and when the stems are placed regularly, within eight or ten inches of one another, and where it is necessary to retain a fence and at the same time to cut, so as to have a supply of young shoots from the bottom, the plan to be followed, is to cut alternately the one part to within eight or ten inches of the bottom, and the other at four feet high, dressing the bank and scouring the ditch, as directed above. In cases where two rows of quicks have been planted, the front one is to be cut by the surface, and the other at four or five feet high, as circumstances may require."

1850. Neglected *hedge-row timber* may be improved by pruning according to its age. Blakey recommends what he calls, foreshortening, or cutting in, as the best method both for young and old hedge-row timber. "This operation is performed by shortening the over-luxuriant side branches, (*fig.* 502. *a*) but not to cut them to a stump, as in snag pruning; on the contrary, the top only of the branch should be cut off, and the amputation effected immediately above where an auxiliary side shoot springs from the branch on which the operation is to be performed; (*b*) this may be at the distance of two, four, or any other number of feet from the stem of the tree; and suppose the auxiliary branch which is left (when the top of the branch is cut off) is also over luxuriant, or looks unsightly, it should also be shortened at its sub-auxiliary branch, in the same manner as before described.

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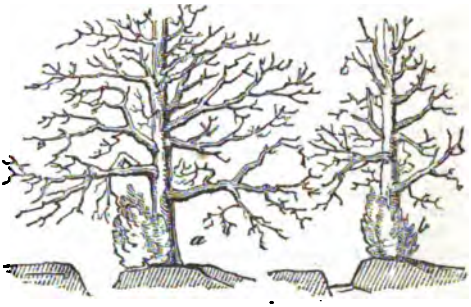

"The branches of trees pruned in this manner are always kept within due bounds; they do not extend over the adjoining land to the injury of the occupier, at least, not until the stem of the tree rises to a height (out of the reach of pruning), when the top branches can do comparatively little injury to the land. By adopting this system of pruning, the bad effects of close pruning on old trees, and snag pruning on young ones, will be avoided; the country will be ornamented, and the community at large, as well as individuals, benefitted."

1851. *Hedge-rows* frequently require to be altered in direction to improve the form, or increase the contents of farm enclosures (*fig.* 503.). Generally, and especially in

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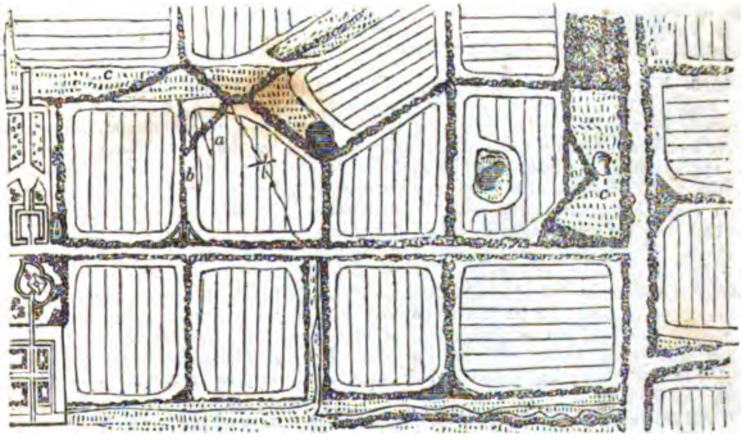

flat, arable lands, this is done by eradicating such as are in unsuitable directions (*a*), and substituting others in parallel, or at least in straight lines; but in rising grounds, and where the surface will be improved by shelter, it frequently happens that a crooked hedge (*b*), is superseded by two straight ones, and the interval (*c*), filled up with plantation. The advantage of straight-lined fields to a farmer is very considerable; and when this object is procured in the latter way, an improvement is produced both useful and ornamental.

1852. *Ornamental Plantations* are no less frequently neglected than such as are considered chiefly useful. Clumps, belts, and screens which have become thin, because they have not been thinned, are almost every where to be met with. "In those neglected plantations," says Lord Meadowbank, "where daylight may be seen for miles, through naked stems, chilled and contracted by the cold, the mischief might, perhaps, be partially remedied, by planting young trees round the extremities, which having room to spread luxuriantly, would exclude the winds, and the internal spaces might be thickened up with oak, silver firs, beeches, and such other trees as thrive with a small portion of light. When once the wind is excluded, the weakest of the old trees might be taken out, and the others left to profit by the shelter and space that is afforded." *Life of Lord Kaimes, by Tytler.*

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One of the most hopeless cases of improvement in this department is, that of an old clump of Scotch pines (*fig.* 504.), from which scarcely any trees can be taken without risking the failure of the remainder. The only way is to add to it, either by some scattered groups in one direction, or in various directions. Where a clump consists of hard wood, either entirely or in part, it may sometimes, if effect permits, be reduced to a group, by gradually reducing the number of the trees. The group left should be composed of two or three trees of at least two species, different in bulk, and somewhat in habit, in order that the combined mass may not have the formality of the clump.

Scattered trees in ornamental scenery otherwise of very good shapes, and very well managed as to pruning destroying the brousing line, &c., individually, are often from want of thinning in some places, and thickening in others, deficient in massiness (*fig.* 505.);

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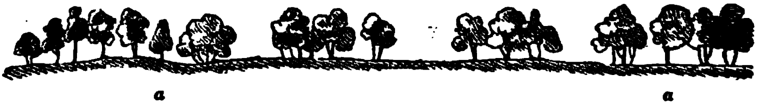

the obvious remedy is to thin out some (*a*), and plant others, so as to destroy the straggling non-co-operating appearance which such trees present, and produce something of grouping, massiveness, and character. (*fig.* 506.).

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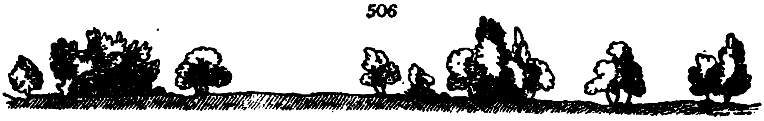

1853. *Wounds, Bruises, Casualties, and Defects of Trees.* Small *wounds*, such as are required to be made by judicious pruning, easily heal up of themselves; large wounds, by amputations of branches, above six inches diameter, should, if possible, never be made. Even wounds of six inches diameter, or under, will heal quicker by the application of any material which excludes the air and preserves the wood from corruption; and we agree with Sang, in recommending coal tar, or the liquor produced from coals in manufacturing gas. It is, however, less favourable to the progress of the bark over the wound than a coating of clay or cow-dung covered with moss to keep it moist. Pontey recommends putty and two coats of paint over it.

"In case the wood, at a *bruised* or amputated place, have by neglect, become already corrupted, the rotten or dead wood is to be pared out quite into the quick; and the wound is then to be dressed with tar or clay covered with a piece of mat, sacking, or moss. A wound, hollowed out as above, may at first appear an unsightly blemish; but, in subsequent years, nature will lay the coats of wood, under the new-formed bark, thicker at that place; and probably may, in time, fill it up to be even with the general surface of the tree.

"All *fractures*, by whatever means produced, are to be managed as the circumstances of the case require. If a large branch be broken over at the middle of its length, it should be sawn clear off close by the lateral which is nearest to the bole of the tree: but, if there is no lateral, or branch, capable to carry forward the growth, cut the main or fractured branch in quite to the bole. In both cases, treat the wounds as above recommended.

"Interior *rotting*, arising from the dampness of the soil, cannot by the art of man be cured; though it might have been prevented by timeous draining. The hearts of trees frequently rot, where there is no excess of moisture, and especially such as have been produced from old roots left in the ground by a previous felling. Such roots, when in good ground, send up very great shoots with few leaves in proportion to their sizes; by the absence of a profusion of these, properly to concoct the juices so abundantly supplied by the roots, the fibre of the wood is loose and imperfect; the next season will supply more leaves in proportion to the supply of juices, yet not a sufficient number for making perfect timber; several years may pass before this event arrive: thus crude and ill-digested timber disposed to premature decay, is the foundation over which subsequent coatings of wood are laid: yet, however, perfect these may be, they do not prevent the progress of decomposition going on in the interior. Nature teaches how necessary numerous leaves are to the proportion of the solid wood; the cotyledons and subsequent leaves of a one-year old tree, are a thousand times greater, compared to its solid contents, than are the leaves to the solid contents of the first year's shoots from roots like the above.

"*Shakes* often arise from the weight and multiplicity of top branches, and might have been prevented by timeous pruning. Shakes or rents in the boles of trees, however, often happen where there is no excess of tops. Sometimes the rain running down from the branches, wets one part of the bole, while the rest is comparatively dry. If this circumstance is succeeded by an intense frost, before the wetted side become dry, the bole may be rent for a great length, and perhaps to the depth of the core. Shakes or rents, like the above, are difficult to cure. The best method of helping them, is to trace out their upper extremity, caulk it up with oakum, and pitch it over, to prevent the rain descending that way in future." *Sang.*

In cases of *hollowness*, Pontey recommends probing to the bottom, letting out the water, if any, with an auger, drying the cavity with a cloth, filling it with dry sand, plugging it with wood and oakum, and then painting it over.

Dicorticated stems or branches by lightning, or otherwise, if the soft wood is not much injured, will heal over and become covered with bark; and this the more certainly and rapidly if the air be excluded by a coating of adhesive matter, as cow-dug and quick lime, or tying on moss or bandages of mat or cloth. Pontey gives an instance in which such treatment was successful in the case of an apple-tree. (*Pruner*, 230.) We have witnessed it on an extensive scale on the trunk of a pear-tree; and we are informed, on the best authority, of other cases now under progress, in the government garden of the Luxembourg at Paris, as matter of experiment, by Du Thuars, a most ingenious physiologist.

Withered or decayed Tops may arise from age and incipient decay; but also, as Pontey states, from improper pruning, or the want of it. We often see it from improper pruning elms, which, after having been close pruned to their summits for many years, are left entirely to nature; in that case they branch out luxuriantly below, and the top withers. By neglecting to thin out the branches on the stems of non-resinous trees, the same effect may be produced.

Stinted bushy Tops show a deficiency of nourishment; on very tall naked stems it is from these circumstances; and on short stems from defects in the soil. *Obliquely placed misshapen heads*, in detached trees, commonly proceed from the same causes and want of shelter. Stinted growth, both in tops and stems, is also produced by ivy, and by lichens, mosses, the misletoe and other parasites. Ivy compresses the bark, precludes its expansion, as well as excludes air and moisture, by which the outer bark becomes rigid and corky. Happily, both men and trees will live a long time under the influence both of deformity and disease.

Excessive *exudations of gum and resins* are peculiar to resinous and some other trees when over pruned, or pruned at improper times. Mildew, honeydew, and blight, three popular names applied to the effects of certain insects of the *aphis* kind, attack the oak, beech, poplar, and many trees; all that can be said is, if proper regimen has been regularly attended to, trees will overcome these and all other enemies.

1854. *Insects and Vermin.* Almost every tree has its particular insect of the hemipterous and depterous families, and many of the coleoptera family are common to all. The foliage of the small-leaved elm of hedges is often almost entirely destroyed in the early part of the season by tenthredinidæ; and those of the larch and Scotch pine have suffered materially in some seasons from aphides. The *Aphis laricea*, L. (*Eriosomata* of Leach,) increased to an alarming extent from 1800 to 1802, on the larch, on account of three dry seasons following each other; but, though it retarded their growth, it ultimately destroyed very few trees. Sang says he has known it since 1785; that it dirties more than injures the tree, and is now (1819) thought little of. Indeed, almost every species of tree has been known to have suffered in some one or more seasons, and in particular districts from insects; for which, on so large a scale, there seems to be no applicable remedy but patiently waiting till their excess, or the increase of other vermin, their natural enemies or a change of seasons, cause them to disappear. Trees, properly cultivated and managed, generally overcome such enemies. The hare is well-known to be very injurious to young trees, and especially to laburnums, by gnawing off their bark. Coating their stems with dung and urine, fresh from the cow-house, is said to be an effectual remedy. It may be put on with a brush about two feet high; a barrow load will suffice for a hundred trees, with stems of three or four inches in diameter; and its virtue, after laid on, endures at least two years. *Bull in Cald. Hort. Mem.* iv. 190.

Chap. VI.

Of appropriating the Products of Trees, preparing them for Use or Sale, and estimating their Value.

1855. The first product afforded by trees is their *leaves*, which are or may be collected in close plantations for the sake of the manure they afford; and in open groves, parks, and lawns, for that purpose, and to prevent their injuring the grassy surface. Though, at first consideration, leaves would appear to benefit pastures by sheltering the roots of the grass during winter, and afterwards rotting into manure; yet experience proves, that in considerable quantities they impede the growth of the grass plants, by bringing on decay at their roots, in all probability owing to their exclusion of air. For this purpose, in well-wooded parks, the leaves are carefully collected in the beginning of winter, and carried to rot-heaps in secluded situations, where in two years from the time of gathering, they become the valuable mould so much in demand by the gardener. A very ingenious machine for sweeping together, and at the same time, lifting up leaves into a box or receiver, has been invented by Snowdon, a London machinist, and has been partially in use in Windsor Forest and at Hampton-court; it is also calculated for cutting or wrenching off weeds, (as clean cut weeds are found to grow again, the same season, while the others rot;) or mowing and lifting the weeds or swarth into the cart; but it is not yet sufficiently matured to enable us to describe it as completely answering all its intended purposes. Great credit, however, is due to the ingenious inventor, who has been occupied on it for upwards of two years, and who has spared neither time nor money.

1856. The next product of trees is the *prunings*; those which they afford at a very early period, and all clippings of hedges or artificial forms, are only fit to be used as leaves; the larger prunings may be used for some of the various purposes to which copse-wood and the lop of trees are applied.

1857. The *thinnings*, when not beyond a suitable age, and taken up properly (1847.) and at a proper season, may be replanted in other situations, or as single trees and groups; or they may be used as hoops, hop-poles, poles for garden-training, for fencing, for props in coaleries, and for a great variety of purposes; those, whose barks are useful for tanning should not be cut down, or rooted up till May, but the others at any time during winter. It is common to sort them into lots, according to their kind or size; and to faggot up the spray for fuel, besom-stuff, or for distilling for bleachers' liquid. See *Copse-woods*, (1860.)

1858. The *seeds* of trees in general cannot be considered of much use beyond that of continuing the species, and therefore, in very particular cases, where it is desired a tree should attain bulk as rapidly as possible, the flowers should be pinched off as they appear. The seeds of the oak, beach, and sweet chestnut, however, are valuable for feeding swine, and where they abound may either be swept together after they drop, and carried away and preserved dry in lofts for that purpose; or if other circumstances are favorable, swine may be driven under the trees to collect them. These, and other seeds, as the haw and holly, are also eaten by deer. The seeds of the trees mentioned, and of all the resinous tribe, are in general demand by the nurserymen for the purposes of propagation. The seeds of almost all other trees and shrubs are also in limited or occasional demand; or may be collected for private sowing. They generally ripen late in the season, and are to be collected in the end of autumn or beginning of winter, with the exception of a few, such as the elm, poplar, willow, and one or two others, which ripen their seeds in May and June.

1859. In *osier grounds*, willows, whether intended for the basket-maker or cooper, should not be cut till the second season after planting, in order to strengthen the stools; but by the third autumn the crop will be fit for the basket-maker, and the fourth, plantations intended for the cooper, (hoops requiring the growth of two years) will be ready. The seasons for cutting are November and March; after the former period the wounds are apt to be injured by frost, and after the latter the sap is too far advanced; some is lost by bleeding, and the buds are developed too suddenly to admit of proper strength in the shoots. The cut should be made within three buds of the point whence the shoot issued, in a sloping direction, and the section on the under-side (814.). In cutting hoop-willows, the swell at the bottom of the shoot only should be left, that being furnished with abundance of buds for future growth. After being cut, the hoops are trimmed from any side-shoots, and tied up in bundles of a hundred, of six scores each, which, in 1820, sold for from four shillings to five shillings a bundle. The willows are sorted into three sizes, and tied in bundles of two feet circumference, within a foot of the lower ends. When to be peeled, they are immediately after cutting set on their thick ends in standing water, a few inches deep, and there they remain till the growth ascends freely, which is commonly by the end of the succeeding May. "The apparatus for peeling is simply two round rods of iron, nearly half an inch thick, sixteen inches long, and tapering a little upwards, welded together at the one end which is sharpened, so as that it may be easily thrust down into the ground. When thus placed in a piece of firm ground, the peeler sits down opposite to it, and takes the willow in the right hand by the small end, and puts a foot or more of the great end into the instrument, the prongs of which he presses together with the left hand, and with the right draws the willow towards him; by which operation the bark will at once be separated from the wood: the small end is then treated in the same manner, and the peeling is completed. Good willows peeled in the above manner, have been sold for some seasons past, at from six shillings and sixpence to seven shilllings the bundle of four feet circumference. After being peeled, they will keep in good condition for a long time, till a proper market be found."

1860. *Copse-woods* are generally *cut over* when the shoots of the stools have attained from three to five inches diameter at their bases; some grown chiefly for hop-poles, and ware or stuff for crates, hampers, or wattled hurdles, are cut over earlier, and others, where small timber for fencing and other country purposes are wanted, are left later. In some parts of Herefordshire, where the oak grows with great rapidity, copse-woods are cut over every twelve years; in the highlands of Scotland, where it grows much slower, the time varies from twenty to twenty-five or thirty years. "The bark is there considered as having arrived at its utmost perfection,and at its highest value, at the age of between twenty and thirty years: under that age, its virtues are weak; above it, the bark becomes coarse and loses its sap. Another important reason for cutting down oak coppice wood about the above period, is suggested in the *Stirlingshire Report*, p. 218; namely, 'that it is a fact established by experience, that it will not renew itself, if it remains uncut, beyond the space of about forty years.'" *Gen. Rep. of Scotland*, 218.

Where there is a considerable tract of copse-wood, it is common to *divide it into portions*, in number according to the period of cutting. These are to be cut in rotation, so that when the last portion is cut over, the first is again ready for cutting.

1861. The *season for cutting* the kinds of trees whose barks are not made use of, is winter and early in spring; but the oak and other trees which are peeled, are left till the middle of April or May. "Birch and larch-woods will peel nearly a month earlier than the oak. Should there be no frost, birch and larch may be peeled about the beginning of April; but the birch is commonly allowed to stand till July, and the peeling of it is commenced after that of the oak has been completed, and the reason is, there is an outer skin upon birch bark which requires to be taken off, as it is of no use to the tanner, and renders that part which is of use more difficult to be ground, and the month of July is the only time at which the two barks can be separated with ease, as at this time the juice or sap has made its circulation through the tree and bark, and this circumstance renders the separation more easy. From the beginning of May to the middle of July is the usual time for barking the oak. The earlier in the spring this operation is performed on the oak, both for the growth, if a natural wood, and for the bark, the better. When the sap has begun to rise, the bark will easily be detached from the wood, and it ought then to be taken off without loss of time; and if the whole could be taken off before the leaf is completely developed, the bark would be better. After the sap has arisen to the leaf and new growth, the bark becomes more dry, and requires more beating to separate it from the wood. And when what is called the black sap is descending the tree, the bark taken off is black, and loses its original color; and at this time also the bark begins to throw off a scurf, more especially young bark without much cork on it; this outer skin having less of the proper sap or juice, and being much drier when taken off, will weigh less, and consequently will not be so valuable.

"If possible, oaks should be barked by the middle of June, as every ton of bark taken off after the first of July will be deficient two cwt. per ton, compared with the same quantity taken off in May, or early in June.

"The termination of cutting is generally fixed for the fifteenth day of July, and after this date there should not be a single stool of oak wood cut that is intended for the growth; and as soon as possible after the fifteenth, the whole of the wood and bark should be carried away, that the young growths may not be disturbed or injured, as at this time they will have made considerable progress; at any rate there should neither be wood nor bark remaining within the new cut hag after the first of August; nor should either horse or cart be permitted to enter it after that period, for after the beginning of August, oaks make what is termed a lammas growth, and the future prosperity and health of the coppice, in a great measure, depend on the first year's growth, as far as regards form and vigor of the shoots." *Forester's Guide*, 69.

1862. The best *mode of cutting* is evidently that of using a saw, and cutting the shoots over in a slanting direction close by the surface. When the stool, after having been cut several times, has acquired considerable diameter, it is customary in the midland counties, Marshal states, to hollow it out in the centre, from a notion that by rotting away the central roots, the circumferential stems will grow more vigorously, and become as it were separate plants. This is in fact the case in very old copses. For several cuttings, however, it must evidently be the safer policy to keep the stool highest in the middle to throw off the rain, and preserve it sound. Monteath says, "It will be found, upon experiment, perfectly evident, that stools dressed down to the surface of the groud (taking care always not to loosen the bark from the root, or allow it to be peeled off in the smallest degree below the earth, but rounded down level to it,) that these stools will send forth the most vigorous shoots, and stand the weather, and be the stoutest and best throughout the age of the coppice." *Forester's Guide*, 61.

From the late season at which the trees to be barked are generally cut, they often receive considerable injury, both from that circumstance, and the manner in which the operation is performed. Monteath appears to us to have furnished the best directions for executing the work in a safe manner. He first sends a person furnished with an instrument with a sharp cutting edge (*fig.* 63.) through the copse, whose business is "to trample down the long grass or foggage all round the root, and then, to make a circular incision into the bark so deep as to reach the wood, at about an inch above the surface of the earth; thus the bark when taken off, will injure no part of that which is below the circular incision.

"The root of the tree being thus preparéd, the cutters ought to proceed to their part of the work, not with an axe, however, as is most generally recommended, but with a saw, because, in cutting with the axe, unless the root of the tree be so small in diameter as to be severed in one or two strokes at most, the axe loosens the root to such a degree, that it not only loses the present year's growth, but often fails altogether to grow. Therefore if the diameter of the root be six inches, or upwards, it should always be cut with a cross-cut saw; entering the saw about half an inch above where the circular incision has been made into the bark, if a small tree; but if the tree be ten or twelve, or more inches in diameter, the saw ought to be entered two inches above it.

"There are two advantages to be derived from cutting with the saw; it has no tendency to loosen the root of the tree, but leaves it in such a condition as to be more easily and properly dressed; it also saves a portion of the wood that would otherwise be destroyed by the axe. On no pretence should oaks of six inches diameter be cut with an axe, but always with a saw. Having cut through the tree with a saw, take a sharp adze, and round the edges of the stool or root, going close down to the surface of the earth, taking with the adze both bark and wood, sloping it up towards the centre of the stool, taking particular care always that the bark and wood both slope alike, as if they formed one solid body, being sure always that the bark be not detached from the root.

"An objection has been made to this mode of cutting with the saw, as taking up too much time; but I have found that two men with a cross-cut saw, kept in good order, will cut as much as two men will with an axe." *Forester's Guide*, 58.

The disbarked timber is prepared for sale by being sorted into straight poles of the largest size, stakes, and other pieces fit for palings, faggots, fuel, &c. The unbarked wood is similarly sorted, and affords, where there is much hazel or ash, cord-wood or bundles of clean shoots for making packing crates, hampers, &c., poles for hops; larger poles for fences, rails, paling stakes, stakes and shoots for hurdles, besom stuff, spray for distillation, and a variety of other objects according to the local demand, or the opportunity of supplying a distant market by land-carriage. The brush or spray of non-resinous trees, is called in some places ton-wood, and is used for distilling the pyrolignous acid used in bleach-fields and calico print-works. "When wood of this description is sent to Glasgow, where there are extensive works for the purpose of distilling it, it sells readily at from 1*l.* 2*s.* to 1*l.* 10*s.* per ton; but when there are large cuttings, particularly of young woods, it is worth while to erect boilers near the wood to distil it, as these boilers can be erected at no great expence, and in this case the liquid is easily carried in casks to where it is consumed, at less expence than the rough timber could be; of course it will pay much better. Small wood of this description is also used for charcoal: but in distilling it, there is part of it made into charcoal, which will supply the demand of that article, so that it is by far the most profitable way, when there is any great quantity to dispose of, to erect boilers and distil it; unless where the local situation of the wood will admit of it being shipped at a small expence, and carried to where the works mentioned are carried on. All kinds of wood will give the extract in question, excepting fir; but oak, ash, Spanish chestnut, and birch, are the best." *Forester's Guide*, 155.

Where the oak grows slow, as in the highlands, the butt ends of the poles are used for spokes for chaise-wheels. "Long spokes are from thirty to thirty-two inches by three inches and a half broad, and one inch and a half thick, and the short ones for the same purpose, from twenty-two to twenty-four inches long, and the same sizes otherwise. Cart-wheel spokes, from twenty-six to twenty-eight inches long, four inches broad by two inches thick. These are the sizes they require to stand when rough blocked from the axe. Small wood when sold for this purpose, brought, in 1820, 2*s.* a cubic foot, measured down to three inches square." *Monteath.*

1863. In some cases copse-woods are sown with grass seeds, and *pastured* by sheep, horses, and cattle. Some admit the animals the fifth year after the last cutting, others not till the eighth: but Monteath thinks this should never be done till the fifteenth year. If the ground is properly covered with trees, it can seldom be advantageous to admit any species of stock unless during a month or two in winter.

In the *operation of barking trees*, "The barkers are each furnished with light, short handled mallets, made of hard wood, about eight or nine inches long, three inches square at the face, and the other end sharpened like a wedge, in order the more easily to make an incision in the bark, which is done all along the side of the tree which happens to be uppermost, in a straight line: and as two barkers are generally employed at one tree, it is proper, that whilst the one is employed in making an incision with the mallet, as above, the other being furnished with the barking bill, (*fig.* 63.) cuts the bark across the tree, in lengths of from two feet six inches to three feet. Having thus made the incision in the bark, both ways, the barkers being also each furnished with peeling irons (*figs.* 59 to 62.), if the tree or piece of timber to be barked is such as the two barkers can easily lift one end of it, this is placed on two pieces of wood, three feet long, and called horses; these are about the thickness of a paling stake, and have a forked end on each about six inches long, the other end sharpened to go into the ground; two of these horses are placed in a triangular form against one another, one end of the piece to be peeled being raised on the horses, the two barkers standing opposite to each other, and entering the peeling irons into the incision made by the mallet, and pressing the iron downwards between the bark and the timber. In this way it will be found very easy to take the bark off in one whole piece round the tree; and, if possible, let these pieces be as long as the incisions made in the bark. In some cases, where there is not much sap, the bark may require a little beating with the square end of the mallet, to cause it to separate easily from the wood; but the less beating with the mallet the better, as it has a tendency to blacken the bark in the inside, or fleshy part of it, so that when the tanner sees it, he supposes it to be damaged, and undervalues it. The branches of the tree being previously all lopped off with the axe, the persons, in number according to the extent of the work, with the bill smooth all the branches, cutting them in lengths of from two feet six inches to three feet, down as small as one inch in circumference. The barkers, principally women, are each provided with a smooth hard stone of about six or eight pounds weight, beside which they sit down, and having collected a quantity of saplings, branches, or twigs, they hold it on the stone with the one hand, and, with the mallet in the other, they beat the piece till the bark be split from the wood, from the one end to the other, and taking it off all the length of the piece, if possible, then lay it regularly aside, till a bundle of considerable size is formed.

"The point most particularly to be observed in this art is, putting the bark up to dry; which is done by putting the bark upon what is called the lofts or ranges. These are erected by taking forked pieces of the loppings, called horses, the one three feet long, the other two feet six inches, and driving each about four inches into the ground, opposite one another, about two feet asunder in the breadth, and as much betwixt them, lengthways, as will admit long small pieces of wood to be put upon them, and as many of these must be put together as will hold the bark of every day's peeling. These ought to be erected in as dry and elevated a spot as can be found in the margin of the wood or better outside of it. The bark being carried and laid on this loft, with the thick ends of it all laid to the high side of the range, and the small bark laid on to the thickness of about six inches; and the bark taken off the largest of the wood laid regularly on the top, which serves for a covering, and the lofts or ranges having a declivity of about six inches, the rain will run off them readily, and if properly put up in this manner, they will keep out a great deal of rain. After it has lain in this state for three days, if the weather is good and dry, it ought to be all turned over, and the small bark spread out, so as not to allow it to sit together, which, if much pressed, it is apt to do; and if it does so with the natural sap in it, it has a chance of moulding, which is extremely hurtful to the bark, and both lessens it in weight and in value. After the bark has stood on the ranges about eight or ten days, if the weather be good, it may either be put into a house or a shed, or if intended to be put up into a stack, it may now be done." A stack of bark ought never to exceed eight feet in width, and twelve or fifteen feet in height, raised in the middle like a hay-stack. If it is to stand any length of time in the stack, it ought to be thatched, and in that state may remain all winter. The greatest care ought to be taken to preserve the color of the inner parts of the bark, because the color of it is generally looked to as a principal criterion of its value, and the merchant or tanner judges of its value chiefly by its color. Before being put into the stack, the natural sap ought to be dried out of it, in order to prevent its fermenting; because if a fermentation takes place in one part of the stack, it generally goes through and spoils the whole. The same mode of treatment will do for all kinds of bark as well as the oak; but the birch, has an outer or shredy skin upon it, that is of no use, and rejected by the tanner, and, as already observed, must be peeled off.

"When the bark is ready for the tanner, it has to undergo the work of *chopping*, which is done by driving in two or more stakes into the ground, with a fork on the upper end of each, leaving them about two feet six inches from the ground, and laying a long small piece of wood across between the two, where a number of people stand, and the bark is carried and laid down behind them, which they take up into their hands and lay it on the cross tree, and then, with a sharp whittle or bill in the other hand, they cut it into small pieces, about three inches in length; when this is done, it is trampled into bags, which hold about two hundred-weights each, and in these bags it is weighed when sold by the ton, in tons, hundred-weights, quarters, and pounds, and in the above manner delivered to the merchant or tanner." *Forester's Guide*, 199.

1864. *Pollard-trees*, which may be considered in most cases as injurious deformities, are lopped at stated periods like copse-woods, and the lop, whether to be barked or otherwise, is to be treated in all respects like that of copse.

1865. The *period at which trees are felled*, for the sake of their timber, is determined by various causes. By maturity of growth, or where the annual increase is so trifling as to render their standing no longer worth while in point of profit: when wanted for private use or sale; or when defects in the tree, or new arrangements, in its situation, point out the necessity of its removal. "A timbered estate," Marshal observes, "should frequently be gone over by some person of judgment; who, let the price and demand for timber be what they may, ought to mark every tree which wears the appearance of decay. If the demand be brisk and the price high, he ought to go two steps farther, and mark not only such as are full grown, but such also as are near perfection."

"In trees, as in the human species, there are three stages, youth, manhood, and old age. In the period of youth, the growth is rapid; in manhood, that growth is matured; and in old age it begins to decay.

"The most profitable season for *felling timber* is at what may thus be termed the beginning of manhood. After that time, though the tree may appear sound and healthy, its annual increase is so little, that it would be more profitable to cut it down and replant. The number of years that a tree may stand, before it arrives at this period, must vary in different soils and situations; but the period itself may easily be ascertained — by the annual shoots — the state of the bark — and by taking the circumference of the tree at the same place for two or three successive seasons, and comparing the difference. In the view of profiting from timber produce, it is of great consequence to cut down plantations at maturity. Many trees will stand half, others a whole century, after they are full-grown, appear quite healthy, and, at the same time, make little or no increase of timber. But there are particular cases, arising from the nature and state of the markets, where it may even be more profitable to cut timber before it is arrived at a full growth." *Treat. on Count. Res.* ii. 577.

1866. *Preparations for Felling.* It has been strongly recommended to disbark trees a year or more before they are taken down in consequence of the result of certain experiments commenced by Buffon in 1737. In May, of that year, he disbarked three oak trees, forty feet in height, where they stood. In the course of three years they died, and, on cutting them down, the outer wood was found hard and dry, and the internal wood moist and softer. After trying its strength, &c. he concludes, that "timber which has been disbarked and dried while standing, will weigh heavier, and prove stronger than timber cut in its bark." Bosc, and other French authors, (*in Cours d'Agr. comp. &c.* art. *Aubier, Bois, Quercus, &c.*) strongly recommend this practice, which is followed in some places on the continent, and in this country with the oak and larch; but not, as far as we have learned, with any other tree. Monteath finds it by far the most efficient way of seasoning larch timber. He barked some trees in spring, and did not cut them down till autumn, and others stood in the peeled state for two years. After various and extensive trials, he is "decidedly of opinion, that the larch treated in this way at thirty years of age will be found equally durable with a tree cut down at the age of fifty years, and treated in the ordinary way." *Forester's Guide*, 152.

As the dry rot (*Merulius destruens Sow.*) is found to arise in a great measure from want of seasoning, or at least to proceed with the greatest rapidity in timber not well seasoned, this practice seems to deserve adoption in that point of view. *Encyc. Brit. Suppl.* art. *Dry Rot.*

In some parts of the north of Europe, the trees are divested of their bark for one or two feet in height from the ground a year or more previous to that on which they are to be felled. We saw this done in Poland and Lithuania, but though we made diligent enquiry in Sweden, we could not learn distinctly the extent to which it was practised in that country and Norway. It is occasionally practised in both for the ostensible purpose of hardening the soft wood : but also accompanied by a deep incision made for the purpose of extracting tar, a practice obviously injurious to the timber, and therefore generally in these countries kept out of view.

When trees stand close together, a very obvious preparation to felling is lightening the tops of such branches as would do injury in falling to the trees that are to be left, or to other adjoining objects.

1867. The *season of felling* is commonly winter, for timber not to be disbarked; but some for the resinous tribe recommend summer as being the season in which it is generally felled in the north of Europe and in the Alps. But the summer season is there adopted from necessity, as in winter the woods are so filled up with snow that felling is hardly practicable. As the timber of these countries is generally squared for the market; the soft wood is chiefly removed, so that the season of felling does not seem as to them to be of much consequence. Besides, the timber is never so full of sap in summer as it is in spring and autumn, and therefore, next to mid-winter, midsummer may be the next best time for felling all kinds of timber-trees.

Where the trees are disbarked at the base a year or more before felling, the soft wood will be partially hardened; but this practice is by no means general in the north.

J. Knowles, in a recent work on preserving the British navy, the dry-rot, &c. after collecting the opinions of all the ancient and modern authors who have written on felling timber, concludes, that the common notion that trees felled in winter contain less of sap or of the vegetable juices than those cut down at any other season of the year, is not true; and that the method of barking standing trees in spring, and not felling them till the succeeding winter, has not in any way realized the expectations formed of the plan.

After describing all the different modes that have been adopted for seasoning timber, he concludes, that the best mode of seasoning is to "keep it in air, neither very dry nor very moist; and to protect it from the sun and rain by a roof raised sufficiently high over it so as to prevent by this as well as other means, a rapid rush of air. *Inquiry into the Means of preserving the British Navy from Dry-rot, &c. by J. Knowles, Sec. to the Com. of Surveyors*, chap. iii.

1868. The *operation of felling* is performed either by digging an excavation round the stem, and cutting the roots at two or three feet distance from it, or by cutting over the stem at the surface. By the former mode the root is obtained for use, and the ground more effectually cleared and prepared for the roots of other adjoining trees, or whatever crop is to follow. Where the tree is intended to stole, which can very seldom be advisable in the case of cutting full-grown timber, or where there is some nicety in taking it down so as not to injure other trees or adjoining objects, it is cut or sawn over, and the root, if to be removed, dug out afterwards. "In cutting large trees, in order to make the tree fall the way required, enter the cross-cut saw on that side of the tree it is intended to fall, and cut it about a third part through; then enter the saw at the other side, and when it is cut so far as to admit a wedge, place the wedge exactly opposite the way you want the tree to fall, and keep driving it slowly till the tree is nearly cut through." *Monteath.*

The tree being felled, is next divested of its branches, which are sorted into fence-wood, fuel, ton-wood, &c. according to the kind of tree; and the trunk is generally preserved as entire as possible for the purchaser. Sometimes it is cut in two, and the root cut, or butt end, being the most valuable, sold for one class of purposes at a higher price, and the top-cuts for others somewhat lower. Sometimes timber is purchased by private contract by the foot or load in a growing state, or after being cut down; in other cases regular sales are made annually, and the produce exposed for sale by auction. It is measured by the cubic foot, fifty of which are a load; and the calculated tables and "Measurer's Guide" generally resorted to, are those of *Hoppus.*

1869. The *roots of trees* are the last product we shall mention. These should, in almost every case, be effectually eradicated, to aid in which, in the case of very large roots, splitting by wedges, rending by gunpowder (848.), tearing up by the hydrostatic press (211.), or by a common lever and triangle (*fig.* 507.) may be resorted to.

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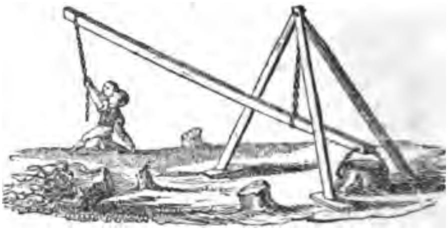

Some compact ash or oak roots are occasionally in demand by smiths, leather-cutters, and others; but in general roots should be reduced to pieces not exceeding three feet long, and six inches in diameter, and put up in stacks not less than three feet every way, but commonly containing two cubic yards. These, when dry, are sold for fuel, or reduced to charcoal on the spot. In eradicating and stacking up coppice woods, it is common to allow a certain sum per stack, something for every acre of ground cleared; and if there are no trees to bark, the allowances are also made for the poles, faggots, &c. so that no part of the operation is performed by day-work.

1870. The usual *method of charring wood* is as follows: " The wood being collected near the place intended for the operation, and cut into billets, generally about three feet in length, the pits or stacks are usually formed in this manner. A spot, adapted to the purpose, of from about fifteen to twenty feet in diameter, of a conical form, is selected, and after being properly levelled, a large billet of wood split across at one end, and pointed at the other, is fixed in the centre of the area, with its pointed extremity in the earth, and two pieces of wood, inserted through the clefts of the other end, forming four right angles; against these cross-pieces, four other billets of wood are placed, one end on the ground, and the other leaning against the angles.

" A number of large and straight billets are afterwards laid on the ground, to form a floor, each being as it were the radius of the circular area; on this floor, a proper quantity of brush or small wood is strewed, to fill up the interstices, when the floor will be complete: and in order to keep the billets in the same position in which they were first arranged, pegs or stumps are driven into the ground, in the circumference of the circle, about a foot distant from one another: upon this floor a stage is built, with billets set upon one end, somewhat inclining towards the central billet, and on the tops of these another floor is laid, in a horizontal direction, but of shorter billets, as the whole is intended, when finished, to form a cone. The whole is then coated over with turf, and the surface generally plastered with a mixture of earth and charcoal dust.

" Previous to the operation of setting fire to the pile, the central billet in the upper stage is drawn out, and pieces of dry combustible wood substituted in its place, to which the fire is applied. Great attention is necessary during the process, in the proper management of the fire, and in immediately covering up the apertures through which the flame obtrudes itself, until the operation be concluded, which is generally effected in the space of two or three days according to circumstances.

" When the charcoal is thought to be sufficiently burnt, which is easily known from the appearance of the smoke, and the flames no longer issuing with impetuosity through the vents; all the apertures are to be closed up very carefully, with a mixture of earth and charcoal dust, which, by excluding all access of the external air, prevents the coals from being any further consumed, and the fire goes out of itself. In this condition it is suffered to remain, till the whole is sufficiently cooled; when the cover is removed, and the charcoal is taken away. If the whole process is skilfully managed, the coals will exactly retain the figure of the pieces of wood: some are said to have been so dexterous, as to char an arrow, without altering even the figure of the feather." *Encyc. Brit.* vol. v. art. *Charcoal.*

" The method of charring wood, for the making of gunpowder, according to an improved system, adopted not many years ago, is however a much more costly operation, though the expence attending it is amply compensated by the superior excellence of the article when manufactured. It is done in iron cylinders, and in so complete a manner, that every particle of the wood is charred. The oily or tarry matter is also preserved, and may, so far as the quantity goes, be made use of instead of foreign tar or pitch. This mode of charring wood for making gunpowder, is carried to the greatest perfection, near Petworth in Sussex, and there is a manufacture of a similar nature near Chester." *Gen. Rep. for Scotland*, vol. ii. p. 332.

1871. The *valuation of trees* forms a distinct profession, and can only be acquired after much experience; like other valuations of property, it depends on a great variety of considerations, some of a general, but the greater part of a local nature. All we shall here attempt, is to give a few general ideas which may be of use to the private cultivator or forester.

In valuing any plantation, the first thing is to know its contents in acres; if this cannot be done, the number of plants must be counted. If a young plantation, the trees of which are unfit for present use as timber, is to be valued, then its value at any distant period, not exceeding twenty or twenty-five years, must be estimated; and whatever sum that estimate amounts to, the present value of that sum will give an idea of the value of the plantation, allowing liberally for accidents to the trees and other unforeseen circumstances. Thus, suppose a plantation of oaks, intended as copse, or actually established as such, to have grown four years, its present value would be next to nothing; but if arrived at its twentieth year, it would fetch fifty pounds per acre. Then the question is, required the present value of fifty pounds, due sixteen years hence, the market price of money being five per cent.? and this, according to any of the modern annuity tables (say *Bailey's*, 4to. 1808. tab. iv.) is 22*l*. 18*s*. This principle is applicable to all kinds of valuing by anticipation; and there is no other mode of valuing applicable to young plantations. The benefits derived from the trees in the way of shelter and ornament, are to be estimated in valuing the territory, and are foreign to the present purpose, which has for its object tree-produce only.

1872. In valuing *saleable trees* of any kind, their number per acre, or their total number by enumeration being ascertained, and the kinds and sizes classed, then each class is to be estimated according to its worth as timber, fence wood, fuel, bark, &c. "In a coppice, wood which cannot readily be measured, the readiest method of counting the stools is, to cause two men to take a line, say about a hundred feet long, or more, and passing the line round as many of the stools as it will inclose, the one man standing still while the other moves round a new number of stools, and count always the stools betwixt the two lines, causing the one man to move the one time with the line, whilst the other man stands still, and so on alternately. The valuator at the same time taking care to average every twenty stools as they go on, before losing sight of the counted stools. This way, too, is a very speedy and sure method of counting the number of trees in any plantation. Or, the stools of a coppice-wood may be counted and averaged by two men going parallel to each other, and the person valuing going betwixt them; the two men putting up marks with moss, or pieces of white paper, on a branch of the stools, the one man going always back by the last laid marks, and the valuator always counting and averaging the stools betwixt the newly-laid and the late-laid marks; counting and averaging the stools always as the men go on, taking only twenty, or even ten stools at a time. To those who have been in the practice of doing this frequently, it will be found very easy, and will be done very speedily, and with a very considerable degree of accuracy. The proper method of learning to do this correctly is, when a person cuts an oak wood for the first time (or, even were the work repeated several times); he should then, in order to make himself perfectly acquainted with ascertaining the average quantity of bark that a stool, or even a stem of a stool will produce, go before the peelers, and select a stool or stem: after having examined it narrowly, he supposes it to produce a certain quantity of bark, and marks this down in his memorandum book. He then causes a person to peel it by itself, dry it, and carefully tie it up, and weigh it, and compare it with the weight he supposed it to produce, and he will at once see how near his calculation comes to the truth.

"A stem of oak from a natural stool, suppose it to measure in girth two inches, by seven feet long, will contain two solid inches and one-third of an inch, according to the measurement of Hoppus. This stem or shoot will produce two pounds two ounces of bark. Again, a stem or shoot of natural oak, measuring four inches in girth, by nine feet in length, will be found to contain one solid foot of wood, and will produce thirteen pounds and a half of bark." *Forester's Guide*, 170.

When growing trees are valued, an allowance is made from their cubic contents for the bark. The rule given by Monteath is, "When the girth or circumference is any thing from twelve inches up to twenty-four inches, then deduct two inches; from twenty-four to thirty-six, three inches; from thirty-six to forty-eight, four inches; from forty-eight to seventy-two, five inches; and above seventy-two, six inches."

"These deductions," he says, "will be found to answer in almost all trees; unless in such as are very old, and have rough and corky barks or barks covered with moss, when an extra allowance is to be made." *Forester's Guide*, 180.

"Many persons," the same author observes, "in valuing measurable oak trees, proceed on the data that every cubic foot of timber will produce a stone (sixteen pounds) of bark. This," he says, "is not always correct;" and he states the following facts from his own experience, with a view to assist beginners in ascertaining the quantity of bark from various trees. "An oak tree, about forty years old, measured down to four inches and a half side of the square, and weighing only the bark peeled off the timber that is measured, without including any of the bark of the spray, &c. every foot of measured timber will produce from nine to eleven pounds of bark. An oak tree, of eighty years old, weighing only the bark peeled off the measurable timber, as above, every foot will produce from ten to thirteen pounds of bark. Every foot of large birch timber, peeled as above, will produce fourteen pounds of bark. Every foot of mountain-ash, as above, will produce eleven pounds and a half of bark. Every foot of the willow, unless a very old tree, will produce from nine to eleven pounds of bark. Every foot of larch fir, not exceeding thirty years old, will produce from seven to nine pounds of bark. The timber of trees, particularly the oak, is peeled out, every branch and shoot, down as small as an inch in circumference." *Forester's Guide*, 189.

The price of timber, like that of every other article in general use, varies with the supply and demand; and is easily ascertained from the timber merchants at the different sea-ports: as is that of bark, charcoal, and fire-wood from the tanners and coal-merchants.

1873. To facilitate *the Measuring of standing Timber*, Monteath has invented a very ingenious machine (*fig.* 508.) It consists of a wheel, or perambulator, about eight inches in diameter, with a bell (*a*) on the end of its axle; at the end of every foot gone over by the serrated circumference of the perambulator, this bell is struck by means of a spring (*b*); the sound of this bell will be heard from the top of the highest tree. A forked handle (*c*) works on the top of the main axle on each side the wheel; one of a set of connecting rods (*e, h*) goes into it, and is fixed with a screw making a swivel joint, and by screwing the nut firm, the wheel can be set to any position, and it will work equally well any way. A small hand (*d*), in the circle of the triangular spring, points to the inches or quarters of an inch on the wheel, and tells what exceeds the inch after a lesser spring (*e*), which strikes at every inch, has struck the bell. The circumference of the wheel (*f*) measures two feet.

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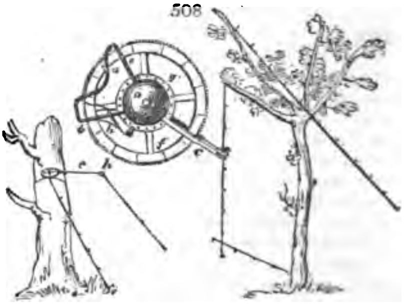

"The rods for working the measuring machine are each three feet long, and one inch in diameter, with connecting screws of brass on each end of them; so that as many as are required for any length or height, can be easily screwed into each other. The other small rods for taking the length of the tree, as also of its branches, are only five-eighths of an inch in diameter; each rod is three feet long, and goes together with connecting screws of brass. The rods are painted black, and divided into feet and inches, with white letters; so that by connecting any number of the rods together that may be required, and by applying them to the tree or branches (*k*), you can take the exact length in a speedy, accurate, and simple manner." *Forester's Guide*, 207.

The value of the invention turns on the use of the wheel, in taking the girth of the tree. Thus, "after having taken the length of the tree in feet and inches, which length may be taken by the rods as already described, the girth is most generally taken at half the length, which girth we are enabled to take with the measuring wheel: this is easily done, by putting up the wheel, with as many of the connecting rods together as will put it up to the height required; then, suppose there are no branches in the way, and having before made a mark on the bark of the tree with the small rods, the uppermost one having a small marking iron in its end for that purpose; this mark is made where the girth is to be taken, and from where you are to take your departure with the wheel, which being done, press the wheel round the tree, following it, and keeping it as level as possible, which the wheel will in a great measure do of itself, by its having teeth like a saw in the hem of the wheel, unless carelessly attended to. As the wheel goes round the tree, be sure to count the number of times the bell strikes, which it does at every foot; and when you see you have not another twelve inches or one foot more to run, to arrive at the place where you took your departure from, count the number of inches that it strikes over and above the last foot, and thus you will at once have the feet and inches that the tree is in circumference; of which take the fourth, and this gives you the side of the square: but when there are branches in the way of getting round the tree, you must have a spare handle for the machine (*e, h*), about two feet, or two feet six inches in length, and by altering the swivel-joint at the top of the first rod to any position required, the person working the wheel by the rods can stand in the same place, and put the wheel, say half way round the tree, if it is very large, and by turning the swivel-joint, and reversing the wheel, at the same time sending it round the other side of the tree till it meet where it left off, and by counting the feet and inches as above, and adding the two together, you will at once have the extreme girth of the tree. When branches are to measure, or when branches are in the way of getting round the tree with the rods, the person with the small rods stands on the opposite side of the tree, and directs the person when to stop with the wheel. Thus, by a little practice in working the wheel, and paying attention to count the feet and inches as they strike, two men will measure growing or standing trees equally as accurately and as expeditiously as if the trees were lying on the ground. In taking the girth with a line, you have first to put it round the tree, then you double it, and apply it to a foot-rule; you then take the half for the side of the square, whereas this machine gives you the exact feet and inches from the top of the highest tree, without the help of any other rule." *Forester's Guide*, 208.

Neither this machine, nor a mechanical dendrometer, invented about twenty years ago, though both of considerable merit, appear to us so well calculated for general use as the *Calibre Timber Measurer*, (*fig.* 70.)

1874. The *Books of Accounts for Trees and Plantations* have already been mentioned (1059). Some have proposed measuring the whole of, or at least all the detached and hedge-row trees on an estate periodically; numbering each tree, and keeping a corresponding register, by which the proprietor, when at a distance, might give directions for cutting down particular trees, &c.; but this appears rather too much in the mercantile style for the dignified enjoyment of landed property, and does not promise any very great advantages.

CHAP. VII.

Of the Formation, Culture, and Management of a Nursery-Garden for the Propagation and Rearing of Trees and Shrubs.

1875. PLANTS of the tree kind are generally procured from the public nurseries, as the plantations of few private land owners are so extensive, or continued through a sufficient number of years to render it worth their while to originate and nurse up their own tree and hedge plants. Exceptions, however, occur in the case of remote situations, and where there are tracts so extensive as to require many years in planting. Besides, as Sang observes, " some are of opinion, that trees, in order to their being rendered sufficiently hardy, should be reared on the soil and situation where they are ultimately to be planted; and if the design be extensive, and such as may require many years for its completion; a conveniently situated nursery is, in that case, highly desirable, not only as saving the carriage of plants, and facilitating the business of transplanting, but as increasing the chance of success, on account of the plants remaining a much shorter time out of the ground than if brought from a distance. If the situation, however, ultimately destined for the trees be cold, high, and bleak, and the soil of course various, some good, and much of it bad, or of an indifferent quality, there it would by no means be advisable to attempt the establishment of a nursery, and especially a nursery to raise plants from seeds. The chief properties of nursery plants intended for transplanting, consist in their strength and cleanness of stem, and in their roots having a multiplicity of healthy fibres; and in order to obtain plants possessing these qualities, it is necessary to sow, and plant out to nurse, if not in rich, at least in mellow earth, and in a moderately sheltered situation." *Plant. Kal.* 20.

The following directions by Sang as to the soil, shelter, aspect, and fencing of a nursery garden are equally applicable to such as are intended for private or commercial purposes:

" In order to have a complete nursery, it should contain *soils* of various qualities, and not less than eighteen inches or two feet deep; the generality of it should be light friable earth; a part of it should be of a clayey nature; and another part should be mossy. Each of these will be found peculiarly useful in the raising of the different kinds of young plants. The whole should be well drained, and trenched, and cropped with vegetables for one or even two years previously to sowing tree seeds. For transplanting, it may be used the first year.

" A nursery may certainly be *over sheltered;* but this is likely to happen only in the case of its being very small; for, if it extend to several acres, unles it be surrounded by very tall trees, the area will be considerably exposed. No part should be either too much exposed, or too much sheltered.

" Any *aspect* from east to west, following the course of the sun, will answer. Ground of an unequal surface is most likely to contain the various soils above mentioned. A nursery should therefore, in general, rise from a level to a pretty smart acclivity; yet no part of it should be too steep, because it is in that case very troublesome to labor.

"The nursery-ground may be sufficiently *fenced* by a stone-wall, or even a hedge six feet high; and if it be of small size, an acre or thereabouts, it will require no other shelter; but if it extend to four or five acres, it must have dividing hedges properly situated, to afford shelter over all the space. The fence, whether of thorns or stone, should be made proof against the admission of hares or rabbits.

"It should be *subdivided* into quarters and borders, of proportionate size to the contents of the area, by walks. The quarters should never be encumbered with large trees, as apples, pears, or the like; because, being already established in the ground, they never fail to rob the young trees of their food, and to cause them to be poor and stunted, unworthy of being planted in the forest.

"It would be very convenient to have a rill of *water* passing through the ground, or to have a small pond, fed by a spring or by a pipe, for the purposes of watering." *Plant. Kal.* 22.

In preparing the soil for the culture of trees it will be advisable to trench it to its full depth, and "necessary," the same author continues, "to give it a good dressing of lime or marl, and dung in compost. Rank manure, such as stable litter, should not be applied to nursery ground, at the time of cropping, with nursery articles; but if it be necessary to enrich it, this should be done by a manured crop of onions, turnips, lettuces, or the like. Potatoes should never go before a crop of seedlings, even of the coarser sorts, as ash, oak, or chestnuts; because potatoes never can be taken clean out of the ground; and it being indispensable to pull up those which rise among the tree seedlings, many of these unavoidably come up along with them. Hence, crops of lettuces, turnips, cabbages, or the like, should rather precede the crop of seedlings. The best kind of management in this particular case, is to interchange the crops of timber trees and esculents occasionally; perhaps, with respect to most sorts of seedling plants, alternately, observing to sow all small seeds, in particular, if not in a rich, at least in a fine tilth." *Plant. Kal.* 24.

"For a *private nursery*," he continues, "no place, certainly, can be more eligible than a field, which may also be occupied as a kitchen-garden. If, for instance, three acres were required for the purposes of nursery, and one or two acres were also required for extra kitchen-ground, or for green crops for cattle feeding, it would be proper to inclose five or six acres, less or more, according to circumstances; by which means, two important objects might be obtained, viz. land of a good quality, and fine tilth, for the raising of seedlings; and an opportunity of effectually changing crops at pleasure. Carrots are peculiarly scourging for a nursery, and, indeed, rather severe for most lands: but we have very seldom found a good crop of trees following one of carrots; while we have found peas, beans, and especially lettuces, easy and enriching crops, well adapted as preparers for succeeding crops of nursery articles.

"In so far as respects *public nurseries*, we have long remarked, that those which are as much market-gardens as nurseries, generally produce the best seedlings, and young articles, for sale; provided that their ground be any thing more than of a middling quality. This fact, if one were wanting, is a sufficient proof of the utility of occupying the ground as above advised, in the double character of a kitchen-garden and nursery.

"In a *cold climate*, or *bleak situation*, with a poor, barren soil, we would by no means advise the raising of seedlings, either in public or private nurseries. It will be found a cheaper, as well as a more satisfactory method, to purchase seedlings, transplant them, and nurse them till fit for final planting; and, even in this case, a piece of the best and most sheltered land in the situation, will be necessary for the purpose." *Plant. Kal.* 26.

1876. A *rotting-ground* will be required for the preparation of certain seeds, by mixing them with sand, ashes, or soil, and leaving them there for different periods, from six months to two years, to rot off their interior coverings. On a small scale, a portion of the compost ground of the kitchen-garden may be used for this purpose. If the scale is large, an area of a few square poles should be set apart for bedding in plants taken up for replanting, or what is called laying in by the heels, or shoughing; this is generally called the *bedding ground*.

1877. If the situation of the nursery be near to the kitchen-garden, and the latter have the proper *office buildings* (707.) no other erection will be required for the nursery than a working-shed for ordinary purposes, occasional shelter, and protection to newly taken-up plants; and for packing or tying them up properly before sending them to their final situation, &c. Frames and hand-glasses may be required for some of the more tender seeds and seedlings; and, on a large scale, a seed-loft and its appendages, as well as an office for writing, &c. may require to be erected apart from those belonging to the kitchen-garden.

1878. The ground being arranged, and prepared by one or more vegetable crops, the next thing is to stock it with stools, or stock plants, to propagate from by layers, and to procure stocks for grafting or budding, but especially in a private forest-tree nursery with tree-seeds. In the tables of ornamental trees and shrubs (1681 to 1694), given in the preceding book; and in the general index at the end of the work will be found the particular mode of propagation, and the requisite soil, for each tree and shrub: by inspecting these sources it will be seen what plants must be procured for stools. If the object is merely forest culture, few, excepting some of limes, poplars, and planes, will be required; but, if tender trees and shrubs are to be reared, the number will be more considerable. Plant the tenderer sorts in the sheltered borders, and the more hardy in the open quarters: the tree kinds may be placed from six to eight feet every way, and the more delicate shrubs from three to six feet apart in suitable soils.

Stocks for grafting, whether for fruit or barren trees, are to be planted in nursery rows according to their kinds; those for inarching round the parent plant (889.), or in pots. (890.)

1879. But the principal objects of culture in a private tree-nursery are the hardy trees and shrubs of the country, which produce seeds; and the great object of the private nursery gardener must be to collect or procure these seeds, prepare them for sowing, sow them in their proper seasons, and transplant and nurse them till fit for final planting. We shall arrange the principal trees and shrubs which ripen their seeds in this country; as cones, nuts, berried stones, berries with small seeds, leguminous seeds, and small soft seeds.

Before treating of the gathering, storing, separating the seeds, sowing, and nursery culture, of each of these general divisions, it is essential to remark, that in collecting every kind of tree-seed, preference should be given to that produced by trees the largest and most perfect of their kind, and to the fullest and best ripened seeds on these trees. The reasons have been too frequently given in this work to require repetition.

1880. *Coniferous Trees.*

Juniperus virginiana, December.
Cupressus thuyoides, January.
— sempervirens, January.
Pinus balsamea, September.
— larix, December.
— canadensis, November.

Pinus sylvestris, November.
— picea, October.
— abies, November.
— nigra, November.
— pinea, December.

Pinus strobus, October.
— pinaster, December.
— cedrus, March.

Shrubs.

Thuya arbor vitæ, November.

Cones may be gathered any time between the ripening season and the following April; but the sooner they are gathered the better, as they supply work for the regular hands of the establishment in bad weather during the winter months; or admit of giving industrious money-making persons work by the job in the winter evenings. The general mode of separating the seeds is by kiln-drying, in the same way as in drying malt, but applying a more gentle heat.

"The cone-kiln is constructed after the manner of a common malt-kiln: the bearers should be about nine feet distant from the fire, and two inches apart. A wire-cloth is spread over them from side to side of the kiln, and the cones are laid on it to the thickness of twelve or fourteen inches. A gentle fire is then applied, and regularly kept up till the cones become opened. During the time of drying, the cones must be frequently turned upon the kiln; and when the seeds begin to drop out, they must be removed to the seed-loft, and sifted till all the seeds which are loose fall out, and be taken from among the cones. The cones are afterwards to be thrashed severely with flails, or passed through a hand-threshing machine, and sifted as before, and so on, till the seeds are taken out as completely as possible.

"It is, however, a safer method to split the larch cones before putting them into the kiln. This operation is performed by a small flat triangular spatula, sharpened at the point, and cutting angles, and helved like a shoemaker's awl. The cone is held by the fore-finger and thumb of the one hand, upon a flat piece of wood, while, with the other, by the splitter, it is split up from the great end; and afterwards each half is split up the middle, which parts the cone into four divisions. This is by far the best and least destructive to the seeds of any method we know; because the cones so split, when exposed to the heat, are suddenly opened, and readily discharge the seeds; which, consequently, are less injured by the fire heat.

"Beside the above method of splitting, there are others. Some people use a cone-mill, which has large sharp teeth in a concave cylinder, and others fixed in a corresponding roller. The mill is wrought by turning the roller by a handle resembling that of common fanners. The cones are let into the mill by a hopper. This instrument is very difficult to work, and bruises the seeds very much; many of which are of course destroyed.

"We have several times made use of the common improved bark-mill, for separating the seeds from larch-fir cones; but the cones are thus so much compressed and bruised, that the seeds suffer exceedingly; and we would by no means advise it: indeed, among all the methods which we have known adopted, to perform the painful and laborious work of extracting the seeds of the larch, the plan of splitting them singly is much the best and safest for the seeds, and ought to be adopted by every one who has occasion to use only small quantities of seed. None of the other kinds of cones require so much labour as the larch, excepting, perhaps, those of the cedar of Lebanon, and black American spruce.

" Cones, which have given out all their seeds, are generally, and very properly, used as fuel for drying other cones. This sort of fuel requires the attention of a very steady feeder: indeed, the most careful and attentive are apt to set the full or drying cones on fire, from the resinous nature, and tendency to flame, of the empty cones used as fuel. Such kilns should, therefore, be erected in situations far removed from a dangerous neighbourhood.

" The cones of Scots pine, the larch, and the spruce, are the principal kinds which are opened by kiln heat. The cones of the silver fir, the balm of Gilead fir, and the Weymouth pine, give out their seeds with very little trouble: indeed, if they be not gathered soon in autumn, and kept from severe drought, they will fall to pieces of their own accord. Seeds of the white American spruce are only procured from warm situations, and from America, and are generally sold in a clean state, or separated from the cones. Cones of the black and red spruce are brought from America, and sold in the state of cones. These should be split, and exposed in a sieve tilted before a gentle fire, with a sheet of paper below the sieve to receive the seeds as they fall out. The seeds should be removed every quarter of an hour; because they are small, and are very easily injured by the heat.

" The cones of cedar of Lebanon should be kept for one year at least, after they are taken from the tree, before the seed be attempted to be taken out. This is necessary, on account of the soft nature of the seeds, and the great quantity of resinous matter which the cones contain when growing, and which is discharged by the keeping.

" The best way to take out the seeds of the cedar, is to split the cones, by driving a sharp conical piece of iron through the heart of them. This work, as well as the taking out of the seeds is greatly facilitated, by steeping the cones in water for a day or two, previous to splitting them. The coats of the leaves should be opened with the hand, and the seeds carefully taken out. The cones of the cedar are brought from the Levant, and may be purchased with safety for seed, although it be several years since they were taken from the tree." *Plant. Kal.* 325.

1881. *Sowing.* April is the best season for all the species; the soil should be in excellent condition, well mellowed by the preceding winter's frost and snow, carefully dug and raked as fine as possible. All the sorts are sown in beds, excepting the cedar of Lebanon and some pines, and the manner of sowing is by *cuffing* or *bedding in*, already described (938.)

The soil for the Scotch pine, before being dug over in February, should be thickly coated with rotted hot-bed dung: the seeds should be sown so as to rise at the distance of a quarter of an inch from one another; and the covering should be half an inch thick. The best preparation for larch seeds is a previous crop of two-years' seedling Scotch pines, and next, a similar crop of the larch. The soil should be dunged and prepared as for the Scotch pine; after sowing the seeds, both of this tree and the Scotch pine, previous to covering them, draw a light roller along the bed, to press the seeds firmly into the earth; then cover a quarter of an inch thick. The larch should rise at the same distance as the Scotch pine; but the seeds being generally more or less injured in separating, many do not come up, and they are therefore sown thicker than the other.

The seeds of the spruce fir are to be treated like those of the Scotch pine; and the balm of Gilead fir seeds, like those of the larch, only the covering should not be less than half, nor more than three quarters of an inch.

The seeds of the silver fir and pinaster require the same sort of treatment as those of the larch. " They must not be sown to rise nearer one another than three in an inch. The covering should be a full inch thick, and performed with great accuracy: for if any of the seeds be left too lightly covered, or if any of them be too deeply covered, they will alike be destroyed." *Plant. Kal.* 332.

The seed of the Weymouth and stone pine may be treated like those of the Scotch pine, but the former covered three quarters of an inch thick, and the latter an inch and a quarter. Sang states, that the only way to get stately trees of these, as of most of the pine tribe, is to sow them where they are to rise into timber.

" The white American spruce seeds are smaller than those of any of the preceding kinds, and therefore require a lighter covering than any of them. One-fifth of an inch is quite sufficient. They should be sown on a piece of fine dry sandy loam, and be covered with earth of rotten leaves of trees to the above thickness, by sifting it upon them." *Plant. Kal.* 333.

" The seeds of black and red American spruce fir are very small and tender. They are still smaller than the seeds of the white American spruce, and therefore require a covering still lighter than mentioned for it. The black and red American spruce should be sown on rich boggy earth, which has been made very fine; and should be covered as lightly as possible. Rich mossy earth, containing a good portion of white sand, answers best. This should be sifted over the seeds with a fine sieve. Neither of these American spruces will allow the roller to pass over them previous to covering. The whole of them should be shaded foom the mid-day sun in the time of coming up, and for some time after, by means of hoops and matting, or spruce-fir branches stuck in the opposite alleys, so as to form an arch over the beds." *Plant. Kalen.* 334.

Cedar of Lebanon seeds should be sown in boxes of light sandy loam; or on a spot of properly-prepared well-sheltered soil, and covered half an inch: the red and white cedar-seeds may be similarly treated, covering a quarter of an inch thick. Arbor-vitæ seeds will come up best under a frame or hand-glass: they should be sown on light sandy soil, and covered a quarter of an inch.

The strictest attention should be paid to the foregoing directions, both in regard to quality of soil, and thickness of covering the seed; for, though resinous trees are extremely hardy when grown up, yet they are all very tender in infancy. The raising regular crops of this tribe is, therefore, justly reckoned the masterpiece of nursery culture in the open ground; and is supposed to be best understood in the northern counties.

1882. *Transplanting.* This tribe benefit less by transplanting than the non-resinous trees; and therefore where circumstances admit, the better plan is, after the seedlings have stood two years in the seed-bed, to remove them where they are finally to remain. The exceptions are those sorts which are transplanted into pots, as the cedars and cypresses, and some of the more delicate pines, which may be kept in the nursing state, in pots, several years, as their roots can be turned out entire.

About the middle of April is the proper time for transplanting all the resinous tribe, excepting the larch; for, as this tree pushes earlier than the others, it should be transplanted in February and March. The first operation common to all seedlings is to loosen the roots of the plants in the seed-bed with a fork, so as, when drawn out by the hand, they may come up with all their fibres entire. The ground, which must be mellow, need not be so rich as for sowing the seeds; being previously prepared, they should be immediately planted in the trench manner (933.) The Scotch pine is generally planted in lines twelve inches apart, and the plants a foot distant in the lines; if intended to remain two years in the lines, they should be placed six inches apart in the line; but they always rise with the best roots, after being only one year transplanted. The spruce and balm of Gilead firs should generally be transplanted at two years; but if weak in the seed-bed, may remain till the third year. They should be planted at the same distances as the Scotch pine, in humid rich earth. The silver fir may be treated in the same manner, but it requires rather more space. If to be nursed only one year, they may be planted in lines nine inches apart, and at six inches distance in the lines; but if to remain two years, then fifteen inches between the lines, and eighteen inches in the line will be necessary. The Weymouth pine should be transplanted at two years into a well pulverized, rich, and sub-humid soil, where it should remain two years before final planting; distance between the lines twelve inches, and from plant to plant eight inches.

The pinaster and stone pine generally rise to well-sized plants the first season after sowing, and should then be transplanted into a rich, well comminuted soil, rather sandy and dry, at nine inches between the lines, and four inches apart in the lines. After remaining there one year, they should be removed to their final situation. Great care is requisite in moving these plants, especially the stone pine, which sends down very long roots.

The white American spruce, after remaining two years in the seed-bed, should be nursed two years in rich sandy and rather dry soil, in lines distant twelve inches, and the plants six inches apart in the lines. The black and red American spruce are much more delicate than the white. After being two years in the seed-bed, they should be planted out in beds of sandy or subpeaty soil, at six inches apart, to stand for one year; at the end of this period, they should be lifted and planted in rows at the same distances as the white American spruce.

The cedar of Lebanon, when one year old, should be lifted and planted in pots of the finest soil; or in lines, at the same distance as the silver fir; after being two years nursed, it should be removed to its final situation, as it never does much good if planted finally at a greater age unless in pots, which is much the best method. The red and white cedars and cypress may remain two years in the seed-bed, and then be treated like the cedar of Lebanon.

The larch may be moved from the seed-bed into the nursing lines, at one or at two years. The soil to receive them should be soft, tender, and prepared by a crop of esculent vegetables with dung the preceding season; but they should never be planted in land newly manured with fresh dung. One year's seedlings, to be nursed one year, should be planted four inches apart in the lines; but if to stand for two years, five inches, and fifteen inches between the lines. The two years' seedlings should be sized, as in the seed-bed they never all rise to the same height; the larger size may be placed six inches apart in the lines, and twelve or fourteen inches between the lines to stand one year; the smaller, at five inches and a foot for standing the same period: they should then be removed to their final situation.

No description of tree-plants receive so much injury from the loss of roots; from the roots being exposed to the air by being kept long out of the soil; or from compression and exclusion of air and moisture by being kept in close bundles, or thick layers, as those of the resinous tribe; they should therefore be finally planted as soon as possible after removal from the nursery; and, indeed, whenever it is practicable, no more should be taken up in one day than can be planted that day or the next. Nor are any plants more easily deprived of the vital principle, by packing and carriage either by sea or land; though, being all evergreens, excepting the larch, they do not readily show it. This has been stated to us, by experienced planters in Wales and other parts of England, as the reason why so few trees are finally produced from the immense numbers of Scotch pine and larch fir annually sent there by the Scotch nurserymen.

Pruning is not required by any of the resinous tribe in the nursery, unless to pinch off a contending leader, or amputate a bruised part of the root or top.

1883. *Trees bearing Nuts, Acorns, Masts, Keys, &c.*

Fraxinus excelsior, November.
Fagus sylvatica, September, October.
— castanea, November.
Æsculus hippo-castanum, October.
Carpinus betulus, November.
Quercus robur, November.

Quercus prinus, November.
— alba, November.
Platanus occidentalis, December.
Acer pseudo-platanus, October.
Juglans regia, September.

Shrubs.
Amygdalus communis, September.
Staphylæa pinnata, October.
— virginiana, October.
Acer communis, & various species, Sept.
Corylus avellana, October.

These being gathered, if circumstances permit, should be immediately sown; but where this cannot be done, or where they are to be sent to a distance, they should be thinly spread in an airy loft till thoroughly dried, when they may be preserved till spring in bags or barrels, or sent off to any distance in these or other packages. When the seeds of the ash, sycamore, platanus, and hornbeam, are only to be kept for the purpose of spring-sowing, the best plan is to take them to the rotting-ground (1876.), mix them with their bulk of dry sand or ashes, spread them in a stratum of ten inches in thickness, in the form of beds, cover with sand to the same thickness, and leave them in that state till wanted for spring-sowing.

1884. *Sowing.* The bedding-in manner (933), or by drills, may be adopted for all the kinds. Acorns, horse and Spanish chestnuts, almonds, and hazel nuts, should be sown in February, in strong loam, in good heart and well comminuted: the seeds should be placed half an inch apart, and covered two inches thick. Walnuts require a similar soil and covering, but should be placed two inches nut from nut. Ash seeds will come up in soil of middling quality, but it should be well dug, and in an open situation, that the plants may not be drawn. Place the seeds half an inch apart, and cover one inch. Sycamore plants when young being liable to be killed by the frost, the seeds should not be sown till the end of March or beginning of April; they should be sown in exposed, dry, sandy soil, an inch apart, and covered one inch in thickness. On rich moist land they will rise so tall and soft, that the extremities of their shoots will not ripen in autumn, and the plants will in consequence be unfit for use. Beech plants, when newly risen, are still more tender than those of the sycamore kind, and therefore should generally be sown in April, but not later than the middle of the month; for if very dry weather set in, they will not rise till the following spring, and so have a great chance of then perishing by the frost. The soil should be tender and rich, previously under a culinary crop with dung; and it should receive a small dressing of well-rotted manure previously to digging for semination. The seeds should lie an inch apart, and be covered a full inch. The best time for sowing the hornbeam is in October; but it may also be sown in February: the soil should be light, but not very rich: the bed form answers best: the seeds should lie half an inch apart, and be covered half an inch in thickness. The plant is seldom raised from seeds; but when this is done, a soft peat earth soil is the best, and the covering should not be more than a quarter of an inch. The seeds of the bladder-nut, if sown as soon as gathered, will come up the following spring; if not, a part will not rise till the second year: sow in light, rich soil, and cover an inch and a half deep.

1885. *Transplanting.* The operations of loosening the plants, sorting them into sizes, and pruning their roots and tops, require to be first performed. As these plants have generally long and strong tap-roots, these require to be cut in the operation of loosening; which, for this purpose, must be performed with a sharp spade, and care taken in thrusting it down, that the root is not cut too high; care should also be taken to preserve uninjured all the lateral fibres. In sorting the plants into two or three sizes, the fractured tap-root of each must be cut smoothly off with a sharp knife, and any side shoots on the stem cut close off. If the plants cannot be immediately planted, they may be *laid in by the heels*, or *shoughed*; that is, thickly bedded in the bedding-ground (1876.) till wanted. Here they may remain in layers not more than three or four inches thick, for a month or two in the winter season; and for a week or two even in February and March. None of the kinds should remain in the seed-bed longer than two years; but in drills they may remain three years; and more especially if the operation of tapping be performed; that is, cutting through their tap-roots about eight inches below the surface. "This is most effectually and readily done by two men with sharp spades; one *rutting* or cutting the ground obliquely with their spades, on each side the line at once, and exactly opposite to each other. After this operation has been performed, the plants should be made firm, by a person treading the rows with a foot on each side. These kinds, so tapped, will, in the course of the following season, in consequence of being thus root-pruned, push many more fibres on the upper part of their roots, than they otherwise would have done; and thus will the plants be better fitted for being transplanted into shallow soils, or indeed into any soil, than they would have been by being allowed to remain in the ground untapped till the time of lifting." *Plant. Kal.* 135.

1886. *Trench planting* is decidedly the best for all plants to be placed in lines; but more especially for ligneous sorts. Dibbing-in is an easier and more rapid mode; but by trench-planting the fibres are spread out and regularly disposed on each side of the main root; whereas, by dibbing, as Sang observes, they are "huddled together into a hole probably not more than an inch and half in diameter." Dibbing, however, may be adopted in the case of such seedling trees as have been robbed of most of their fibrous roots, by being pulled out in thinning beds intended to stand for two years.

The *age* at which most of these sorts should be transplanted is one year; and the soil most desirable for removing them to, is the same as recommended for the seed-bed. The distances between the lines and the plants in the line depend partly on their kinds, but principally on the length of time they are to stand before retransplanting or final removal. The larger-growing broad-leaved sorts, as the chestnuts and walnuts, to stand only one year, should not be nearer than eighteen inches by six inches; and the oak, ash, beech, &c. not nearer than fourteen inches by three inches; if to stand for three years, the interspaces may be two or three inches more: something depends on the openness of the situation, and a good deal on the soil. The judicious nursery gardener will consider all the circumstances, and adopt such variations of the ordinary distances as shall produce plants with well-ripened shoots, and numerous fibrous roots.

1887. *Pruning, Culture, and taking-up for final Planting.* When the plants are to remain two or more years in the nursery lines without removal, dig the ground between the rows in winter. At midsummer cut close off the lower side shoots: some defer this work till winter; but, besides the loss of sap avoided by midsummer pruning, the wounds heal the same season. In taking up for final planting, such plants as have been trench-planted must be loosened on the side which was solid at planting; if they have been in training for several years they should be lifted by throwing out a trench on one side fully to the depth of the roots, and then putting in the spade on the opposite side, so as to get below all the roots.

1888. *Trees with berried Stones.*

Sorbus aucuparia, August.
— domestica, November.
Ilex aquifolium, November.
Pyrus torminalis, November.
— aria, September.
Taxus baccata, November.
Prunus cerasus, July.
— domestica, October.

Shrubs.

Rhamnus alaternus, October.
Rhamnus frangula, September.
— communis, November.
Laurus nobilis, November.
Rosa, various species, October.
Prunus padus, August.
— lusitanica, September.
— virginiana, August.
— spinosa, October.
— canadensis, August.
— laurocerasus, September.
Hedera helix, April.
Daphne laureola, June.
— mezereon, June.
Viburnum tinus, June.
Phillyrea angustifolia, February.
Mespilus oxyacantha, October.
— azarolus, October.
— pyracantha, November.
— amelanchier, November.
Juniperus communis, October.

The whole of these, when gathered, require to be taken to the rotting-ground; mixed with their bulk of dry sand or ashes, laid in beds of ten inches in thickness, and then covered with ten inches of sand, light sandy earth, or ashes. Here some sorts, as the holly, will require to remain two years; the haw, mountain-ash, and yew one year; and the other sorts one winter, or till the following February. During this time the beds of each kind should be uncovered; carefully turned over, and the covering replaced. The advantage of rotting off their exterior covering in heaps rather than in the soil, where they are to germinate, is the saving of ground; for though some of the holly and haw, for example, will come up the next or the second season after sowing; yet, by keeping them one or two years in the rot-heap, we are sure all the seeds will germinate the same spring in which they are committed to the soil. To the above general remarks, the gean forms an exception; for if sown immediately after being gathered in July, it will come up the following spring; but it will keep in the rot-heap a year.

When any of these seeds are to be sent to a distance, instead of being carried to the rot-heap, they are spread thin in lofts, dried and packed in barrels; great care must be taken that they are sufficiently dried, otherwise putrescent fermentation will commence, and the vegetative principle will be destroyed by the heat evolved.

1889. *Sowing.* The season is generally February, and the manner by *bedding-in*, as before. The haw, the most important of this class, should be sown in the lightest, richest land in the nursery; and if not very rich, some dung may be added. Sow in beds three feet four, or three feet six inches apart; the seeds should lie within a fourth of an inch of each other, and be rolled with a roller of fifty or sixty pounds' weight, and exactly the breadth of the bed previously to covering, which should be one inch deep. If the seeds are too moist to admit of drawing a roller over them, beat in the seeds with the back of the spade. This operation of rolling in seeds not only fixes them in their places, so as to admit of applying the covering with greater freedom, but by consolidation is calculated to retain moisture, exclude too much air, and thereby promote germination. Holly and yew seeds should be sown on rich friable soil, shaded by a wall or by wattled hurdles, or other means, from the midday sun. The distance is the same as for haws; they should be rolled, or beat in, and covered not more than half an inch. If previously rotted for two years, they will all come up the following May; but if only one year in the rotting-bed, a part will not come up till the second year: in this case they should be sown thin, as the growing plants will impede the others in breaking through the soil. Mountain-ash seeds require a fine and rather rich soil; the seeds should not lie nearer than an inch, and the covering should be only a quarter of an inch. The gean should be sown, as soon as gathered, in deep sandy loam, the pulp being previously bruised; it need not be very rich, but must be dug deep before sowing: place the seeds an inch apart, and cover three quarters of an inch thick. Gean stones, which have been preserved in the rotting-ground for spring-sowing, will not come up regularly the summer following, but a part will lie till the second spring. The advantage of sowing as soon as gathered, is therefore obvious. Great care should be taken not to sow the cherry for the gean as the former is not nearly so well calculated for a timber tree. The seeds of the common and Portugal laurel, laurel-bay, mezereon, spurge-laurel, phillyrea, and the like, should be sown as soon as gathered, in rich, soft soil, on a dry bottom: the seeds should be an inch apart, and be covered an inch. During the severest weather of winter, it will be advisable to protect them by hoops and mats. The seeds of the service, buckthorn, bird-cherry, and other species of prunus, rhamnus, and mespilus, may be treated like those of the laurel, but will not all require so deep a covering, nor will any of them require protection in winter.

1890. *Transplanting.* What has been advanced on transplanting plants from nuts, keys, &c. will apply here. Most of these species being smaller, will not require so great distances between the rows and plants. All the deciduous sorts may be transplanted in February or early in March; and all the evergreen species from the middle of April to the middle of May, and during the month of August. The greatest care will be requisite in lifting evergreens from the seed-bed, where they have been already once moved, so as not to injure their fibres; and on no account should more be taken up at a time than what can be planted the same day. Select for them the soils most suitable to their natures (1884.), as far as the limits of the nursery will permit; and, in general, rather prefer a shady situation, especially for the holly, yew, and all the laurels. Hollies, having few fibrous roots should be frequently transplanted; but this is not necessary with the yew, which has fibres in greater quantity. In transplanting the deciduous sorts, prefer narrow spaces between the lines, and wider intervals in the rows; to wide rows, and plants crowded in the row. One year's seedling thorns, for instance, to be nursed one year, may stand nine or ten inches by two inches; if for two years, twelve or fourteen inches, by three or three and a half inches.

Pruning, Culture, and Lifting for final Planting. See Nut-bearing trees, &c. (1883.)

1891. *Trees bearing Berries and Capsules with small Seeds.*

Tilia europea, November.
Pyrus communis, October.
— malus, October.

Shrubs.
Berberis vulgaris, September.
Buxus sempervirens, September.

Cornus mascula, October.
— virginiana, October.
Sambucus nigra, September.
— racemosa, September.
— canadensis, September.
Lonicera, various species, August.
Jasminum fruticans, October.

Ligustrum vulgare, October.
Euonymus latifolius, November.
— europæus, November.
Viburnum lantana, September.
— opulus, October.
Ribes grossularoides, September.

As this class of seeds are only wanted in small quantities, the most convenient way of preserving them is in the seed-loft or root cellar in dry sand. They should be frequently turned over to separate the seeds from the pulp and husks, and cleaned by sifting and fanning early in February. For sending to a distance, they are to be treated like berried stones; or they may be separated and cleaned previously to deportation.

1892. *Sowing.* All of them require a soft and rather moist soil, with the exception of the box, which should have a soil rather sandy and dry. They may be sown in February, in beds, and covered not more than a quarter of an inch; and when the seeds first begin to vegetate, it will be an advantage to shade them from the sun, by wattled-hurdles; place them across beds which lie north and south, and along those lying in a direction east and west.

Their *transplanting* and *future culture* are the same as for the foregoing division.

1893. *Trees bearing Leguminous Seeds.*

Cytisus alpinus, October.
Robinea pseudacacia, November.

Shrubs.
Robinia caragana, November.

Colutea arborescens, October.
— cruenta, October.
— pocockii, November.
— media, October.
Coronilla emerus, October.

Cytisus nigricans, September.
— sessilifolius, October.
— austriacus, September.
— tomentosus, September.
— laburnum, October.

These being collected are to be dried thoroughly in an airy loft, and the pods being afterwards threshed or opened, the seeds may be preserved in bags or boxes till spring, or sent to any distance.

The season for sowing all of them is February; the soil should be light, deep, and sandy, and the seeds placed an inch apart, and covered three quarters of an inch thick. This should be particularly attended to in the case of the laburnum, the seeds of which, being generally sure growers, if they rise thick, they lose their leaves about midsummer, become mildewed, and die. Attention should be paid not to intermix the tree laburnum (*C. alpinus*, W. en.) from the shrubby sort.

1894. *Trees bearing small soft Seeds.*

Betula alnus, November.
— alba, October.
Ulmus campestris, June.
— effusa, June.
Populus nigra, May.
— dilatata, May.

Populus tremula, May.
— alba, May.
Salix alba, June.

Shrubs.
Syringa vulgaris, October.

Populus tacamahacca, May.
Cistus, various species, September.
Philadelphus coronarius, October.
Salix pentandra, August.
— babylonica, June.
Rhus cotinus, and other species, July.

All these require to be gathered as soon as ripe, otherwise some are apt to drop out of their capsules, as the alder, birch, and lilac; and others to be blown away and lost, as the elm, poplar, willow, and sumach. They should be gathered perfectly dry, and spread thin in an airy loft, till fit to put up in bags or boxes, for keeping or deportation.

Sowing. Most of the sorts may be sown immediately after being gathered, in which case they will be more certain of germinating; and a number of elms, poplars, and willows, will come up the same autumn. But as protection during winter will, in that case, become requisite, the better way, in general, is to defer sowing till March or April, when all the sorts may be sown in light rich earth, rather moist, and covered not more than half an inch. The principal tree of this class is the broad-leaved elm, which, where intended for two-year seedlings, which, in most cases, is the preferable age for transplanting, should be sown to rise at least two inches apart, as the plants grow with great vigor even the first year.

Their *transplanting* and *future culture* are the same as directed for berried stones, keys, &c.

1895. *Culture common to all the Classes of Tree-Seeds.* New sown seeds of most kinds are greedily devoured by various descriptions of vermin. Mice attack "acorns, sweet chestnuts, hazel-nuts, walnuts, and holly-seeds. They not only eat them on the spot but they carry to their retreats great numbers of the seeds of which they are most fond. The cheapest, and perhaps the most effectual trap for their destruction, is the well-known but neglected fourth figure trap (*fig.* 509.) The new-sown haws and mountain-ash berries are a prey to the chaffinches, green linnets, and other birds. If the quantity sown be not great, the beds may be hooped over, and covered with small-meshed nets. But if a great breadth of ground be sown, it must be constantly watched after sowing. If the watching be vigilantly attended to, for a few days immediately after sowing, the seed will not need much more attention till they begin to break the ground; at which period the watching should be closely and regularly continued. As they are always the strongest and best ripened seeds which rise first; it is, therefore, of much importance to prevent these from being picked up." *Plant. Kalend.* 250.

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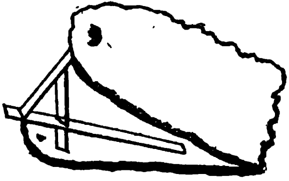

Before the tree seeds come up, a crop of weeds will probably have made their appearance; these are to be removed when young, otherwise drawing out their roots will materially disturb the vegetating seeds. "It not unfrequently happens, that the land in which fir and larch seeds have been sown, becomes battered by heavy rains. This will certainly happen if rain fall immediately after sowing before the surface become dry; but if it once be fully dried after sowing, and before the rain fall, it will seldom or never batter. Suppose, however, the seed-beds are battered, so that the tender seeds cannot rise with freedom, the best way to relieve them is to draw over them a wooden roller, stuck over with lath nails at half an inch distance, and driven in so as to remain half an inch beyond the wood of the roller. The roller should not be more than thirty inches long, and not more than thirty pounds weight. By drawing this roller along the one side of the battered bed, while walking in the alley, and returning with it over the other, an ordinary sized bed will be completely relieved. Some people *rake* their battered beds, in order to enable the seeds to rise. This is a most dangerous and destructive method of relieving vegetating plants. From their tender state, the smallest twist breaks them over, and consequently destroys them. We have experienced much advantage from using the light, armed roller, here recommended. It is, however, much better when no such are required. The surest way to guard against the need of such means, is to work the land when it is in a proper condition, and to sow the seeds in such weather as that the surface after sowing will be fully dry before rain come on. There is no dispensing with this precaution, when it is wished to secure an equal and good crop of seedlings." *Plant. Kal.* 367.

In May the pines and firs will begin to pierce the ground with the husks of the seeds still on their tops, and then watching the birds becomes of the utmost importance; not one ought to be allowed to light on the beds; to prevent which will require unremitting attention from break of day till sunset, for five or six weeks, till the plants are all up, and have thrown off their husks. After the nuts, mast, and haws have come up, they are no longer in danger from mice, but they may be attacked by snails, and grubs of beetles and cockchafers at their roots. These are to be hand-picked.

In June severe droughts very often set in, and these are very prejudicial to small seeds, especially those of the resinous tribe, when rising through the soil. At this time watering and shading may be applied with great advantage, provided the former is accompanied by the latter, and daily attended to from the time it is commenced till rain falls. The best mode of shading is by the wattled hurdle. By the end of July the seedling plants of most sorts will be out of danger, and excepting a few of the tender sorts specified as requiring protection in winter, or by a hand-glass or cold frame, will require no other care but weeding till fit to be transplanted.

1896. The next most general mode of propagating hardy trees and shrubs, is by *layers*. The more common species of forest-trees to which this mode is applicable, are the *Acer Platanoides*, *pseudo-platanus*, *tartaricum*, *dasycarpum*, *opalus*, *negundo*, and other species. *Betula lenta*, *populifolia*, and *rubra*. *Fagus ferruginea*. *Platanus occidentalis* and *orientalis*. *Populus græca*, *monolifera*, and *canescens*. *Tilia alba*, *americana*, *europæa*, and *pubescens*. *Ulmus campestris*, *nemoralis*, and *suberosa*. Some of these, as the poplars and planes, are also propagated by cuttings; but layers make the strongest plants. Whenever seeds can be procured, however, it is best to propagate in that way, as likely to produce the largest trees. The other trees propagated by layers, will be found in the table of ornamental trees already given (1681.), and in the *arboricultural catalogue;* and all the shrubs so propagated in the different tables of ornamental shrubs (1683 to 1694.) The situations and distances for planting stools in the nursery have been already mentioned (1888.); and, as there is nothing peculiar in the operation of layering timber trees or shrubs, we have merely to refer to the general directions as to layers and stools. (889.) The young or preceding year's shoots of all the sorts above enumerated, if layered in autumn or winter, will be fit for being detached and planted in nursery lines by that time twelve-months. They should be transplanted into well comminuted soil, as far as practicable, suitable to the nature of each; the distances should be regulated by the size of the layers and the time they are to be nursed. For ordinary purposes, layers need not be nursed more than two years; but for single trees and ornamental plantations, they should be several times removed, and close pruned, till they have attained six or eight feet in height. Evergreen trees and shrubs, as being more tender than the others, should be layered in March and April, and from August to October. Some sorts root most freely when the wood is in a succulent state; and of such the current year's shoots are laid about midsummer. This is practised with *Stuartia*, *Arbutus*, *Andromeda*, *Kalmia*, *Azalea*, *Magnolia*, *Alaternus*, *Phillyrea*, *Laurus nobilis*, and *sassafras*, *Zanthoxylum*, *Pyrus japonica*, &c. The same practice is adopted with other free growing sorts that it is wished to multiply as rapidly as possible; as the *Rosa*, (1684.) *Hibiscus*, *Lonicera*, *Aristotelia*, *Mespilus*, &c. Layers of the last sorts made during summer from the same year's shoots, will be fit to detach by winter or the following spring; of the other sorts seldom sooner than the second August or autumn; but even then a season is gained, as the layers of those plants made in autumn, generally require to remain two years before they have made sufficient roots. The layers of all evergreens should be removed at the proper seasons, for pruning, laying, or transplanting that tribe; that is, in April and May, and in August and September.

1897. The next most general mode of propagating trees and shrubs, is by *cuttings*, and the common forest-trees generally so multiplied, are as follow: *Platanus occidentalis* and *orientalis*. *Populus angulata*, *balsamifera*, *dilatata*, *græca*, *monolifera*, *nigra*, *pendula*, and *trepida*. *Salix*, all the tree species; and *Sambucus nigra*. These are also propagated by layers, and a few of them by seeds; which last, it should never be forgotten, is by far the best mode where timber trees is the object. The numerous tribe of shrubs propagated by cuttings, will be found in the tables of shrubs already referred to. (1683 to 1694.)

The manner of forming and planting cuttings has been already described. (918.) The seasons for deciduous and evergreen woody plants are the same as for layering; and as in the latter mode of propagation, so in multiplying by cuttings, some sorts succeed best when the current year's wood is taken at midsummer; as for example, *Laurus æstivalis, benzoin* and *sassifras, Bignonia, Euphorbia, Phlomis, Rosa, Santolina,* &c. Cuttings of some of these sorts, made of year-old wood in spring or autumn, require to stand two seasons before they have made sufficient roots to admit of their removal; by midsummer cuttings one year is gained. The same practice may be applied to deciduous sorts; but the plants produced are not so strong as by cuttings of ripened wood. All cuttings require to be planted in a shady situation, and sandy soil, dry at bottom; but kept somewhat moist by occasional watering in dry weather: their lengths are generally made in proportion to the length of the year-old wood, but seldom exceeding six or eight inches. The shoots of some sorts, as poplar, willow, honeysuckle, &c. are divided into several cuttings of this length. An inch of the former year's wood is often preserved in autumn-made cuttings; but this is not essential; as more important points are, making a smooth horizontal section at a bud, and in planting, pressing the earth very firmly to the lower extremity of the cutting. Midsummer cuttings should in almost all cases be covered with hand or bell glasses. The alder, most willows, the Lombardy, and some other poplars, will grow from cuttings or truncheons of several feet long, and of several inches in diameter. "This method is occasionally adopted, when it is requisite to form expeditiously some rough plantation, to serve as a hedge or screen along an outward boundary. Cuttings for this purpose may consist of long, slender rods of one or two year's growth, or as well of large truncheons or stakes from three to six feet in length. Further, the willow, in particular, will increase from large pole-cuttings of from six to ten feet, planted out at once to form either pollard-stems, or be trained into full standards." *Abercrombie.*

The seasons for transplanting straight cuttings into nursery lines, are those already mentioned as the most fit for moving deciduous and evergreen trees, originated by other modes. (1879 & 1882.)

1898. By *Suckers.* A few common trees, and a number of shrubs are propagated by suckers. The timber trees are the *Ailanthus glandulosa, Robinia pseud-acacia, Populus canescens, alba,* and *tremula;* and *Ulmus campestris.* Of hedge-plants, the common sloe and other wild plums, crabs, and pears, are, or may be so propagated. Various shrubs are propagated by suckers. Suckers make better trees than plants raised from cuttings, and also very good hedge-plants. To induce a tree to send up suckers, the horizontal roots may be laid bare, notched in different places, and the earth mixed with sand and replaced; a powerful co-operative would be to cut the tree over by the surface, by which means all the sap would be employed in root-shoots. At the end of one, but sometimes not till the end of the second season, the suckers will be fit to slip off, or to separate by the knife with a part of the parent root attached; they may then be pruned as required, and planted in nursery lines.

1899. One or two forest-trees, and several exotic trees and shrubs are propagated by *grafting, budding,* and *inarching.* The common forest-trees are the *Fraxinus americana, Populus candicans, heterophylla,* and *lævigata. Pyrus Aria, Quercus exoniensis, Ulmus campestris,* and *suberosa.* These, and the ornamental trees and shrubs so propagated, are worked on stocks of the more hardy species of the same or of the next allied genus; and, probably, make as durable plants for timber trees as layers; by which mode the above enumerated sorts are also propagated. The stocks should be at least one year established, previously either to grafting or inarching: the operation for deciduous sorts is performed in spring at the rise of the sap. (911.) Evergreens are almost always inarched either in April, or May, or August. Budding is performed in June and July, and is chiefly used in propagating the rose. (1685.) Some inarched sorts require two seasons before the scion can be detached from the parent plant.

1900. *General Culture* and *Management of a Private Nursery.* There is nothing material to be advanced on this head, but what has been already recurred to in this chapter, or in treating of the general management of the kitchen-garden. The first grand point is so to arrange the rotation of crops, that a crop of culinary vegetables shall intervene between every crop of trees, where that crop remains on the same soil two or more years; and between every two or three crops, where the crop of trees is lifted annually or the second year. The next thing is changing the surface of the soil, as in horticulture (1115.), weeding, stirring the surface, watering, shading, pruning, training, stocking, and protecting. The important points of management are to procure the proper quantities of seeds or stools requisite to produce the quantity of trees to be annually furnished; to proportion the number of plants taken up daily to the number replanted in the nursery or forest the same day, and to attend to general order and neatness.

Chap. VIII.

Arboricultural Catalogue.

Here we mean to enumerate ,and shortly describe the principal timber trees which may be cultivated with advantage as such, in the climate of Britain, and also the most useful plants for hedges. We shall arrange the whole as resinous, hard-wooded, and soft-wooded trees; including in each section the hedge-plants belonging to it, and in the last, the willows proper for osier plantations; the general culture of the trees contained in each of these sections, has been given in chapters III., IV., and VII.

Sect. I. *Resinous or Coniferous Trees.*

1901. These are comprised in three genera belonging to the natural order of *Coniferæ*, J.; viz. *Pinus*, and *Cupressus*, *Monœc. Monad.* L., and *Juniperus*, *Diœc. Monad.*, L. The trees, which are valuable as timber, are comprehended under the genus *Pinus*, which comprises the three subdivisions of pines, larches, and firs. The first is distinguished by fasciculated leaves in different sheaths, but proceeding from the same sheathing base; the second by fasciculated leaves from solitary sheaths; and the third by solitary leaves. The branches of the whole genus are frondose or spreading, and caduceous: those of the pine-tribe spread the least; those of the larch tribe rather droop; and those of the firs are thin and much spread, and are peculiarly frondlike.

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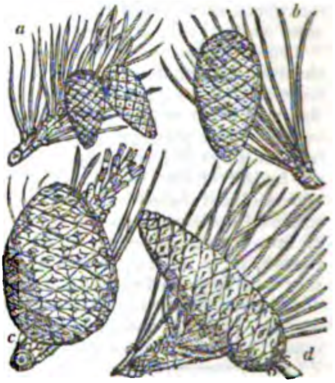

The *Wild* or *Scotch Pine*, erroneously denominated Scots Fir, is the *Pinus sylvestris*, L.; (*Lam. pin.* 1. t. 1.) *Pin*, Fr.; *Keifer* or *Führe*, Ger.; and *Pino*, Ital. (*fig.* 510, *a.*) It is an evergreen sub-conical tree; the foliage inclining to dark blue or gray; shorter and broader than those of the stone-pine (*b*); it is common in most parts of Europe, particularly the northern countries, and is the only species of the genus indigenous to Britain, being a native of Scotland, and naturalized in England and Wales. Under favourable circumstances it attains the height of seventy or eighty feet: it flowers in May, and the cones are fit to gather in December. The finest pine-woods in Britain are at Invercauld, in Invernesshire, and Gordon castle, in Aberdeenshire.

Use. The timber of this tree is the red or yellow deal of the north of Europe, and is the most durable and valuable of any of the genus, unless we except the common larch. The universality of its application is known to every one. The Highland pine, Sang states to be not inferior to any imported, either in cleanness or durability, when it has been grown on a proper soil, and to a sufficient age. "But the planted Lowland pine," he adds, "is seldom applied to offices higher than that of roofing sheds or huts, lining of carts, lathing, or making of packing-boxes; while the natural or self-sown is fit for the finest purposes." Pontey considers the English-grown wild-pine, if properly pruned and grown to a sufficient age, as likely to equal that of foreign growth. The tree is of great value as a nurse-plant; being next to the common birch and bastard mountain-ash, or mountain-sorb, (*Pyrus hybrida*,) the most hardy timber-tree. Among its minor uses we shall only mention the production of tar by incision.

Varieties. Of these, several have been noticed by botanists, and some consider the *P. maritima* (*sp. Wild.*) as nothing more. According to Sang, the variety commonly cultivated is least worth the trouble. "The *P. sylvestris var. montana*," he says, "is the variety which yields the red wood: even young trees of this sort are said to become red in their wood, and full of resin very soon. The late distinguished G. Don of Forfar, exhibited specimens of cones of each variety to the Highland Society of

Scotland, and likewise to the Caledonian Horticultural Society. The variety preferred by G. Don, is distinguished by the disposition of its branches, which are remarkable for their horizontal direction, and for a tendency to bend downwards close by the trunk. The leaves are broader and shorter than in the common kind, and are distinguishable at a distance by their much lighter and beautiful glaucous appearance. The bark of the trunk is smoother than in the common kind. The cones are thicker, and not so much pointed. The plant is more hardy than the common sort, grows freely in almost any soil or situation, and quickly arrives at a considerable size." Sang says he has seen trees of this variety at Caristoun and Brechin castle: and it is much to be wished that he or some other competent nurseryman, in that quarter, would collect the seeds, and propagate it extensively.

Thouin (*Notes sur le Culture de Pins*, 8vo. 1819,) mentions a variety, which he calls *P. syl. var. pin de riga*, as affording the best timber. Whether the pine which forms the extensive plantations along the sea coast at Bourdeaux, and is called by foreign authors, *Pinus maritima*, be a variety of *P. sylvestris* or a distinct species, does not appear to be ascertained. The plant is tender, and easily killed by frost when young; but its timber is said to be of excellent quality. *Radcliff's Flanders*, 250.

Soil and Native Site. "This tree is naturally the inhabitant of mountainous districts, and of rocky, gravelly, or poor sandy soils, where its timber becomes most valuable and durable. On the sides of mountains, in dells and hollows, among stones and rocks, beside rapid rivulets or mountain torrents, it is found in high perfection; and if it stand single, it is of great beauty. In many parts of the Scots Highlands, where the soils are extremely various, and much mixed, the Scots pine has arrived at a good size, and often attained remarkable dimensions. In any kind of soil from a sandy to a clay, provided the substratum be rubble or rock, it will grow and flourish; but in wet, tilly soils, it ought never to be planted; because whenever the roots have exhausted the turf or upper soil, and begin to perforate the sub-soil, the tree languishes and dies." *Plant. Kal.* 65.

Insects. The larva of *Noctua Pinastri*, L., (*Xylena*, Hüb.) are deposited in the leading buds, and often perforate the young shoots, and leave the tree without a leader. The *aphis pini* infests the tender shoots; and various *Dermestidæ* live in the bark, and perforate the soft wood.

The *Pitch* or *Red Canadian Pine*, *P. resinosa*, (*Lam. pin.* 20. t. 4.) is an American tree, introduced in 1756, not unlike the Scotch pine, and "receives its name from the color of the bark. From the high geographical range of this pine, it is well adapted to associate with the *P. sylvestris*. It has been imported in the form of masts into this country. Like the *P. sylvestris*, it affords an inferior timber on a damp and unsuitable soil." *Caled. Hort. Mem.* ii. 367.

1902. The *Pinaster* or *Cluster Pine*, *P. Pinaster*, L. (*Lam. pin.* 9. *t.* 5.) (*fig.* 510, *b.*) grows to the height of fifty or sixty feet, with broader, thicker, and longer leaves than the common pine (*a*): the branches are also farther apart, and grow more horizontal than in that tree. As the tree advances in age it becomes naked and unsightly below; but the top grows highly picturesque, and may readily be distinguished in the landscapes of the Roman and Florentine painters. It grows naturally on the mountains of Italy and the south of France; in Switzerland it is cut into shingles for covering their houses, and also for making pitch. It flowers in April and May, and the cones are fit to be gathered in December. It was introduced in 1596, but never much cultivated, being less hardy and much less valuable as a timber tree than the common pine. It is very picturesque, and well merits culture in that point of view. There are some large specimens at Culzean-castle, on the sea-coast of Ayrshire.

1903. The *Stone Pine*, *P. Pinea*, (*Lam. pin.* 11. *t.* 6, 7, 8.) (*fig.* 510, *c.*) grows to a considerable height, with a straight stem and rough bark. The leaves are not quite so long as those of the pinaster, and are of a greyish or sea-green color. The cones are five inches in length, round, thick, and obtuse; the kernels are large, and frequently served up in desserts during the winter season in Italy and the south of France, and they are also much relished by the Chinese, for the same purpose. It is a native of the south of Europe; very common about Ravenna, and forming a distinguishing ornament of the villas of Rome and Florence. It was introduced here in 1570; but as the wood is not so resinous as most of the other sorts, it has been only cultivated for ornament.

1904. The *Swamp, Georgia, Pitch*, or *Long-leaved Pine*, *P. Palustris*, (*Lam. pin.* 27. *t.* 20.) (*fig.* 510, *d.*) is a valuable and a lofty tree in America, affording planks, which, imported into this country, are valued 20 per cent. higher than any other American timber, excepting the black larch. The leaves are a foot or more in length, produced in tufts at the ends of the branches, and having a singular appearance. It grows in a warmer climate than most other pines; and if it were found to produce equally valuable timber in the low warm situations of England, which it does in America, it would be a most valuable tree. It was introduced in 1730, but has been very little cultivated.

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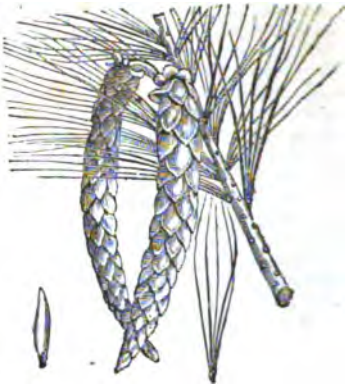

1905. The *Weymouth* or *New England Larch*, commonly called Weymouth pine, *P. Strobus*, (*Lam. pin.* 31. *t.* 22.) (*fig.* 511.) forms the connecting link between the pine and larch tribe. It is one of the tallest of the genus, attaining in America the height of 100 feet and upwards. The bark is smooth and delicate, and the leaves soft and of a bluish green. Vast quantities of the timber, under the name of the white-pine, are imported from America; but the tree seems to be of so delicate a habit, as to prevent our expecting it ever to become a large or valuable tree with us, especially in exposed situations. It was introduced in 1705, and has been a good deal cultivated, having formerly been supposed the most valuable tree of the genus, next to the common pine. The largest specimens are at Mersham-hatch, Sir E. Knatchbull's seat in Kent, and at Whitton-park in Middlesex.

1906. The *Cedar Larch*, or *Cedar of Lebanon*, is the *P. Cedrus*, L. (*Lam. pin.* 59. *t.* 37.) *Cedre*, Fr.; *Cederbaum*, Ger.; and *Cedro*, Ital. It is distinguished from all other trees of the genus by its strong ramose branches, which, in some cases, deviate from the common character, and become irregular in shape, and permanent in duration. The general character of the shoot, even when the tree is young, is singularly bold and picturesque, and quite peculiar to the species. The tree is a native of the coldest part of the mountains of Libanus, Amanus, and Taurus; but is not now to be found in those places in great numbers. Maundrell, in his journey from Aleppo to Jerusalem in 1696, could reckon only sixteen large trees, though many small ones: one of the largest was twelve yards six inches in girth, and yet sound; and thirty-seven yards in the spread of its boughs.

The forest of Libanus never seems to have recovered the havoc made by Solomon's forty score thousand hewers; so that we have now, as Professor Martyn observes, probably more cedars in England than there is in Palestine. The tree is supposed to have been introduced here in 1683. The oldest specimens are two in Chelsea-garden; but there are more magnificent ones at Whitton-park, Zion-house, Pains-hill, Warwick-castle, and other places.

Use. The tree has been very generally planted for ornament, and from its branchy head, and its aversion to pruning, it is not likely ever to become a valuable timber-tree in this country. When planted for that purpose, it should, as Sang recommends, be sown in groves, and thus drawn up with few branches by proximity. Much has been said of the timber which borders on the miraculous; as far as experience has gone, it is greatly inferior to that of the common larch, or the wild pine. Its great use is as a single tree in lawns, where it combines beauty and singularity in a degree not to be found in any other tree. It has also an excellent effect in the margin of plantations, and one or two plants will give force and character to the dullest front of round-headed trees, and effect a great deal even in the fronts and sky outlines of plantations with spiry tops. (1824.)

1907. The *Common Larch* is the *P. Larix*, L. (*Lam. pin.* 53. 35.) *Larix*, or *Melese*, Fr.; *Lerchenbaum*, Ger.; and *Laricio*, Ital. It is the only species of the genus, the leaves of which are deciduous: it rises to eighty or a hundred feet high, forming a narrow cone of small white-barked caduceous, pendulous branches, with delicate drooping spray. It is a native of the Alpine mountains, on the north sides of which, in hollows and chasms, it attains to its greatest height and thickness, and most durable timber. In returning from Italy, by the Simplon, the silver fir will be found in great perfection in the Hollows on the south side; the common Scotch pine on the summit, and the larch in descending to the Vallais.

It appears to have been cultivated by Parkinson in 1629; and Evelyn, in 1664, speaks of a tree of good stature, "not long since to be seen at Chelmsford, in Essex, (also mentioned by Harte,) which sufficiently reproaches our not cultivating so useful a material for many purposes." Harte, in his excellent essays, published in 1715, gives a figure of the larch, and strongly recommends its culture. It was first introduced into Scotland by Lord Kaimes in 1734, (*Lam. pin.* t. 35.) and afterwards in 1741, planted by the Duke of Athol at Dunkeld, and these last trees have prospered so astonishingly, and the timber produced from such as have been cut down, has so fully answered all the eulogiums that had been bestowed on it, that the larch is now considered, on the whole, as decidedly the most valuable timber-tree, not even excepting the oak.

Some of the first-planted larches in the low grounds, near Dunkeld, have grown to the height of one hundred and twenty feet in fifty years, which gives an average of two feet four and a quarter inches a year. It is stated by the Duke of Athol, in a communication to the Horticultural Society, made in June, 1820, that on mountainous tracts, at an elevation of fifteen or sixteen hundred feet, the larch, at eighty years of age, has arrived at a size to produce six loads (300 cubic feet) of timber, appearing in durability and every other quality, to be likely to answer every purpose, both by sea and land. *Hort. Trans.* iv. 416.

Professor Martyn (Miller's Dict. *in loco*) has brought together a mass of valuable information respecting the history of the larch in this country, and its uses in others. That singularly accomplished agricultural writer, Dr. Anderson, did much to promote its increase by his essays and other works from 1750 to 1790; and subsequently the Bishop of Landaff, Marshal, Nicol, Pontey, and Sang, have each, in practice, and by their popular publications, contributed to spread the tree, and now several millions are annually planted in the mountainous districts of the empire. The larch, Sang observes, passes all other timber-trees, for the first ten or twenty years after planting, and will arrive at a timber size in almost any situation or soil. It bears, he says, "the ascendancy over the Scots pine in the following important circumstances: that it brings double the price, at least, per measurable foot; that it will arrive at a useful timber size in one-half or a third part of the time, in general, which the fir requires; and, above all, that the timber of the larch, at thirty or forty years old, when placed in soil and climate adapted to the production of perfect timber, is in every respect superior in quality to that of the fir at a hundred years old. In short, it is probable that the larch will supersede the Scots pine in most situations in this island, at no very distant period." The finest specimens of this tree are at Dunkeld, Blair, and Monzie, in Perthshire.

Use. Much has been said of the durability of larch timber in Italy: its resistance to fire, according to some (Matthiolus), and its great combustibility, according to others (Duhamel); its durability under water at Venice; and its not being liable to warp (Harte). We shall confine ourselves to its uses as experimentally proved in Britain; and perhaps we shall do this with most effect by stating that it may be used for all the purposes for which the best foreign deal is applied; for many of those of the oak; and that it is more durable than any other timber when placed in a situation between wet and dry, especially if the bark be not removed, it being still more incorruptible than the wood. The bark is also of considerable value in tanning; a circumstance of great importance, since it is found that disbarking a year or more previously to felling is the best mode of seasoning the timber, and preventing it from warping, or being attacked by the dry or wet rot (1866.) One property almost peculiar to the larch is, that the timber is exceedingly valuable at every period of its growth; so that a dead-hedge of larch boughs, or a hurdle wattled with larch spray, will last longer than dead-hedges or wattled-hurdles of any other species of tree. Planted in rows in exposed gardens it forms a useful hedge-plant in point of shelter; but in this respect is deficient as a fence, and gets soon naked below. Rods, stakes, pales, rails, posts, and especially gate-posts, of this tree, are therefore more valuable than of any other; the spruce-fir approaching the nearest to it in these respects. Turpentine is extracted from it in the Tyrol; but that being always injurious to the timber, can never be recommended for adoption in this country: it is also peculiarly valuable as a nursing-tree.

Varieties or Species. Of the *P. larix*, there is a variety with red and another with white flowers, one with cinereous bark, called the Russian larch, and one with pendulous branches. There is also the black larch (*P. pendula*), and red larch (*P. microcarpa*), natives of America, by some considered distinct species; the timber of both of which is said to be harder than that of the common white larch. As these trees are only to be met with in the nurseries, originated by layers, they cannot be recommended to be planted as timber-trees. There are, however, a few large specimens at Dunkeld and other places; and from these the trees will probably soon be propagated by seed, and a practical estimate be formed of their merits. There are some trees of the red larch on the Athol estates, but they do not contain one-third as many cubic feet of timber as the white larch at the same age. The wood is so ponderous that it will scarcely swim on water. *Hort. Trans.* iv. 416.

Soil and Site. The larch will grow and attain a large size in every soil and situation, excepting in standing water; but a certain elevation of surface, or coldness of climate, and inferiority of soil, is absolutely necessary to produce the timber in perfection. The quality of the timber of all trees is more or less affected by climate and soil; but that of the resinous tribe particularly so. We pointed out several instances in 1806, (*Treatise on Country Residences,* ii.) Sang mentions a number as having occurred since 1812, (*Plant. Kal.* 59.) and observes generally that he has "known it in several places make the most rapid progress for 30 or 35 years, and though there was no external signs of disorder, yet, when it was felled, the wood had begun to rot in the hearts of the trees; so that there was scarcely a sound tree over a large extent of ground; yet here, the oak, the chestnut, the elm, and the ash, amongst which the larch had been used as a nurse, are not only in the utmost vigor, but their wood is perfectly sound. Some larches in a similar soil and situation had attained seven feet each, and were quite hollow a good way upwards."

Insects. The *Coccus larixea*, and the others mentioned as inhabiting the common pine.

1908. The *Norway Fir* or *Common Spruce Fir*, *P. Abies*, L. (*Lam. Pin.* 73. t. 25.) *Sapin*, Fr.; *Fichte*, or *Tanne*, Ger.; and *Abiete*, Ital.; is the first species of that section of pinus in which the leaves are solitary. It is one of the tallest of European trees, attaining from 100 to 150 feet in height, with a very straight but not thick trunk, and throwing out its spreading frond-like branches so as to form an elegant narrow cone of vivid green. It is a native of the north of Europe, and particularly abundant, as the name imports, in Norway: its timber being the white deal received from that country and the Baltic. It is supposed to have been introduced about 1548, and has been, and still is, more cultivated than any species of the genus, excepting the common pine and the larch. Some of the finest specimens are in Harefield park, at Blenheim, and at Temple Newsham.

Use. The timber is inferior to that of the common pine in durability and bulk; and being often knotty, is not proportionally strong for horizontal bearings with that timber. White Norway deal, however, is used for a great variety of purposes in building; and the entire trees are more prized than any other for masts for small craft, for spars both for marine purposes and on land. What constitutes the value of this fir is, that its timber is equally durable at any age, like that of the larch; and what renders it peculiarly adapted for masts, spars, scaffolding, poles, &c. is its habit of almost in every case, whether standing single or detached, growing perfectly erect and straight. The tree may be cut for rods, stakes, and scythe or other implement handles, when the trunk at the base is not more than two inches in diameter, and the bark being kept on it, it will prove almost as durable as the larch. Pontey says, that poles of spruce are so far inferior to those of the larch, that they are more apt to crack when exposed whole to the influence of the sun and air; but in all other respects it is nearly equal to it, and in straightness surpasses it. The tree is peculiarly valuable as a nurse, from being evergreen, and closely covered with branches, by which radiating heat is retained; from its conical shape and rigid stem, by which it does not suffocate or whip the adjoining trees; from its being valuable at whatever age it is thinned out; and from its being an excellent shelter for the most valuable game. It will not, however, grow in situations where the common pine and larch will flourish. It is also an excellent hedge-plant for shelter, but is deficient in point of defence and durability. By incision, it yields a resin, from which, by various preparations, turpentine and Burgundy pitch is formed. The tops or sprouts (*spruytsen*, Ger.) give the flavor to what is called spruce-beer.

Varieties and Species. Linnæus has five varieties of *P. abies*; but the principal are, the white *P. alba*, (*Lam. Pin.* 39. t. 26.); the red *P. rubra*, (*Lam. Pin.* 43. t. 28.); and the black *P. nigra*, (*Lam. Pin.* 41. t. 27.) These are all natives of N. America, and their timber, which is white, possesses nearly the same properties as that of the European species. The white spruce rises only to 40 or 45 feet, with pale bluish-green leaves. The black spruce is reckoned the most durable of the tribe. "In America, the black spruce is used for knees in ship-building, where neither oak nor black larch can be easily obtained: these knees are not prepared from two diverging branches, as in the oak; but from a portion of the base of the trunk connected with one of the largest diverging roots. The timber of the red is universally preferred throughout the United States for sail-yards, and indeed imported for this purpose into Liverpool from Nova Scotia, where it is also used for constructing casks for salted fish. It is chiefly from the decoction in water of young shoots of the black, and not exclusively from those of the white spruce, as supposed by Lambert, that the celebrated beer is prepared by fermentation, with a due proportion of sugar or molasses. The essence of spruce of the dealers is prepared by evaporating this decoction to the consistence of honey."

Soil and Site. Pontey says it grows rapidly on every description of soil, from a very stiff loam, and such as possess a very considerable degree of humidity, to a very dry sand, provided the situation be not very much exposed. Sang says it luxuriates much in deep, low situations: in shallow soils and exposed places it never succeeds. It "should never be planted for the sake of its wood, excepting in masses or groves by itself; otherwise its timber is so coarse and knotty, that it is hardly worth working:

but in the mass way, if planted thick, and properly pruned and thinned afterwards, it may be trained to tall clean timber."

Insects. The *Coccus abietes*, and occasionally the others which infest the common pine.

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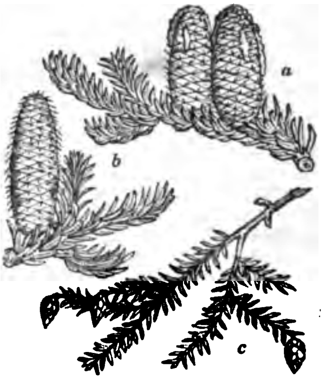

1909. The *Silver Fir, P. Picea, (Lam. Pin.* 46. t. 30.) (*fig* 512, *a.*) is a lofty evergreen tree, forming a cone broader at the base, in proportion to its height, than the spruce, and displaying a more stable and majestic figure than any of the other firs. It is more thinly covered with frond-like branches than the spruce, and differs from it also in regard to the frondlets, which, when they grow old, and begin to decay, do not droop down as in that tree, but remain rigid till the last. The upper surface of the leaves is of a fine vivid green, and their under surface has two white lines running lengthwise on each side of the midrib, giving the leaves that silvery look, whence has arisen the name. It flowers in May, and the cones are ripe in December. It is a native of the Alps and Germany, was known here in 1603, and has been a good deal planted as an ornamental tree. It grows faster for the first twenty or thirty years of its growth than any other tree of the genus, excepting the larch. Some of the finest specimens in England are at Woburn, in the evergreen drive, planted by Miller. The tree called the grand silver-fir there, measured, in 1810, nine feet ten inches in diameter, at four feet from the ground; it has a clean pruned stem of seventy-five feet, and the estimated height is upwards of 110 feet.

Use. The timber is reckoned inferior to that of the common pine, and is not of much value till of forty or fifty years growth. According to Sang, though till of late years planted only as an ornamental tree, " yet there is, perhaps, none of the genus more worthy of cultivation for the sake of its timber." It is more prolific in resinous matter than any of the fir kind.

Its *Soil and Site* are nearly similar to those most desirable for the common spruce; but it requires a climate rather milder, and a more loamy earth. On poor sands, where the common pine and larch will thrive, it dies off in a year or two after planting. None of the genus are more majestic on a lawn; but its characteristic, or natural situation, is in dells, and on the sides of sheltered rocky steeps.

1910. The *Balm of Gilead Fir, P. Balsamea, (Lam. Pin.* 48. t. 31.) (*fig.* 512, *b.*) is an American tree of much smaller stature, and more delicate habits than the silver-fir. Its timber is of little value; nor can the tree be reckoned very ornamental, though frequently planted for the sake of variety. The balm or resin procured from it possesses no medical properties superior to those of common turpentine; but the tree during summer sends out a pleasing terebinthinate odor.

The *Hemlock Spruce,* or *Hemlock Fir, P. Canadensis, (Lam. Pin.* 50. t. 32.) (*fig.* 512, *c.*) is a drooping, low, evergreen tree, which may be considered as entirely ornamental.

Sect. II. *Hard-wooded non-resinous Trees.*

Of these we shall give a few descriptive traits of the principal species; the most important of which are the oak, ash, elm, chestnut, and beech.

1911. The *Oak* is the *Quercus,* L., *Monæc. Polyand.* L., and *Amentaceæ,* J. *Chêne,* Fr.; *Eich,* Ger.; and *Querec,* Ital. The following species and varieties are planted for their timber.

The *Common Oak, Q. robur, (Eng. Bot.* 1845.) a native of Britain. It grows to the height of fifty or sixty feet when in a heavy loam; flowers in April, and ripens its acorns in October and November.

The most valuable variety of the common oak is said (*Caled. Hort. Mem.* iii. 376.) to be the *pedunculata* (*Eng. Bot.* 1342.), or the stalk fruited; by some considered a distinct species. It is distinguished from *Q. robur* by the marked circumstance of the acorns being placed on long fruit-stalks, whilst those of the *robur* are nearly sessile. Besides, the superior utility and hardiness of the timber, the pedunculated oak is, in fact, the most magnificent of the two British sorts. Miller says, this variety of the *Q. robur,* (and which he calls the *fœmina,*) is more rare than the sessile-fruited; but Professor Martyn says, this is not the case, and that the pedunculated is equally general as the other. It is observed by Du Hamel, that oaks in forests being propagated from the acorn, there are so many varieties that it is difficult to find two resembling each other in every respect. Professor Martyn observes, that the figures in ancient authors have the fruit uniformly on foot-stalks, which shows that that variety had been most common: and Ray considers it as the common oak of England. *Du Roi* affirms, that the timber of the sessile-fruited is reddish, and brittle, whilst that of the stalk-fruited is whitish and hard. From these, and various accounts, as well as our own observation, we consider ourselves justified in recommending to nurserymen and others, who gather acorns for seeds, to take effectual precautions that only the stalked sort be gathered.

1912. The *Turkey Oak, Q. cerris,* (*Du Roi,* 2 t. 5. f. 1.) a native of the south of Europe, introduced in 1735. This species is distinguished by oblong, pointed, and frequently lyrate leaves, jagged, and a little hoary on the under side. The acorns are small, and have rough, prickly cups. The tree grows from forty to sixty feet high.

There are several varieties, but the best is that called the Devonshire or Luccombe, from the name of the person who raised it from seeds, saved from a tree of the Turkey-oak grown in Devonshire.

There are about forty species of exotic oaks introduced in this country, which may be considered as timber trees, and are such in effect, in their native countries. Of these, the greater part are natives of America; and it has been recommended, (*Caled. Mem.* iii. 378.) to cultivate the *Q. tinctoria* or *Quercitron* on account of its bark, which affords a valuable yellow die. All these species, however, are either too tender, or too scarce, or too dwarfish, and slow-growing, to warrant us in considering any other than the *common* and *Luccombe* oaks, as fit for the purposes of profitable planting.

Use. The oak cannot be considered so valuable a tree for general purposes as the common pine and larch; but its great strength and durability will probably long maintain its superiority in Europe, and the other temperate regions of the globe, as a material for naval architecture. The timber is useful at every age, and more durable when of small diameter than that of any other of the hard woods; the value of the bark of young trees is greater than that of such as are old.

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Soil and Site. It grows best in a deep clayey loam, not beyond a moderate elevation above the sea; but it will grow in any soil not marshy, not attaining, however, a large size in poor sands or at a considerable elevation.

Insects. The *Egger Moth* (*Phalena Quercus,* L., *Lasiocampa Leach,*) (*fig.* 513.) inhabits all the species, and its larvæ sometimes denude entire branches.

The *Small Gnat, Cynips Quercus folii,* (*Diplalepis,* Leach,) (*fig.* 514.) pierces the leaves with its sting, and deposits its eggs in the wound; the extravasated juices rise round it, and form a gall, which becomes hard, and in this the larva lives and feeds, and changes to a pupa. The oak galls of commerce are so formed: the best are imported from Turkey and Greece.

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1913. The *Ash* is the *Fraxinus,* L., *Polygam. Diœc.* L., and *Oleinæ,* B. P. *Frêne,* Fr.; *Asche,* Ger.; and *Frassino,* Ital. There are two species which may be considered as forest-trees.

The *Common Ash, F. excelsior,* L. (*Eng. Bot.* 1692.) is a native of Britain, and grows from sixty to eighty feet in height, with a straight stem. It has pinnate leaves, which come out late in spring, generally from April 22d to May the 15th, and fall early in autumn; it flowers in April and May, and the female and hermaphrodite plants ripen their seeds or keys in November. Of this there is a variety, the simple-leaved, *simplicifolia,* possessing no advantages as a timber-tree, and rather to be avoided by the profitable planter, as generally propagated in the nurseries by layers. Raised from seeds it produces pinnate leaves.

1914. The *White* or *American Ash, F. Americana,* W. (*Mich. Arb.*) This is a lofty tree like the other, distinguished by the whiteness of its bark, narrower leaves, and smaller seeds. It is found in Jersey and Pennsylvania, where it attains the height of eighty feet, with about three feet in diameter at the base. It is patient of cold, thrives in deep fresh soil, by the banks of rivers, and unites all the good properties of the common ash.

There are two varieties, the *red* and *blue*: by some accounted distinct species. They are smaller trees, and present no advantages to the profitable planter over the two species mentioned.

Use. The ash is unquestionably the most valuable indigenous timber next to the oak; and in some places, as copse, is more valuable than that tree. It is more especially used by the coachmaker and agricultural carpenter. The wood is useful when the stem is only three inches in diameter. Toughness and elasticity seems to be its characteristics, and for this purpose, the faster the tree grows the better. Timber from a tree of slow growth, and considerable age, is uniformly found to be more or less brittle, and therefore more or less unfitted for the purposes to which this tree is applied, especially shafts or poles of carriages. As underwood, it is fit to cut every seven years for crate-ware for the potteries, hoops, and hop-poles, requiring for those products little or no thinning or culture, but merely periodical cutting. It forms excellent fuel; burning when green or new better than any other tree. "A few ash pollards," Professor Martyn observes, "will produce many loads of lop, which makes the sweetest of all fires." The ashes afford more potash than those of most trees; and the bark is used occasionally for tanning, and will dye yellow.

Soil and Site. It will not thrive on thin soils, where the bottom is wet, nor in mossy earth or gravel; but in most others it will do well; and above all, in a hollow, where a friable loam has accumulated from the *debris* of surrounding rocky heights, and is drained by a rivulet. Such rocky dells and dingles abound in Perthshire and Fifeshire, and in them the ash is to be found in great perfection. It will not thrive at a great height above the sea, nor in bleak situations any where.

1915. The *Elm* is the *Ulmus*, L., *Pentand. Dig.* L., and *Amentaceæ*, J. *Orme*, Fr.; *Ulmebaum*, Ger.; and *Ormo*, Ital. There are two species which may be regarded as timber-trees.

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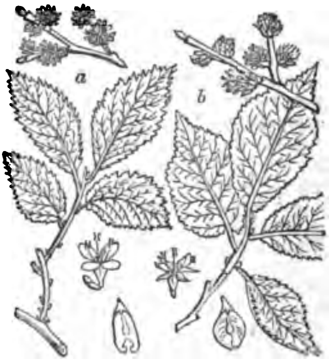

The *English* or *Narrow-leaved Elm*, *U. Campestris*, (*Eng. Bot.* 1886.) (*fig.* 515. *a*,). It is considered a native, or naturalized in England by Sir J. E. Smith and others; but Dr. Walker considers it as brought originally from the Holy Land. It would be difficult to point out any situation where it has the appearance of having sprung up from seeds; though it is said to be common in the woods of the north-west of England. It is certainly the loftiest of the deciduous trees of this country, being often found upwards of eighty feet high. It flowers in April and May, and ripens its seeds in a fortnight or three weeks after the decay of the flower. This species requires a dry soil, rather good than indifferent, and also a good climate. It does not thrive in the north of England or in Scotland, unless in good soils and moderately sheltered places. Professor Martyn says, it is not found north of Newark on Trent.

It grows to a great size in a short time. Evelyn says, in little more than forty years it will arrive to a load of timber. Marshal says, the largest narrow-leaved elms he has seen, are in the vale of Gloucester, and of these, the best is Piffe's elm, near the Baddington oak. At five feet high it girts sixteen feet; at ten feet it throws out large arms, which rise seventy or eighty feet. Some of the elms in the mall of St. James's Park are upwards of 200 years old. Boutcher says, that he sold a line of English elms, above sixty in number, which at twenty-four year's growth were about eighteen inches in diameter, a foot above ground, and forty feet high.

1916. The *Broad-leaved Wytch* or *Scotch Elm*, *U. montana*, (*Eng. Bot.* 1887.) (*fig.* 515. *b*,) is readily distinguished from the other by its broad rough leaves, lax, pendulous flowers, and by a general disposition in the tree to flexuosity in its mode of growth. The trunk soon divides into wide-spreading branches; and when the tree is at its full growth, it seldom rises to more than half the height of the other. The wood is less tough than that of the English elm. It is clearly indigenous, being found in the shady sides of hollows, and the outskirts of woods in many places, both in England and Scotland. It is much less difficult in regard to soil and situation than the other species, being found in bleak exposures in Yorkshire, but never at any great height above the level of the sea. Cook mentions a wytch, or Scotch elm, felled in Sir Walter Bagot's park in Staffordshire, which was seventeen feet diameter at the stool, and produced, top and lop included, ninety-seven tons of timber. The trysting elm in the parish of Roxburgh, Tiviotdale, measured, in 1796, at four feet from the ground, thirty feet in circumference.

Use. The timber of both sorts is used in all works where it may be continually dry or wet; as, for water-pipes, pumps, water-wheels, &c. It is also very generally used for weather-boarding, and for common cabinet work. The knotty parts, like those of the ash, are used for naves and hubs. The lop and top make good fuel and charcoal.

Soil and Site. The narrow-leaved elm requires a light, dry, soil, and warm situation, and will do little good in sand or gravel, in exposed places; but the broad-leaved sort is a very hardy tree, and will grow in thin clayey soil on retentive sub-strata better than most others. It will also thrive in situations elevated and exposed on all sides.

1917. The *Beech* is the *Fagus sylvatica*, L., (*Eng. Bot.* 1846.) *Monœc. Polyan.* L., and *Amentaceæ*, J. *Hêtre*, Fr.; *Buche*, Ger.; and *Faggio*, Ital. It is a native of England, and grows in its natural soil and situation to sixty or eighty feet high. It is found congregated in forests, in chalky, flinty soils, thrives well in sheltered bottoms; but not where it is exposed to the west. There are fine specimens of this tree at Castle Howard, Woburn, Newbottle, and Dalkeith park. It is not so long lived as the elm, nor will it grow in situations so much elevated as will the Scotch elm.

Use. The timber is brittle, and decays soon in the air; but under water it is more durable. It is used by the millwright, turner, carver, last and wheelmaker, chair and cabinet-maker, and more or less in other branches. It is much used by bakers and in glass-houses as billet-wood; and the stack-wood forms an excellent charcoal.

Soil and Site. Dryness and some degree of calcareous matter are the characteristics of the soil in which the beech delights; and the declivities of hills facing the east or south are its favorite situation.

1918. The *Common Hornbeam* is the *Carpinus Betulus*, L. (*Eng. Bot.* 2032.) *Monœc. Polyan.* L., and *Amentaceæ*, J. It is a native tree, nearly allied in habits and appearance to the beech, but is less lofty, and thrives in colder, stiffer soils, and in rather more elevated situations. It flowers in April, and ripens its seeds in November.. "Although Evelyn is perhaps too partial to the hornbeam, yet, raised from seed, it forms a tree of the first rate, equalling the common beech in magnificence; but unfortunately the hornbeam, like several of our best forest trees, may with ease, almost at any period of the year, be propagated from layers, and the usual consequences of this practice, follow, — a stinted, bushy, dwarf-like progeny. This tree, however, retaining its decayed, shrivelled, pale, russet leaves during winter, like the common beech, forms most valuable shelter planted in hedges." *Cal. Mem.* ii. 397.

Use. Chiefly in turnery, being white and tough as the name imports. It is frequently used as a substitute for the beech.

Soil and Situation. A dry soil is essential, whether cold or chalky. It is a social tree, and found in natural copse-woods, as in Hertfordshire; but never at any great height above the level of the sea.

1919. The *Spanish Chestnut* is the *Castanea vesca*, W. (*Fagus Castanea*, L. *Eng. Bot.* 886.) *Monœc. Polyan.* L., and *Amentaceæ*, J. It is the *Châtaignier* of the French; *Castanienbaum* of the Germans; and *Castagno* of the Italians. It is one of the most magnificent of European trees, exceeding the oak in height, and equalling it in bulk and extent. It is doubtful whether it be a native of Britain, though it ripens its fruit in sheltered valleys even in Scotland. It seems a very long-lived tree, of which the best proof is the specimen on Mount Etna, two hundred and four feet in circumference. Boutcher says, the shade of the chestnut, like that of the ash, is injurious to other plants. The leaves which continue late in autumn are not liable to be eaten by insects like those of the oak.

The Spanish chestnut, has been already described as a fruit-tree. (1478.) As a timber-tree it is used for the same purposes as that of the oak; though by some considered as more brittle when old. The roof of Westminster Abbey, and that of the Parliament House in Edinburgh, with many other antient works, are said to be constructed of it; but considering that it is not a native tree, this is extremely improbable; and it is much more rational to suppose, with Professor Martyn and Daines Barrington, that what is by many taken for chestnut, is only oak of a different grain. It is used by the cabinet-maker and cooper; makes an excellent coppice tree for poles and hoops; the bark is equal in astringency to that of the larch and mountain-ash for tanning; and the leaves and nuts afford food both for men and deer.

Soil and Situation. The soil in which it thrives best is a deep sandy loam, and the situation one somewhat sheltered. In Calabria, and on the Apennines between Florence and Bologna, where we have seen it in abundance, it does not attain a great size on the higher and more exposed parts of those mountains, but is, as Sang observes, a surprisingly magnificent tree in the hollows. Pontey says, "on sandy soils, where the oak would make but slow progress, I have seen the chestnut grow extremely quick, and therefore, in such cases, the latter should be used instead of the former."

1920. The *Walnut*, *Juglans regia*, has been already treated of as a fruit-tree. (1477.) Its timber, when of mature age, is valuable as a cabinet wood, and for gun-stocks, being light, hard, and durable.

1921. The *Common Sycamore* is the *Acer Pseudo-platanus*, L. (*Eng. Bot.* 303.) *Polyg. Monœc.* L., and *Acereæ*, J. It is one of our hardiest native trees, and equal in magnitude with, though more tame in its outline and form than the oak. It flowers in April and May, and ripens its keys or seeds in November. Its foliation is earlier than that of most trees, and its decadence is next to that of the ash. It is a quick grower, will endure the sea breeze better than most trees, and is not liable to grow to one side when exposed to winds that blow chiefly in one direction.

Use. The timber is chiefly used by the turner and millwright, and formerly, when earthenware was less common, it was in great request for trenchers and other table and household utensils. It affords a saccharine juice, like the sugar, and other American maples, from which a wine may be made.

1922. The *Norway Maple, A. platanoides*, is a tree common in the native woods of Lithuania. It grows to a large size, and its leaves die to a golden colour. Its timber does not differ materially from that of the sycamore.

Soil and Situation. Both thrive best in a soil similar to that preferred by the ash, but will grow in all inferior soils, and at a great height above the level of the sea.

1923. The *Mountain Ash* is the *Pyrus aucuparia*, E. B. (*Eng. Bot.* 337.) *Icos. Di.-Pentag.* L., and *Rosaceæ*, J. It is a low and very hardy native tree, attaining the height of twenty or thirty feet, with a straight, clean, erect, stem, and globular compact head. It flowers abundantly in April and May, and ripens its berries in August or October, according to the situation.

Use. In profitable planting it is chiefly valuable as a nurse-tree, growing very fast when young, and enduring the most severe exposures. The timber is used by wheelwrights, and for other common country purposes: the bark is used by tanners; and the berries afford a dye. As an undergrowth it affords tolerable poles and hoops.

Soil and Site. It will grow in any soil, dry or wet; and as to situation, it is found on the sea shore, and near the tops of the highest mountains. It seems to thrive best on the sides of most rocky dells and dingles.

1924. The *White Beam Tree, Pyrus Aria* (*Eng. Bot.* 1858.) is a very hardy native tree, growing to the height of thirty or forty feet, with an erect stem. Its uses and culture are the same as those of the mountain-ash. Its white leaves, and coral berries mealy to the taste like those of *Pyrus torminalis* (1480.), have a fine effect in autumn.

1925. The *Acacia*, or *Locust Tree. Robinia Pseud-acacia*, L. (*Schmidt, arb.* 1. t. 32.) *Diadelp. Decan.* L., and *Leguminosæ*, J. This is a thorny, fast-growing tree, of middling stature a native of America, of no great beauty as a tree, but ornamental when young, and very well adapted for copse-wood and rough timber. It flowers in June and July, and ripens its seeds in September. The leaves come out late in spring, and fall off early in autumn like those of the ash.

Use. The timber is much valued in North America, and said to be superior to that of the laburnum; "being close-grained, hard, and finely veined; and in America more valued by the cabinet-maker than any other native timber whatever. Pursh, in his late valuable *Flora*, asserts, that being nearly incorruptible, it is equally useful for posts and gates. We are informed by a friend, that gate-posts of this timber, on the property of M. Howard, near Baltimore, have remained fresh for nearly a century. The finely pinnated leaves, and pendulous white odorous flowers, add greatly to its beauty, and its value is scarcely known in this country. The flowers, however, are very seldom produced." *Caled. Mem.* ii. 414.

Soil and Site. It prefers a deep sandy soil, and rather sheltered situation; being very apt to throw up suckers from the running roots, and as it stoles freely, it seems peculiarly calculated for coppice-woods. Beatson (Com. to Board of Agr.) has cultivated it in this way to great advantage.

1926. The *Birch* is the *Betula*, L., *Monœc. Poly.* L., and *Amentaceæ*, J. *Bouleau*, Fr.; *Birchenbaum*, Ger.; and *Betulla*, Ital. There are two species which may be considered valuable as timber-trees. The common birch, *B. alba, var. pendula* (*Eng. Bot.* 2198.) is a middle-sized native forest-tree, distinguished by its white bark, fragrant leaves, and graceful, pensile form. It grows in the coldest regions of the north, and farther up the sides of the British mountains than any other timber tree. In the swampy grounds of Sweden and Russia it grows to a much greater size than in the more temperate climate of this country. It is of importance to cultivate the pendulus variety as a taller and more rapid growing tree independently of its variety.

1927. The *American Birch, Mahogany Birch, Mountain Mahogany*, or *Cherry Birch of Canada*, is the *B. lenta* (*Mich. arb.* 2. p. 145. t. 4.) (*fig.* 516.) This is a more lofty tree than the common birch, with a brown-colored bark spotted with white. "It abounds most in the middle states of Pennsylvania, New York, and the Jerseys, where it attains a height of seventy feet; but disappears altogether in the higher latitudes of the northern states, and is scarcely to be found in Nova Scotia. It is therefore likely to succeed with us in the moist and deeper soils of our highland valleys, especially when closely associated with other trees. The probability of this is heightened by various facts already ascertained. The value of the timber is well known to our cabinet-makers; and we have seen tables, bed-posts, and other articles of furniture made of it, equalling in beauty those of mahogany, which it resembles, when some time exposed to the light, the newly wrought boards being of a rose-color. Although of an exceeding quick growth, the grain being naturally close, it takes a fine polish in cabinet-work. We add to this, that the leaves, which appear early in spring, are said to possess a peculiar fragrance, which they retain when dried by means of a stove, affording, on infusion of boiling water, an agreeable diluent, superior to some of the common teas of commerce." *Caled. Mem.* ii. 380.

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1928. The *Poplar-leaved Birch*, *B. populifolia*, (*fig.* 517, *a*), and *Hudson's Birch* (*P. Hudsonii* (*fig.* 517, *b*), are elegant, rapid growing trees; and when once they are so common as to be propagated from seed, will deserve culture as timber trees.

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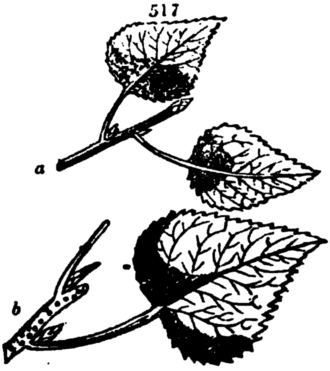

Use. The timber of the common birch in England is chiefly used as fence wood, fuel, and occasionally for harrows, &c. and other agricultural implements, the tree being most frequently planted as a nurse to others for coppice or variety.

This tree, like the mountain-ash, will grow in almost every kind of soil and situation.

1929. The *Wild Cherry* is the *Prunus avium*, L. (*Blackw.* t. 425.) *Icos. Di.-Pentag.* L., and *Rosaceæ*, J. *Guigne*, Fr.; *Wild Kirschen*, Ger.; and *Ciriegio Silvatico*, Ital. It is a native tree, above the middle size, the timber of which is of considerable value. It thrives best in dry sandy loams, and in such situations, Sang observes, its timber becomes of most value. It is of peculiar beauty in spring when in flower, in August when in fruit, and in autumn when its leaves change to a beautiful red and yellow.

Its timber is chiefly used by the cabinet-maker and chair-maker.

1930. The *Tree Laburnum*, *Cytisus alpinus*, W. en. (*Bot. Mag.* 176.) *Diadelph. Decan.* L. and *Leguminosæ*, J. It is a low tree, a native of Switzerland, cultivated chiefly for ornament, but affording also a valuable timber. For this purpose the variety or species (*C. alpinus*), with broad leaves and long racemes, is decidedly to be preferred, as being much more of a tree than the other. Sang says, it has a full claim to the characters of useful and ornamental; is beautiful when in flower, and may, in a grove, be trained to a fine stem of very considerable size.

Use. The timber (the false ebony of the French) is much prized, by cabinet-makers and turners, for its hardness, beauty of grain, and durability. The tree is frequently sown in plantations infested with hares and rabbits, who will touch no other tree as long as a twig of laburnum remains. "Though eaten to the ground in winter," as Boutcher observes, "it will spring again next season, and thus afford a constant supply for these animals, so as to save the other trees till of a size to resist their attacks. The timber has been sold for upwards of half a sovereign per foot."

Soil. It becomes most valuable in light loams and sandy soils.

1931. The *Holly* is the *Ilex aquifolium*, L.; (*Eng. Bot.* 496.) *Pent. Monog.* L.; and *Rhamni*, J. *Houx*, Fr.; *Stechbaum*, Ger.; *Agrifoglio*, Ital. It is an elegant, shining evergreen tree, rising from twenty to thirty feet high, affording a timber of considerable value, and much in use as an ornamental hedge-plant. It is a native of Britain, of great longevity, and found growing in woods and forests, as an undergrowth to the oak, beech, ash, and fir. It thrives best in a free deep loam, rather light, as in Needwood forest in Staffordshire, and the fir forest of Blackhall near Aberdeen. It is a cheerful looking tree from its shining leaves and coral berries, and peculiarly fit for ornament.

Use. The timber, which is as white as ivory, is chiefly used in inlaying and veneering, and by turners and mathematical instrument makers. The straight shoots, of five and six feet in length, make excellent coachmen's whips. Bird-lime is made from the bark by washing and separation of the woody fibre. Sheep and deer eat the croppings. It is the best of all hedge plants.

Soil and Situation. It thrives best in cold, loamy soils, and rather sheltered situations.

1932. The *Hazel, Corylus avelana,* already treated of as a fruit-shrub, forms a hardy useful undergrowth in most situations, supplying hoops, crate-ware, basket-stuff, walking-sticks, rods, poles, withys, fence-wood, fuel, &c.; besides the fruit, where the soil is tolerable, is worth something, and an excellent charcoal is made from the stackwood.

1933. The *Box Tree, Buxus sempervirens,* L. (*Eng. Bot.* 1341.) *Monœc. Tetran.* L. and *Euphorbiaceæ,* J. *Buis,* Fr.; *Buchsbaum,* Ger.; and *Bosobo,* Ital.; has some claims to attention as a valuable timber, being in considerable demand for inlaying, turnery, mathematical instruments, and wood-engravers' blocks. It thrives in any light soil and under the drip of trees. Raised from the seed it will attain the height of twenty or twenty-five feet, and be fit to cut down in thirty years. *Miller's Dict. in loco.* As an ornamental undergrowth and edging plant, it is of the greatest value.

1934. The *Elder Tree, Sambucus nigra,* already treated of as a fruit-tree (1465.), forms an excellent nurse-plant in exposed situations, and a rapid hedge in moist places. The wood is very hard, and used by the toy-makers and turners. When grown as a nurse, or for timber, it should always be raised from the seed.

1935. The *Hawthorn, Mespilus oxyacantha,* E. B. (*Eng. Bot.*); *Icosan. Di.-Pentag.* L.; and *Rosaceæ,* J. *Aubépine,* Fr.; *Hagedorn,* Ger.; *Branco spino,* Ital. It is a native shrub, of great importance as a hedge plant, and is also frequently introduced into narrow plantations as an undergrowth. It will not grow, however, under the drip of trees, and therefore, in a profitable point of view, is only to be considered as affording the impermiable, close, and durable, and easily raised fences, called quickset hedges. The timber of such plants as grow singly, and attain a tolerable size, is valued by the millwright and turner, and the roots by the cabinet-maker. It is often spoiled, Sang observes, through inattention after cutting; if it be allowed to lie in entire logs or trunks, it soon heats, and becomes quite brittle and worthless; it therefore ought to be instantly cut up into planks, and laid to dry. The haws and foliage afford excellent food for deer.

Soil and Site. It will not thrive in a wet soil, nor one very dry and poor, much elevated or much shaded; a free deep loam in an airy situation suits it best. For hedges it may be raised from cuttings of the roots, planted where they are finally to remain. Such cuttings are only to be procured in quantities where an old hedge is to be removed, and the labour of selecting and preparing them falls little short of the price of good two-year seedling plants; so that unless in a season when thorn plants are scarce and dear, few advantages attend this practice.

1936. The *Yew* is the *Taxus baccata,* L. (*Eng. Bot.* 746.); *Polyg. Monœc.* L.; and *Coniferæ,* J. *If,* Fr.; *Eihenbaum,* Ger.; and *Tasso,* Ital. It is a low, bush-like, dark, evergreen tree, of great longevity, slow in growth, and affording a hard, white valuable timber. It flowers in April and May, and its berries are ripe in November. It is found in a wild state in bleak situations, and on a variety of soils, dry and moist. It is very common in ancient church-yards, in many of which it has attained a great size and age. Evelyn, and after him, Professor Martyn, have referred to a great number of examples of notable trees of this species.

Use. The timber is used by the cabinet-maker for inlaying, and by the mathematical-instrument-maker, and whip-maker. It is sometimes used as a substitute for box and other hard woods, and every one knows it was formerly used for boughs, and the spray as palm leaves by the ancient Christians. It forms one of the best hedge plants for gardens, &c. topiary work, and for this purpose was much employed when the geometric style of gardening prevailed.

Soil and Situation. Almost any soil, not over-wet, will suit the yew, and it will grow on the bleak sides of mountains, and under the drip of trees.

Sect. III. *Soft-wooded Trees.*

This class may be considered as characterized by great rapidity of growth; comparatively limited duration; and timber of inferior value.

1937. The *Horse-chestnut, Esculus hippo castanum,* L. (*Schmidt. arb.* 1. t. 38.) *Heptand. Monog.* L.; and *Acereæ,* J. *Maronnier,* Fr.; *Marronienbaum,* Ger.; and *Marrone,* Ital.; is a magnificent and beautiful tree, when in May it is covered with its digitate foliage, and fine large spikes of white flowers. It is of rapid growth, and speedily produces a considerable bulk of timber, which, however, is of no great value.

Being highly ornamental as a single tree, and in the outskirts of plantations, it need never be planted in masses for timber. It was brought from the northern parts of Asia into Europe, about the year 1550, and was cultivated by Gerarde and Tradescant.

As Gilpin observes, it is far from being a picturesque tree, its outline being that of a parabola: but all beauty is not picturesque beauty, and the foliage and flowers will ever advocate the cause of this tree, (which the Hon. D. Barrington compared to a giant's nosegay), though "its leaves begin to drop early in summer, and make a litter around the trees during the remainder of the season."

Soil and Situation. It requires a good, rather dry soil, and suffers materially from storms of every kind when planted in exposed situations. It used formerly to be much used as an avenue tree, especially by the French, and is particularly adapted for this purpose, and the margins of plantations.

1938. The *Lime*, *Tilia Europæa*, L. (*Eng. Bot.* 610.); *Polyand. Monog.* L.; and *Tiliaceæ*, J. *Tilleul*, Fr.; *Lindenbaum*, Ger.; and *Tiglio*, Ital. This is one of the most beautiful, graceful, and fragrant of our native trees, rising to the height of seventy or eighty feet, and finely clothed with pendulous, recurved branches, from the ground, or the browsing line formed by cattle upwards. It is found wild in woods and grassy declivities, sends out its leaves in April, flowers in May, and ripens its seeds, though sparingly, unless under favorable circumstances, in October.

Use. It was much valued by the Romans for its shade, and the multiplicity of purposes to which the timber was applied. It is now more a tree of ornament than of profit, but the timber is still used for various common purposes in general economy, and by the carver, turner, and musical-instrument maker. It forms an excellent charcoal for gunpowder; and of its inner bark, macerated in water, is formed, in the north of Europe, the bass mats of commerce. This bark is called in Sweden and Russia, bast, whence, by corruption, bass. It is the fittest of all trees for avenues, and forms good tree hedges. The famous Kowno, honey is made exclusively from the blossom of this tree.

Varieties and Species. There are several sorts noticed in our table of ornamental trees (1681.), but the best, both for effect and timber, is the red twigged, (*T. Eu. var. corallina*), and the broad-leaved American (*T. Americana*), which is a distinct species, distinguished by the larger size of the leaves, and elegant pendulous flowers.

Soil and Situation. All the sorts prefer a deep loam, and rather sheltered situation, for though patient of cold, they are much injured by storms. In Sweden, the common species abound among the *debris* of granite and trap rocks; and in Russia it covers extensive tracts of deep, soft, black earth. In bleak situations, where it is not covered by snow in winter at the roots, or sheltered by other trees, it will not thrive.

1939. The *Alder*, *Alnus glutinosa*, W. (*Eng. Bot.* 1505.); *Monœc. Tetrand.* L.; and *Amentaceæ*, J.; is a middle-sized native aquatic tree of no great value, either as timber or ornament farther than that it will grow where few other trees will thrive, excepting the birch, poplar, and willow. It flowers in May, and ripens its seeds in September and October.

Use. The timber is used in water-works, and by the turner, millwright, lastmakers, and others, as well as for common country purposes, and charcoal.

1940. The *Poplar* is the *Populus*, W. *Diœc. Dodec.* L.; and *Amentaceæ*, J. *Peuplier*, Fr.; *Poppelbaum*, Ger.; and *Poppio*, Ital. There are several species which may be reckoned timber trees.

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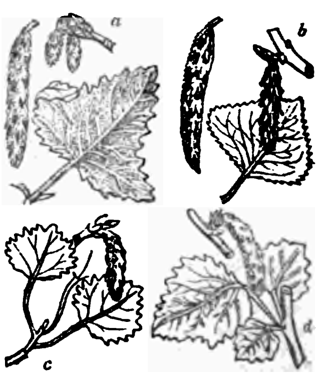

The *Abele Tree*, *P. Alba*, (*Eng. Bot.* 1618.) (*fig.* 518, *a.*) The variety called the hoary poplar is distinguished from the common wild abele by its larger three, four, or five lobed leaves, dark above and downy under, and by the young shoots having a purple bark covered with white down. It is a rapid growing tree, speedily attaining great bulk of timber, a height of 60 or 70 feet, and great extent of branches. The *P. vistulensis* seems a variety of this tree; and on the banks of the Vistula, particularly at Villeneuve, near Warsaw, grows to upwards of 100 feet high, with a clean trunk and ample head.

1941. The *Common Black Poplar*, *P. nigra*, (*Eng. Bot.* 1910. *fig.* 518, *b.*) is a native tree, of lofty growth, distinguished by its light-green leaves, and lightly notched on the edges, and ash-colored bark. It is, by some, considered a mere variety of the alba, and for the purposes of profit may be so considered.

1942. The *Trembling Poplar*, *P. tremula*, (*fig.* 518, *c.*) and the *Common Poplar*, *P.*

canescens (*d*), are hardy natives; but being of less rapid growth than the species mentioned, are little cultivated as timber trees. The common poplar in the northern counties may be frequently seen in a pollard state in hedges, where it furnishes lop for fuel, and sometimes for handles to hay-rakes, &c.

1943. The *Lombardy Poplar*, *P. dilatata*, grows to a lofty tree, occupies little space, and is not very injurious by its shade. It will not thrive, however, in exposed situations, or in very indifferent soils. Some of the largest trees of this species are at Blenheim. Sang and Nicol say it seldom thrives in Scotland.

1944. The *Black Italian Poplar*, (*dilatatata, var.*) of the northern nurseries, so strongly recommended by Pontey, is thus described by him, by comparison with the Lombardy poplar. " The leaves of both are very much alike in color, shape, and turn, the only difference being in the latter producing them somewhat larger than the former, though not near so large as the other poplars, whose leaves are of similar shape. The branches of the latter grow much less erect, and, likewise, much thinner upon the stem. The only other distinction necessary is the bark, which, on a stem or branch of from two to four or five years' growth, is always found smoother, and of a much darker color than any of the poplars that are at all like it in other respects."

He says it was first sent to Scotland from America, and disseminated by Dicksons and Co. of Hassendean-burn. Sang says, " many have ventured to assert, that it is merely a play on the vanity of possessing new sorts, and that it is not really distinct from those formerly cultivated." Pontey says, he measured, in December, 1813, " a tree growing in the garden of Richard Atkinson, of Huddersfield, which has been planted twenty-five years, being then about six feet high; the height is now about sixty feet, and contains forty-six feetof good timber. It grows on the side of a garden where the soil is light, and about a foot deep, upon a very coarse gravel, having been formerly a water-course."

We could never find any poplar in general cultivation, or wild, in Italy, but the Lombardy and alba, and occasionally in elevated moist places in the Alps and Appenines, the tremula.

1945. The *Black Athenian*, *P. græca*; *Black American* or *Birch-leaved*, *P. betulifolia*; the *Canadian*, *P. monilifera*; and *Carolina Poplars*, *P. angulata*; are all rapid growing lofty trees, which, in favorable soils and sheltered situations, speedily produce great bulk of head and timber; but the hoary and the black Italian appear the best for the general purposes of the profitable planter. They are all short-lived trees; flower in March and April, and ripen their seeds from a fortnight to a month afterwards.

Use. The wood being soft is used by the sculptor, turner, and toy-maker, and also occasionally by the cabinet and musical instrument maker, as a substitute for that of the lime. But no limited application of poplar timber, like the above, can be depended on by the profitable planter, and, therefore, the safest way is to consider it as useful for the common purposes of domestic and rural economy, and more likely to afford profit from bulk than quality. The bark of the black is so astringent, Sang states, as to be used for tan.

Alluding to the black Italian sort, Pontey says, " In that sort of planting which perhaps may be considered as most of all profitable, namely, that which adds to the comfort and consequence, and, of course, the value of a place, previously scantily furnished with that important appendage, wood, this tree is excellent; as, in judicious hands, it may be made to produce very considerable effects, while many others (highly esteemed) would produce them in prospect only. In short, for distant scenery, where wood, not species, is the immediate object, this plant, hitherto in many places a stranger, is clearly superior to all the family of the forest."

Of the timber of the hoary poplar, he says, Lord Sheffield " has lately made some floors, which, in appearance, are superior to any floor I have seen, whether of deal or oak; and, as to durability, I see no reason to doubt of that, if the density and weight of the article be considered, in connection with such testimonies as books afford relative to the point. Floors, however, are only one of the many inferior purposes for which it is applicable; as it is certainly proper for almost every article of furniture usually made of mahogany. For the lighter descriptions of it, now so fashionable, it may be made a very good substitute, without any other addition to the natural color of its heart than the means cabinet-makers generally resort to, in order to heighten the color of such wood; and with respect to the sap, and where more of color is required, the aqua-fortis stain will instantaneously produce it, so far as that it would be difficult to distinguish it from real mahogany. Indeed, it is equal to the best in color and smoothness of surface, and much superior to the plain or inferior sorts in those respects, as well as in transparency and variety; and it has the further advantage over mahogany, and most other woods, that it takes but little of either oil or rubbing, to produce upon it the sort of mellow shining surface, so much admired in furniture that has been some years subjected to proper attention."

Of poplars and willows in general, he observes, " were we but half as well apprised of the various purposes to which their timber might be properly applied, as we are of the quickness of their growth, I am persuaded they would then be considered as subjects worthy of general attention."

Natural Soil and Situation. None of the sorts mentioned are ever found wild in very poor soils, but generally in such as are deep and moist, but not springy; by rivers and in bottoms, where the soil has accumulated from the surrounding heights, or alluvial deposits have taken place, for ages, poplars are found in the greatest perfection.

1946. The *Willow* is the *Salix*, L.; *Diœc. Monand.* L.; and *Amentaceæ*, J. *Saule*, Fr.; *Weidenbaum*, Ger.; *Salici*, Ital. There are two species which seem more immediately to merit cultivation as timber trees, and several as fit for cultivating in osier grounds.

The *Huntington* or *Common White Lincolnshire Swallow-tailed Willow*, *S. alba*, (*Eng. Bot.* 2430.) (*fig.* 519.) grows to a lofty tree, with a branchy stem, and tapering flame-shaped head. It seems common to Europe, being found pollarded by way sides in Sweden, the south of Russia, and Italy. As a timber-tree it produces a great bulk in a short time; and as a pollard or coppice wood, on suitable soils, it is prolific in fuel, pales, and bark for the tanner.

The *Upland* or *Red-twigged Willow* of Pontey, (*Profit. Plant.* 72.), appears to be a variety of the *S. alba*, being distinguished from it by its hoary or silver-like leaves, and deep red shoots. The timber and mode of growth appear to be the same as those of the Huntington willow, but being of slower growth, the former is to be preferred. Of the red-twigged willow of Sang, there are large trees near Dunfermline, upwards of 60 feet high.

The *Bedford Willow*, *S. Russelliana*, (*Eng. Bot.* 1808.) (*fig.* 520.) This is also a lofty, bulky-headed tree, in general appearance and habits very much resembling the *S. alba*.

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Use. The timber may be used generally in rural economy, and the poles form a light and convenient hurdle. Pontey says, the timber is " considerably durable; a property which, it appears, may be much augmented by steeping some months in water, as is frequently done with oak saplings."

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The bark of all the sorts mentioned is found to be sufficiently astringent to be now generally used by tanners.

The following are esteemed the best willows for osier grounds:

1947. The *Common Osier*, *Salix Viminalis*, (*Eng. Bot.* 1898.) (*fig.* 521.) The leaves are long, waved at the edges, but not serrated; shining green above, and silvery underneath. The shoots grow long, straight, and tough, and are well-adapted for the larger sorts of baskets, hampers, crates, and hoops.

The *Auricled Osier*, *S. stipularis*, (*Eng. Bot.* 1214.) " The two-year old shoots make excellent rods for baskets, cradles, bird-cages, and such articles; and the one-year shoots are used as fillings. The shoots are long, nearly equal in thickness throughout their extent, and somewhat downy, or hoary, particularly at the tops or extremities. The leaves are alternate, with footstalks, long and narrow, somewhat notched on the edges, green and smooth above, woolly below. The stipulæ or leaf-scales are conspicuous and remarkable, resembling a pair of ears."

The *Green Osier, S. rubra,* (*Eng. Bot.* 1145.) is an excellent basket willow. "The shoots are very long, tough, smooth, and of a grey color, occasionally inclining to purplish. The leaves are narrow and very long, from three to four inches, bright green on both sides, and serrated."

The *Basket Osier, S. Forbyana,* (*Eng. Bot.* 1344.) "The best willow for the finer sorts of basket-work. The shoots are of a yellowish ash-color, sometimes purplish; smooth, very flexible and tough. The leaves are alternate, on footstalks, from two to three inches long, somewhat serrated, chiefly towards the top; dark green above, and glaucous or pale bluish beneath."

The *Long-leaved triandrous Willow, S. triandra,* (*Eng. Bot.* 1435.) "is common in osier-beds, and its stools afford most excellent shoots for basket-work, long, slender, pliable, and tough; they are smooth, of a brownish color, and towards the top they are fluted or grooved. The leaves are long, and closely and strongly serrated."

The *Velvet Osier, S. mollissima,* (*Eng. Bot.* 1509.) "Its leaves are very smooth and green above, and very silky and soft beneath. Shoots long, and very numerous, but not tough; when allowed, however, to remain for two years, they make most capital rods."

The *Yellow Willow* or *Golden Osier, S. vitellina,* (*Eng. Bot.* 1329.) produces "handsome shoots, of a yellow color and shining, and well adapted for basket-work."

BOOK IV.

LANDSCAPE GARDENING.

In the three branches of gardening hitherto considered, art is chiefly employed in the cultivation of plants, with a view to obtaining their products; but in the branch now under consideration, art is exercised in disposing of ground, buildings, and water, as well as the vegetating materials which enter into the composition of verdant landscape. This is, in a strict sense, what is called landscape gardening, or the art of creating or improving landscapes; but as landscapes are seldom required to be created for their own sakes, landscape gardening, as actually practised, may be defined, "the art of arranging the different parts which compose the external scenery of a country residence, so as to produce the different beauties and conveniences of which that scene of domestic life is susceptible."

What these beauties and conveniencies are, must, in different ages and countries, depend on the state of society and climate; and, in the same age and country, on the wealth and taste of individuals. This art would be a very simple one in rude ages and mild climates, when man had few wants, and scarcely any desires; but, like other arts, would become more intricate as mankind betook to more variable climates, and became more refined in habits and manners. Taking a view, as far as history permits, (see Part I.) of the past and present state of landscape gardening in all countries, the objects desired in the country residence of a wealthy man, wishing to display his riches, are fundamentally the same. These were and are, *adaptation* to the habits of genteel life for the time being, as to matters of use and convenience; and *distinction* from the common scenery of the country, as to matters of taste or beauty in landscape. The first object would principally affect the mansion and accompanying erections for men or cattle; and these would, at first, be merely of greater dimension than those of the common mass of rustics; but, as society improved, they would be distinguished by more perfect execution, and appendages indicative of the habits of genteel life. The second object, distinction in the surrounding scenery, was and is effected by such dispositions of the common materials of landscape, as ground, water, trees, &c. as indicate the employment of art and expence. In early times, this would produce regularly level or sloping surfaces of ground, and water and trees bounded by straight or geometrical lines, which would distinguish the country residence from the natural or open unenclosed scenery around. In late or modern times, when the general face of the country was disposed in artificial forms, a contrary practice would be pursued, and natural-like scenery would be created for precisely the same object as in the other case; the display of wealth and taste, and the attainment of distinction.

Hence the origin of what are called the geometric and natural styles in landscape gardening, both evidently founded on the same principle, the love of applause and distinction. The first has been generally condemned as unnatural and absurd; and so it is, if we look upon it as an imitation of nature; but as it never pretended to this, but, on the contrary, was avowedly a display of the power of art over nature, it ought to be judged, like every other work of man, by the end in view; and if, as we have already observed (184.), it be considered as designed to distinguish the garden scenery of the man of wealth from the common fortuitous scenery of the country in rude or less cultivated times and places, it will be found admirably calculated for that purpose, and just as natural to man as any other part of his habits or manners.

But we will even go farther, and maintain that the geometrical disposition of landscape scenery has powerful beauties, both of the inherent kind, as that of a long broad avenue; or of general or particular associations, as its suitableness to Gothic architecture, very ancient residences, &c. Disapproving, therefore, of that absolute preference of the modern or natural style, which totally excludes the other, we have, in treating of planting, (Book III. chap. IV.) not lost sight of the geometrical dispositions of trees; and we shall, in considering the present branch of our subject, notice also the dispositions of ground, water, roads, &c. peculiar to the geometric style. A knowledge of both will be desired by the liberal minded practical designer; and the occasional adoption, in part, at least, of the ancient style, will be dictated by general good taste, as well as by the particular tastes of individuals, and the circumstances of peculiar situations.

We shall consider, in succession, the principles of composing landscape; the treatment of the materials of verdant scenery; the union of these materials in forming landscapes; and the union of landscapes in connection with scenes of use and convenience in forming country residences.

Chap. I.

Of the Principles of Landscape Gardening.

1948. 'Gardens and buildings,' Lord Kames observes, 'may be destined for use solely, for beauty solely, or for both. Such variety of destination bestows upon these arts a great command of beauties, complex not less than various. Hence the difficulty of forming an accurate taste in gardening, and architecture; and hence, that difference or wavering of taste in these arts, greater than in any art that has but a single destination.' (*Elements of Criticism*, 4th edit. vol. ii. 431.) Not to consider landscape gardening with a view to these different beauties, but to treat it merely as "the art of creating landscapes," would thus embrace only a small part of the art of laying out grounds, and leave incomplete a subject which contributes to the immediate comfort and happiness of a great body of the enlightened and opulent in this and in every country; — an art

> ——' Which teaches wealth and pride,
> ' How to obtain their wish — the world's applause.' *Mason.*

1949. The ancient authors on architecture and gardening, have rarely attempted to lay down any *general principle* of composition. Vitruvius hints obscurely, that the different parts of buildings, should bear some proportion among themselves, like that which subsists between the different members of the human body; that the quantities constituting the magnitudes of temples, should have certain ratios to one another, and he lays down canons for the individual proportions, and collective arrangement of the columns of the different orders. These, however, are not principles, but mechanical rules, formed on very limited associations. The same remarks will apply to the directions respecting the walks, walls, hedges, and borders of the ancient style, laid down by D'Argenville, Clarici, Le Blond, and Switzer. It is in the writings of modern authors, therefore, and chiefly from the enlightened investigations of the Rev. A. Alison, that we are to draw our information as to the principles by which the artists of the ancient style were instinctively guided in their productions.

1950. With respect to the *modern style*, considered as including what belongs to the conveniences of a country residence, as well as the art of creating landscapes, Pope has included the principles under, 1st. The study and display of natural beauties. 2d. The concealment of defects; and, 3d. Never to lose sight of common sense.

Whateley concurs in these principles, stating the business of a gardener to be 'to select and to apply whatever is great, elegant, or characteristic' in the scenery of nature or art; 'to discover and to show all the advantages of the place upon which he is employed; to supply its defects, to correct its faults, and to improve its beauties.' H. Repton, whose observations on landscape-gardening bear on the title-page, 'written with a view to establish fixed principles in these arts,' enumerates congruity, utility, order, symmetry, scale, proportion, and appropriation, as principles, 'if,' as he observes, in one place 'there are any principles.' G. Mason places the secret of the art in the 'nice distinction between contrast and incongruity;' Mason, the poet, invokes 'simplicity,' probably intending that this beauty should distinguish the English from the Chinese style; simplicity is also the ruling principle of Lord Kames; Girardin includes every beauty under 'truth and nature,' and every rule 'under the unity of the whole, and the connection of the parts;' and Shenstone states, 'landscape, or picturesque gardening,' to 'consist in pleasing the imagination,' by scenes of grandeur, beauty, and variety. Convenience merely has no share there, any farther than as it pleases the imagination." Congruity and the principles of painting, are those of U. Price and of R. P. Knight; and nature, utility, and taste, those of Marshal. From these different theories, as well as from the general objects or end of gardening, there appear to be two principles which enter into its composition; those which regard it as a mixed art, or an art of design, and which are called the principles of relative beauty; and those which regard it as an imitative art, and are called the principles of natural or universal beauty. The ancient or geometric gardening is guided wholly by the former principles; landscape gardening, as an imitative art, wholly by the latter; but as the art of forming a country residence, its arrangements are influenced by both principles. In conformity with these ideas, and with our plan of treating of both styles, we shall first consider its principles as an inventive or mixed, and secondly as an imitative art.

Sect. I. *Of the Beauties of Landscape-Gardening as an inventive and mixed Art, and of the Principles of their Production.*

1951. "*Works of Art,*" Alison observes, "may be considered, either in relation to their design or intention — to the nature of their construction for the intended purpose — or to the nature of the end they are destined to serve; and their beauty accordingly will depend, either upon the excellence or wisdom of the design, the fitness or propriety of the construction, or the utility of the end. The considerations of design, of fitness, and of utility, therefore, may be considered as the three great sources of the beauties of works of inventive art. They have been called relative beauties, in opposition to those of nature and imitative art, which are hence denominated natural or independent beauties. There is a third source of beauty common both to arts of invention and imitation, which is that of accidental beauty, or such as is produced by local, arbitrary, or temporary associations. The beauties of objects, whether natural, relative, or accidental, are conveyed to the senses by the different qualities of matter, forms, sounds, colors, smells, and motion; but form is the grand characteristic of matter, and constitutes in a great degree its essence to our senses. In our remarks, therefore, on the beauties of inventive art, we shall chiefly consider design, fitness, and utility, in regard to form.

1952. The *Expression of Design* is displayed by such forms and dispositions, as shall at once point out that they are works of art. Thus regularity and uniformity are recognised in the rudest works of man, and point out his employment of art and expence in their construction. Hence the lines, surfaces, and forms of geometric gardening should be different, and in some degree opposed to those of general nature. Irregular surfaces, lines, or forms, may be equally useful, alike works of art, and, considered with reference to other beauties, may be more agreeable than such as are regular; but, if too prevalent, they might be mistaken for the production of nature, in which case they would lose the beauty of design; 'but forms perfectly regular, and divisions completely uniform, immediately excite the belief of design, and with this belief, all the admiration which follows the employment of skill and expence.' Ground in level or regular slopes, or in hills or hollows of symmetrical shapes, woods of right-lined boundaries; trees, and especially such as are foreign to the soil, planted equidistantly in masses, in quincunx, or in straight rows; water in architectural basins, regular canals, or fountains; walks, and woods, of uniform width and perfectly straight; straight walls and hedges, are easily distinguished from nature's management of these materials, and are highly expressive of the hand of man.

Another reason why regular forms are satisfactory, D. Stewart (*Philosophical Essays,* 238.) derives from the principle of a sufficient reason, adopted by Leibnitz, 'What is it, that in any thing which is merely ornamental, and which at the same time does not profess to be an imitation of nature, renders irregular forms displeasing? Is it not, at least, in part, that irregularities are infinite; and that no circumstance can be imagined which should have decided the choice of the artist in favour of that particular figure which he has selected? The variety of regular figures, it must be acknowledged, is infinite also; but supposing the choice to be once fixed about the number of sides, no apparent caprice of the artist in adjusting their relative proportions, prevents a disagreeable and inexplicable puzzle to the spectator.'

'Wherever symmetry is useful to the soul, and may assist her functions, it is agreeable to her; but wherever it is useless, it becomes distasteful, because it takes away variety: therefore, things that we see in succession ought to have variety, for our soul has no difficulty in seeing them: those, on the contrary, that we see at one glance, ought to have symmetry; thus at one glance we see the front of a building, a parterre, a temple; in such things there is always a symmetry which pleases the soul, by the facility it gives her of taking the whole object at once.' *Montesquieu.*

In the progress of the arts, the expression of design, though at first difficult, becomes afterwards easy, and renders regularity and uniformity only expressive of common design. Hence, to confer a character of superiority in works of design, variety would be introduced; and as uniformity was the sign of design, so uniformity and variety would become the sign of improved or embellished design. 'Considering, therefore, forms in this light as beautiful, merely from their expression of design, the observation of Dr. Hutcheson may perhaps be considered as an axiom with regard to their beauty, viz. that where the uniformity is equal, the beauty of forms is in proportion to their variety; and when their variety is equal, their beauty is in proportion to their uniformity.' *Alison's Essays*, p. 106.

To this stage, in the progress of design, may be referred the architectural ornaments introduced in garden-scenery, such as seats, buildings, statues, urns; and in the later stages of the art, serpentine walks, labyrinths, verdant sculpture, and many other improvements. The variety and embellishment thus conferred on gardens produced in time many absurdities that we would not wish to see resorted to with a revival of the ancient style, unless in examples considered solely with a view to imitation. The sculpture of trees, however, might, when first introduced, be greatly admired, even by men of sense, for its novelty, and the discovery of a certain degree of skill in the artist; but as, in our times, they would neither be new or meritorious, they could scarcely be consistently introduced with a view to embellish design.

To prevent variety from degenerating into confusion, and, as Professor Stewart characteristically expresses it, 'puzzling the spectator,' unity of intention must never be lost sight of. This, indeed, is necessarily implied in every work of art, since, without it, the slightest attempt at design would only end in a chaos of materials.

1953. *Fitness*, or the proper adaptation of means to an end, is the second source of the relative beauty of forms. Considered in relation to the parts of a building, it is generally denominated proportion, and refers to the adequate strength of certain parts to bear certain weights, &c. In the detail of the ancient, and in scenes of relative beauty in the modern style of gardening, it relates to the magnitude and situations of buildings, and other artificial objects, relative to natural ones — to the extent of the different scenes or constituent parts of a residence, compared to the whole — to the propriety and congruity of certain objects as ornaments — and, in general, to the adequacy of means to an end, whatever these means or that end may be.

1954. *Utility* is the third source of the relative beauty of forms. None of the other beauties will compensate for the entire want of utility in any scene of architecture or gardening. Objects at first thought beautiful, soon lose this expression when they are found to be of no use; and others, with first impressions the most disagreeable, are felt to become beautiful as they are known to be useful. 'This species of beauty,' Alison observes, 'is in itself productive of a much weaker emotion than that which arises from the different sources of ornamental beauty; but it is of a more constant and permanent kind, and much more uniformly fitted to excite the admiration of mankind.' (*Essays on Taste*, vol. ii. p. 201.) 'To unite these different kinds of beauty; to dignify ornamental forms by use; and to raise merely useful forms into beauty, is the great object of ambition among every class of artists. Wherever both these objects can be obtained, the greatest possible beauty that form can receive will be produced. But as this can very seldom be the case, the following rules seem immediately to present themselves for the direction of the artist:

1. 'That where the utility of forms is equal, that will be the most beautiful to which the most pleasing expression of form is given.

2. 'That where those expressions are at variance; when the beauty of the form cannot be produced without sacrificing its utility; that form will be most universally and most permanently beautiful, in which the expression of utility is most fully preserved.' *Essays*, vol. ii. p. 202.

Some of the various modifications of utility, as applied to country residences, may be here enumerated.

For the purpose of habitation, for example, good air and water, a genial climate, fertile soil, cheerful prospect, and suitable neighbourhood, &c. are known requisites.

1955. *Convenience* must be joined to use, comforts to conveniencies, and luxuries to comforts. Exercise, whether in the shape of walking, riding, or driving, requires to be provided for; and recreation, whether in the common field sports, athletic games, or in botanical, agricultural, and other useful, elegant, or scientific pursuits, must be kept in view; rural fêtes and amusements might also be enumerated.

1956. *Accidental Associations* form the last class of relative beauties, and are 'such associations as, instead of being common to all mankind, are peculiar to the individual.' 'They take their rise from education, from peculiar habits of thought, from situation, from profession; and the beauty they produce is felt only by those whom similar causes have led to the formation of similar associations.' (Stewart's *Essays*.) Among these may be reckoned,

1957. *Classical and Historical Associations.* The influence of the former in architecture is well known; the latter often adds charms to a spot, in no respect remarkable to those who are unacquainted with its history. 'Classical associations,' Stewart observes, 'have added immensely to our natural resources, but at the same time, warped our taste in various instances;' acquiring, as Alison adds, 'a superiority over the more permanent principles of beauty, and determining for a time the taste of nations.'

1958. *National Associations* are also frequently at variance with such as are universal, and have perhaps greater influence than any other associations whatever. Stewart's *Essays*.

1959. *Personal Associations*, or such as arise from the accidental style of natural beauties, to which we have been accustomed in our youth. Many particulars come under this head, which it would be tedious to enumerate; but one mode of vanity and selfish feeling deserves particular notice, as intimately connected with the business of the landscape gardener. It is that interest which the attachment to property creates in men's minds, 'rendering them alive to every trifling recommendation belonging to what is their own, while it blinds them to the most prominent beauties in the property of their neighbours.' Stewart's *Essays*, p. 468.

This leads to what, in laying out grounds, is called *appropriation*, or such an arrangement as shall, either in reality or appearance, render all, or the greater part of what we see from a country seat, our own. The simplest way of effecting this, is by shutting out all objects which do not correspond with the idea, by means of walls or plantations. A more refined mode is, by harmonizing the scenery; by adopting some of the forms, colors, and arrangements in our own territory (1777.), which appear in those of our neighbours, as seen from the house, or some particular points of view. According to Whateley, 'one property of a riding is to extend the idea of a seat, and appropriate a whole country to the mansion.' For this purpose, he requires the road of the riding to be different from common roads in form and preservation, and distinguished by accompaniments borrowed from a park or garden, &c. R. P. Knight strongly objects to appropriation, and ridicules certain attempts of this sort, made by placing the family arms on the inns and public-houses of the neighbourhood, and on 'stones with distances,' as, he says, was recommended by one improver. Girardin also objects to the principle; but Repton, and we believe, almost every other professional man, finds it a very principal object of attention. Repton defines appropriation to be, 'that command over the landscape visible from the windows, which denotes it to be private property belonging to the place.' 'A view from a London house into a square or into the parks, may be cheerful and beautiful, but it wants appropriation; it wants that charm which only belongs to ownership; the exclusive right of enjoyment, with the power of refusing that others should share our pleasure. The most romantic spot, the most picturesque situations, and the most delightful assemblage of nature's choicest materials, will not long engage our interest without some appropriation; something we can call our own; and, if not our own property, at least that may be endeared to us by calling it our own home.' *Fragments of Landscape Gardening*, p. 206.

This *envie de s'arrondir* seems to have existed, and the proximity and intermixture of property to have been felt as an evil among landed proprietors, from the earliest ages. Ahab desired the field of Naboth, that he might convert it to a garden of herbs, (or flower-garden,) because it was near to his house; and Marvel, the attorney, says to his patron,

"———————— What course take you
(With your good patience), to hedge in the manor
Of your neighbour, Master Frugal? As 'tis said,
He will not sell, nor borrow, nor exchange;
And his land lying in the midst of yours,
Is a foul blemish." *Massinger. New Way to pay Old Debts*, Act 2. Scene 1.

I stick still in the inn of a hired house," writes the amiable Cowley to Evelyn, "without that pleasantest work of human industry, the improvement of something which we can call our own."

In concluding the subject of accidental associations, it is proper to observe, that the objections to their use apply with far less force to the art of laying out grounds than to architecture, or any of the other elegant arts. For as a country residence is created for the enjoyment of an individual family, that family have undoubtedly a right to gratify their peculiar tastes; but, in so far only as their tastes are in unison with those of men of cultivation and refinement, must they expect to obtain the sympathy of men of general associations.

Sect. II. *Of the Beauties of Landscape-Gardening, considered as an imitative Art, and of the Principles of their Production.*

1960. The chief object of all the imitative arts is the production of natural or universal beauty. Music, poetry, and painting, are the principal imitative arts; to these has been lately added, landscape-gardening, an art which has for its object the production of landscapes by combinations of the actual materials of nature, as landscape-painting has for its object their imitation by combinations of colors. Landscape gardening has been said 'to realise whatever the fancy of the painter has imagined,' (Girardin); and 'to create a scenery more pure, more harmonious, and more expressive, than any that is to be found in nature herself,' (Alison). Such are Alison's ideas of the powers of this art; and such appear, in some degree, to have been those of Whateley and Girardin. A more correct idea of its capacities, in our opinion, is suggested by the remark of Lord Walpole, when he represents it as 'proud of no other art than that of softening nature's harshness, and copying her graceful touch.' It has also been said, that it is 'to poetry and painting, what the reality is to the representation,' (Girardin). But experience proves, that the former (the reality) is always exceeded by the latter, both in respect to natural and picturesque beauty. Suppose, for example, any given variety of ground, rocks, and distance, as the basis to be furnished with wood, water, and buildings; the rocks shown, or concealed, as the gardener may wish, or as the genius of the place may require, and every other purpose effected, which is in the power of gardening to perform. When all this is done, it will be a scene greatly inferior in beauty to the imitative creation of a painter from the same ground-work and materials; or, let there be a natural landscape, either of mediocrity or of any given beauty, with every circumstance so arranged, as to be alike suitable for both arts; and let a painter and a gardener, each attempt to copy it according to their art, with or without permission, to improve its beauties. Which of the two imitations would be most beautiful, considered in the abstract, and without reference to any selfish or arbitrary association? Decidedly, in our opinion, the production of the painter. In short, no comparison between the powers of landscape-painting and those of landscape-gardening can be instituted, that will not evince the superior powers of the former art.

The great source of the beauty of every verdant landscape is wood; and so much of the beauty of all woods depends on accidental circumstances, in their progress from the time of planting, till they attain a considerable age, and which circumstances cannot be said practically to be under the control of the gardener, that however high our aim, however we may study the natural effects of time, and however correctly we may imitate them, at the end of all our labors, any wood of art will always be far inferior to a wood of nature under the same circumstances. For further illustrations, we have only to appeal to such painters as have made landscape their particular study, and who certainly must be considered in this case as the best judges with regard to scenic truth or picturesque beauty.

1961. To what *kind, or degree of beauty* then, can landscape-gardening aspire? To this we answer, that, abstracted from all relations of utility and design, it can seldom succeed in producing any thing higher than picturesque beauty, or such a harmonious mixture of forms, colors, lights, and shades, as will be grateful to the sight of men in general; and to such, more particularly, as have made this beauty in some degree their study. This harmonious assemblage of objects may be grateful and agreeable, without being accompanied by any, or at all events, by much general expression; for example, of gaiety, melancholy, grandeur, simplicity, or elegance; but it may also combine one or more of these poetic or general beauties in a high degree, and this, too, with or without being picturesque. It may recall many other pleasurable emotions, if we admit the considerations of fitness, novelty or its contrast to surrounding scenery, and utility or its adaptation to man.

Such is our opinion of the capacities of landscape-gardening. If it is lower than that of some authors and artists, we can only say, that it has been formed from the observation and experience of what actually takes place. The artist may and ought to aim at the highest degree of beauty, which his own imagination, the genius of the place, and the views of the owner, will admit of; but let him not proceed with, or hold out to the world, mistaken views of what his art can and cannot perform.

From this view of the powers of art, it will be sufficiently obvious, that with Price, Girardin, Knight, and other authors, we consider the principles of painting to be those of imitative-landscape gardening, in that view of this term which limits it to 'the art of creating landscapes of picturesque beauty;' and in viewing it as adding to picturesque beauty, some other natural expression, as of grandeur, decay, melancholy, &c. we consider it, with Pope, Warton, Gray, and Eustace, as requiring, both in the designer and observer, the aid of poetic mind; that is, of a mind conversant in all these different emotions, or pleasures of imagination, which are called up by certain signs of affecting or interesting qualities, furnished by sounds, motion, buildings, and other objects.

If, taking a third view of imitative-landscape gardening, as 'the art of laying out the grounds of a country residence,' then, with popular opinion, we comprehend under the term all the above beauties, with those of relative beauty, the principles of which have been the subject of the preceding section.

The principles of landscape-gardening then, as an imitative art, we conclude to be derived from nature.

As developed by the principles of landscape-painting; and,

As recognised by poetic mind, or a mind alive to those general beauties or associations universally felt in civilized society.

We consider this, perhaps, to many a tedious development of the principles of landscape-gardening, called for by the vague and indefinite manner in which they are spoken of by authors, no less than by artists; and, as a proof of this, we refer our readers to the volumes of the late H. Repton, who, whatever may be the merits of his practical taste, has certainly, whenever he has touched on the subject of principles, written in a very unsatisfactory manner.

To those who are conversant with the literature of landscape-gardening, it must appear a very gratuitous task to write a book "with a view of establishing fixed principles" in the art, and to find in such a book, after the publication of the works of Whateley, the two Masons, De Lille, Price, and R. P. Knight, such a passage as the following: "If any general principles could be established in this art, I think they might be deduced from the joint considerations of relative fitness or utility, and comparative proportion or scale; the former may be referred to the mind, the latter to the eye." *Obs. on Landscape Gardening by H. Repton, Esq. Introduction*, p. 2.

While we disapprove of this disingenuous mode of writing, the frequency of which we must regret in this artist's works, we willingly pay tribute to his practical good taste, and more especially in architecture.

1962. We shall attempt, as a proof of the theory of landscape gardening which we adopt, a slight analysis of the *principles of a composition*, expressive of picturesque and natural beauty. For this purpose, it is a matter of indifference, as far as respects picresque beauty, whether we choose a real or painted landscape; but, as we mean also to investigate its poetic or general beatuy, we shall prefer a reality. We choose then a perfect flat, varied by wood, say elms, with a piece of water, and a high wall, forming the angle of a ruined building; it it animated by cows and sheep; its expression is that of melancholy grandeur; and, independently of this beauty, it is picturesque, that is, if painted it would form a tolerable picture.

The first obvious principle which pervades this, or any beautiful or expressive view, is a certain degree of *unity* in its expression. No ideas of gaiety or prettiness are excited by this scene. All the parts unite in forming a whole, which the eye can comprehend at once, and examine without distraction. '*La vue*,' says Girardin, '*le plus vagabond de tous le sens, a besoin d'être fixée pour jouir avec plaisir et sans lassitude.*' Were this principle not prevalent, the groups of trees, the lake, and the building, would only please when considered separately, and the result would be as poor a production as a machine, the wheels of which are accurately finished, and nicely polished, but which do not act in concert so as to effect the intended movement.

Secondly, it is *true to nature;* that is, the objects or materials are what they appear to be. The trees, which are neither very old nor very young, though in the distance diminished by their remote situation, we discover by their trunks and contour, to be still trees. They are not shrubs placed near the eye, with a view to produce a false perspective; nor is the fragment of building merely a disguised wall, because it has openings which have once been windows, and is crowned in one part by battlements. The water is natural, its surface being below the level of the adjoining ground, not raised above it, as is often the case in artificial waters. This completes the truth or reality of the scene.

The necessity of adhering to truth is still greater in painting, in which all objects must appear to be natural, not only in forms and color, but also relatively to the forms and colors around them. Objects, especially those whose forms and dimensions are familiar to us, as men or horses, painted of different heights in the same plane; as, for example, in the distance, of the same magnitude as that in which they appear in the foreground, would, from the acquired habit of measuring unknown by known objects, give a falsehood to the scene, and appear as animals of a different species, or as monsters.

It seems to be from the same principles of being true to nature, that a gradation of scene, or what is called distance, is required, or at least is so satisfactory in landscape. The mind, after being impressed with the effect of a whole, delights in examining its parts in succession; the more simple and obvious the arrangement of these parts, therefore, the more readily does the mind acquiesce in their effect. The eye of the artist, seizing on the nearest and most remote parts of a scene, readily marks an intermediate or middle distance; no given extent seems necessary for this purpose:

> 'To make the landscape grateful to the sight,
> Three points of distance always should unite;
> And howsoe'er the view may be confined,
> Three marked divisions we shall always find.' *The Landscape, by R. P. Knight.*

Thirdly, having been pleased with the impression of this landscape, and having satisfied ourselves that its component parts are individually natural, let us, in the next place, observe their *disposition*, or how in this respect they concur in forming a whole. 1. As to forms, we find that their disposition is in groups or masses. The largest group, for example, is placed towards one side of the picture in the foreground, another towards the opposite side of the middle distance, including the building and adjoining lake; and the remote, or third distance, consists of a low line of wood, with projecting groups or masses. 2. As to colors, we find only different shades of yellow and green on the trees and ground. 3. As to the light, we find one large and principal light near the middle of the view, diverging into shade as it approaches the sides; the clearest part is the water, and the next clearest the building, and the third light spreads over a broad space of ground, near the water. The groups in the foreground are all in a deep shadow. One of these, near the water, partakes of the principal light, and those in the third distance are distinguished by a sort of neutralization of light, color, and shade. Such is the disposition of the groups or parts, in order, in a complex view of the whole, to fix the eye, and prevent it from being distracted by scattered lights, confusion of forms, and inharmonious colors.

We shall next remark the *connection* which subsists between these different groups. 1. They are connected in each distance by a real nearness of situation; and, 2. In the view as a whole, from the one group coming in part before the other, so as to produce connection by apparent proximity. Suppose the reverse to be the case, and that the groups were unconnected either by real or apparent distance of situation, the consequence would be, that each group being surrounded by light, would become a distinct object. The eye would have no resting place, and the assemblage would compose a whole.

What comes next to be examined, is the *relation* which subsists between the parts composing each individual group. 1. In regard to the form of the parts of each group, as they are all groups of the same sort of tree, we find one elementary form prevalent, but differing in magnitude, and in combination, by their contrasted disposition, to such a degree, that each group differs in form from the others, without at the same time being of opposite forms.

In regard to *color*, the same kind of color prevails in each and in all of the groups, but is varied in degree by the same contrasted disposition. In some parts a yellowish green prevails, in others a greenish yellow, in others a russet or red-green, and occasionally a bright green, as on that part of the turf where the light strikes with the greatest force.

In regard to *light and shade*, those parts of the groups which rise above the horizon, and are backed by the sky, are dark, and generally darker than such as are backed by the ground, or by other adjoining groups. The prominent parts of each group, are lighter than the retiring parts or recesses among the spray and leaves. These prominent and retiring parts, in the near groups, are very numerous; in the distance they are lost in the general ærial shade of the group. It may be observed as a general principle, that trees, from their rough surface, and consequent imperfect reflection of light, are always comparatively darker than water, buildings, or ground. In creating real landscape, they serve in some measure as shades, as the other materials mentioned serve as lights.

We have said nothing of the sky, the cows, and sheep. Suppose, then, in order to complete this sketch, that we represent the sky as merely grey and cloudy, and the cattle and sheep grouped in the middle distance, what will be the expression of the view? We think it would express very little to general observers; but there being nothing glaringly offensive in the arrangement, it would be expressive of some beauty to him who had bestowed some attention to the subject of landscapes; for though it exhibits but little harmony of forms and colors, light or shade, it still possesses enough of these ingredients to render it worth looking at as a picturesque view.

It remains to account for the general or natural expression of melancholy and grandeur. For this purpose, let the building be the ruins of an ancient castle, whose lofty quadrangular form may be readily imagined from the walls we mentioned, as composing a part of the scenery.

The character of grandeur, then, is not in this instance communicated to the picture, by the picturesque effect of the walls, which have no variety of form, light, or shade, in themselves, but by the mental associations to which they give rise in a cultivated mind.

It will not be supposed from this, that we mean to recommend the introduction of artificial ruins in improved scenes, we have merely made choice of this expression, as very obviously pointing out the distinction between picturesque and poetic beauty, or beauty derived from other associations. We shall add a few other examples.

1963. Imagine the cattle and sheep removed, the surface of the ground covered by smoothly mown turf, and the luxuriant branches of some of the foreground trees nearly reclining on the ground. The first expression would be that of beautiful, or *elegant picturesque;* the next that of stillness, and consecration to man, — stillness, as being without animals or moving objects; and consecration to man, from the mown surface, greatly heightened by the circumstance of the branches of trees reclining on the ground, which never can happen where sheep or cattle are admitted, and which forms the leading visible distinction between a group of trees in a park, and a group on a mown lawn. It is not from the smoothness of the turf, or any particular mixture of light and shade in the reclining branches, that this expression is produced, but from reflecting on the cause of this appearance.

Imagine, instead of the smooth turf, uncouth rough ground, covered in some places with furze, briars, brambles, and tangled thickets; the water fringed with rushes, and partially concealed by aquatic shrubs; and wild horses and deer forming the animated part of the scene. The expression would be eminently picturesque; but there would also be an expression of wildness, not resulting from the picturesque qualities as such, but from mental reflection on the difference between this scene and one of cultivation.

Imagine the view deprived of the lake and the building, and consisting only of the wood and ground, with the heads of a straggling row of willow trees appearing in the middle distance, and the sound of a distant waterfall heard through the trees. Here, to picturesque beauty we have an idea of water — of an immense body of it in the lake or river which supplies the waterfall — and of the rocks, which oppose their powerful obstruction to a body of water. The reader will here remark, how much of the sublime beauty of this scene depends on sound, which can never be included under picturesque beauty. The leading expression is that of sublimity, accompanied by various associations of dignity produced by the rocks, and of grandeur suggested by the stream, after the waters have renewed their tranquil course, and rolling, as we may imagine, majestically along under the shade of the line of willow trees.

Other examples, of a more striking nature might be adduced; but these instances we consider sufficient to show the difference between a composition merely picturesque, and one expressive of general or natural beauty, and to prove our position, that both poetry and painting enter into the principles of imitative landscape-gardening.

They will also show, how very little the production of natural beauty is within the power of the landscape-gardener. He may display it to more advantage. In the first example of expression, for instance, the building, or such parts of it as more obviously show its real character, might be displayed by the removal of some over-obtruding branches; and in the second, a garden-seat, and some garden-trees, as the lime, cedar, &c. might add to the idea of consecration to man. In the third, a corn-field or a barn in the distance, would aid the effect by contrast; and in the last, a bridge would determine the situation and reality of the river. But to attempt effecting these expressions by building a ruin, placing a garden-seat in a paddock, or erecting a bridge where there was no water, would, however common in the infancy of the art, be now justly considered ridiculous.

Much more, it is true, might be done in improving the picturesque beauty of each of these scenes, provided the trees were already grown to maturity, and too numerous rather than too few; but if the trees are yet to plant, it is evident that only the ground-plans of the masses and groups of trees, and of the breadth of the lawn, could be formed by the artist."

Since the introduction of the modern style, it has been a very common error to suppose that picturesque beauty is the only beauty to be aimed at in laying out grounds; but so far from this being the case, it will often happen that the alterations required for the purposes of convenience and character, will lessen that beauty, whilst it increases that of dignity, refinement, and appropriation to man. As an example, we may refer to Rivenhall Place, in its state before being improved by H. Repton, (*fig.* 522.) and the

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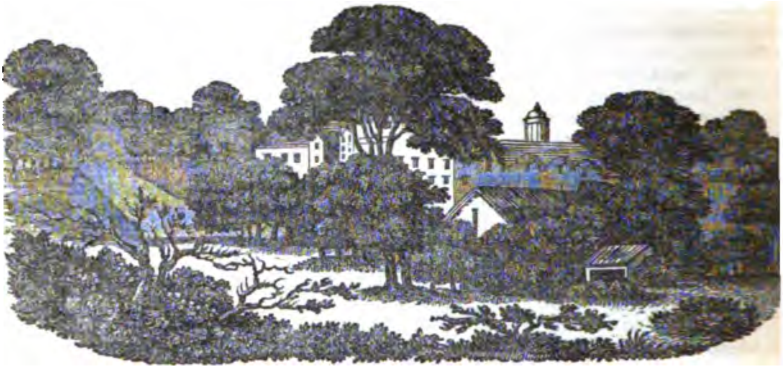

same residence subsequently to improvement, or as intended to be improved (*fig.* 523).

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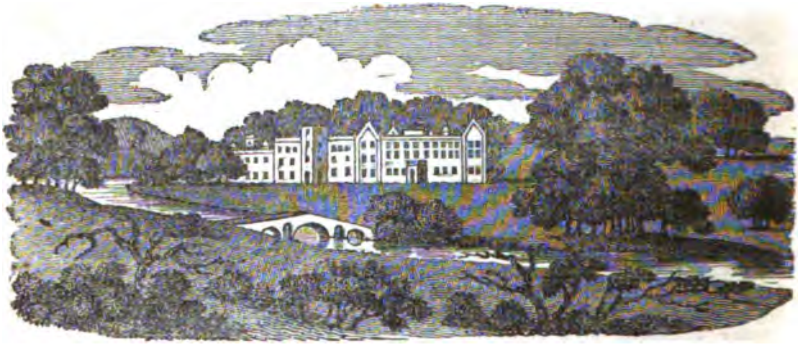

Chap. II.

Of the Materials of Landscape-Gardening.

Whatever style of gardening we adopt, the materials with which we work in order to obtain the desired effects are the same. Those of nature, are ground, wood, water, and rocks; to these, art has added buildings, roads, walks, fences; and animated or moving objects, sounds, &c. may be considered as accompaniments only partially under our control.

Sect. I. *Of operating on Ground.*

1964. The operations of art on this ponderous material are necessarily of a very limited description. The most extensive and costly operations, to restore or create natural surfaces, even when attended with the desired effect, afford less permanent gratification to personal feeling than most other improvements. If a deformed space has been restored to natural beauty, we are delighted with the effect, whilst we recollect the difference between the present and the former surface; but when this is forgotten, though the beauty remains, the credit for having produced it is lost. In this respect, the operations on ground under the ancient style, have a great and striking advantage; for an absolute perfection is to be attained in the formation of geometrical forms, and the

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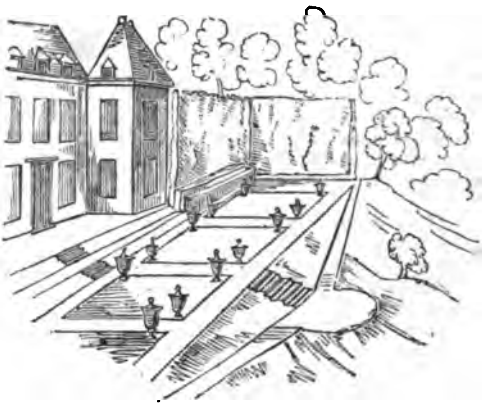

beauty created is so entirely artificial (*fig.* 524.) as never to admit a doubt of its origin. Long, therefore, after the improvement is finished, the credit and the beauty remain to gratify and charm the owner. Improvements on surfaces, whatever be their object, ought to be made in scenes which are near the eye, or intended to be frequently seen; at a distance they are lost if the effect be on a small scale, and often better effected by wood, if on one of considerable magnitude. All operations on ground may be included under, 1. Those which have for their object the beauty of art or design; and 2. Those where natural beauty is intended to be produced.

1965. *Operations with a view to relative or artificial Beauty.* The forms in use for this purpose are few and simple. They originate in, and are influenced by, those of the house; and are, for the greater part, bounded by right lines; and the surfaces are levels or slopes of different degrees of abruptness. The magnitude as well as form of each of the figures in the ground immediately adjoining a house, or in a detached walled enclosure, should be regulated chiefly by the magnitude of the mansion, or extent and grandeur of the whole place, though they are often obliged to conform, in some degree, to the natural surface. When the ground slopes from the house in all directions, narrow parallelograms will be the prevailing forms both of the levels and slopes. The broadest level, and greatest perpendicular depth of slope, will generally be placed next the house, and the next broadest level, &c. in succession, till, after three or four levels, and as many slopes are obtained, the artificial surface shall finally blend with the natural; unless, as is frequently the case in the geometric style, a kitchen garden wall, or some similar work of art forms the termination. In this case, separation by some architectural or other accompaniment, will, by forming a break in the order of forms, admit of adopting, in continuation of the artificial surface, such levels and slopes as the character of the scene may require, or a due regard to economy dictate. When the mansion, or scene of operations, is on a surface naturally flat, the levels will be of greater dimensions, the slopes smaller, and both fewer in number. But though parallelograms are the common figures employed, sections of polygons, trapeziums, circles, and curvilinear figures, are frequently admitted. They are used in architectural elevations, and in fortifications, which are the prototypes of this part of ancient gardening; and, therefore, when apparent in the mansion, should be reflected, as it were, by the grounds. (*fig.* 525)

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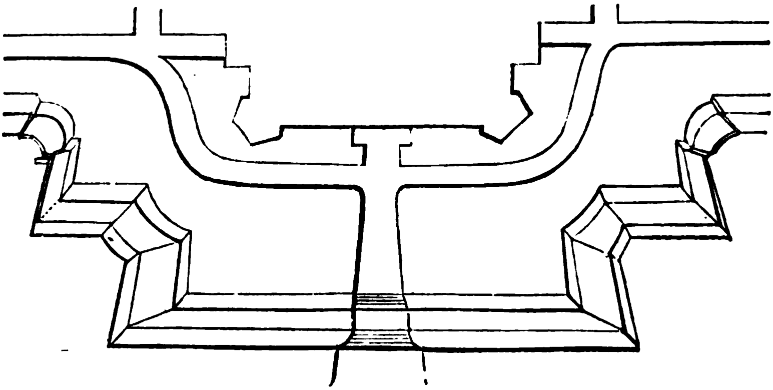

The forms to be used, however, is a matter easy to determine. The principal difficulty is to arrange them together, so that they may concur in producing a whole or a good effect. In disposing, connecting, relating, and contrasting them for this purpose, the artist will preserve regularity and uniformity in the complex view of the whole, varying and harmonizing the detail according to the degree of beauty and variety he intends to produce. If he has duly prepared his mind by theoretical studies, and practised architectural and landscape drawing, his own feeling of their impression will suggest when he has attained the desired effect; for the models of artificial surfaces which remain of ancient gardens are poor productions compared to what might be created in this way, through the judicious application of the principles of relative beauty.

1966. *Natural Beauty of Ground.* As the right lines and geometrical forms of the architect, take the lead in grounds of artificial beauty, so the flowing and broken lines, and undefined forms of the landscape-painter, take the lead in those of natural beauty. To create them in ground, is generally impracticable and unadvisable; but where they exist concealed by accidental deformities, or incomplete in expression, through dullness in their leading features, art may relieve from the impediments to beauty, even though the situation is at some distance from the eye. In recluse scenes immediately under view, art may aspire to create beauty even from a tame flat, but especially from its opposite, a flat abounding with deformities. In effecting all those purposes, the same principles apply. The first thing to fix in the mind is the desired surface, or that style of natural ground which is best to be imitated. The next thing is to examine on what parts, forms, and lines, the natural beauty of this ground chiefly depends; if undulating, whether the concave or the convex prevails; if broken ground, whether horizontal and perpendicular, or curved and inclined lines prevail. These are then to be imitated in the improvement, ever keeping in view the important principle of a whole as the end of the connection, and harmony of the parts of which it is composed.

1967. *The Removal of accidental Deformities* forms one of the commonest operations on ground. Old quarries and other pits, useless cattle-ponds, open drains, mounds of earth, marks of ridges, are to be considered of this description. As they have been raised by art, so in dispersing them, the best general rule is to restore the natural surface; but sometimes the remains of fences are so numerous, that advantage may be taken of the earth to be removed, and some variety given to a surface otherwise dull and featureless. If the fence consists of a great number of turns of different lengths, by removing both the mound and part of the surface on each side of the drain, a small winding hollow or vale may be formed: the effect of which may be heightened, by placing the earth removed on adjoining indications of natural eminences; not so as to form knolls, but so as to connect and harmonize with the prevailing idea of expression. The most simple and obvious improvement of exhausted quarries and dry pits, is to plant them (*fig.* 526.); but this, though it will form a series of pleasing scenes, is not always consistent with the general expression to be created, and such groups as would arise from these spots, might destroy breadth of light and connection, independently of excluding distant objects. In this case, they must be filled up by under-growths, or by lowering the adjoining surface in such a way as not to interfere with general effect, or a sufficient descent for the surface-water. Where broken ground enters into the idea of the composition to be effected, open drains, or hollow pits, afford fine sources of picturesque beauty, especially if the ground is dry, or can be readily under-drained. This character, however, can seldom be introduced as an original feature; but in ground naturally leading to abrupt and broken lines, it may be more desirable to improve this expression, than attempt creating a more polished surface.

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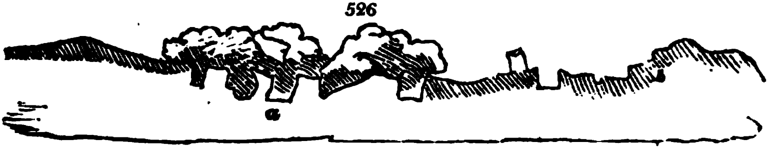

In cases of this sort, almost every thing depends on the introduction of wood, copse, and verdant roughnesses, to harmonize the broken surface; for mere broken ground, without a character of luxuriance and wildness communicated by wood, is seldom better on a smaller scale than a surface deformed by scars.

1968. *Natural Bumps or Excrescences*, (*fig.* 527. *a.*), as well as pits (*b*), are not un-

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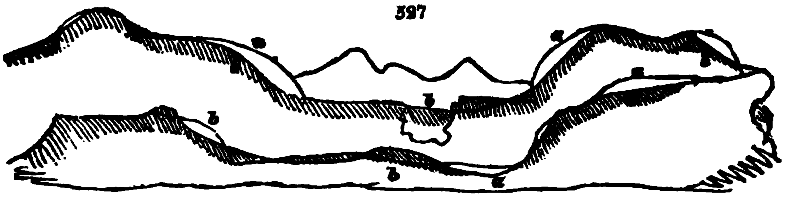

common in many grounds which have not been subjected to agricultural improvement. When these are not large, the process of fallowing with the plough will remove them; when they are of some magnitude, they may often become sources both of polished and picturesque beauty. If they are numerous and so distributed, as that by the removal of some, and the enlargement through that means of others, they may give an impression of undulation, especially if situated on a naturally irregular surface. If on a declivity, and covering rocks or huge stones, a mixture of flowing lines with abruptnesses may be happily introduced.

1969. *A varied but yet dull Surface* may often be improved by a skilful artist. By studying the character indicated by nature, it will generally be found, that the deficiency of expression is owing to the hollows being in part clogged up, either naturally or by long continuation under the plough; and the swells lowered in a corresponding degree by the same process. In this case, the obvious improvement is to remove earth from the hollows, and place it on the eminences, ever keeping in view the natural expression, and avoiding to end the improvement, by leaving the hollows gutters, and the eminences pointed ridges. This sort of improvement is not a very obvious one, though often attended with surprising effects, for every foot of depth taken from a hollow, and laid on an adjoining hill, adds two feet to the height of the latter.

1970. All these observations will be understood as referring to grounds near the house. *Distant scenes* of a park, hills, or mountains (*fig.* 528.), are only to be improved by

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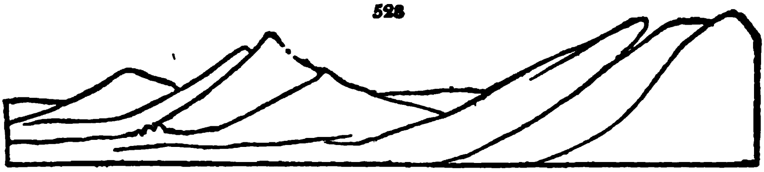

wood; and these remarks, in so far as they extend, will suggest not what is to be removed, but what must be concealed. Many excellent remarks on this part of the subject are to be found in the picturesque tours of Gilpin, referring to ranges of hilly scenery in different parts of the country, of much of which he has given views. With respect to ground, as respects garden-scenery, almost the only writer who has treated of it at length, is Whateley, whose excellent book so frequently referred to by all succeeding writers on gardening, ought to be in the hands of every man of taste. In the chapter on ground in that work, the author concludes with a salutary caution, which ought ever to be taken in connection with the wisest rules; 'a caution which has more than once been alluded to, must always be had in remembrance; never to suffer general considerations to interfere with extraordinary great effects, which rise superior to all regulations, and perhaps owe part of their force to their deviation from them. Singularity causes at least surprise, and surprise is allied to astonishment. These effects, are not, however, attached merely to objects of enormous size; they frequently are produced by a greatness of style and character, within such an extent as ordinary labor may modify, and the compass of a garden include. The caution, therefore, may not be useless within these narrow bounds; but nature proceeds still farther, beyond the utmost verge to which art can follow, and, in scenes licentiously wild, not content with contrast, forces even contradictions to unite. The grotesque, discordant shapes which are often there confusedly tumbled together, might sufficiently justify the remark. But the caprice does not stop here; to mix with such shapes a form perfectly regular, is still more extravagant; and yet the effect is sometimes so wonderful, that we cannot wish the extravagance corrected.' " *Obs. on Mod. Gard.* p. 23.

Sect. II. *Of operating with Wood.*

1971. Almost all the grand effects in both styles of improvement are produced by wood, which, whether in scattered forests, thickets, or groups, or in compact geometric squares, avenues, or rows, constitutes the greatest charm of every country. Trees improve the most varied outlines of buildings (*fig.* 529.), and without them the grounds of a resi-

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dence (*fig.* 530.) would often be nothing more than an unmeaning profusion of winding roads or walks. A tree in itself is, indeed, the noblest object of inanimate nature; combines every species of beauty, from its sublime effect as a whole, to the most minute and refined expression of mind in the individual beauty of its leaves; exhibits that majestic uniformity and infinite variety which constitutes the essence of relative beauty, and the natural expressions of individual species are as various as are their forms and magnitude, their utility to man, and the situations, soils, climates, and other general and accidental circumstances of which they are indications.

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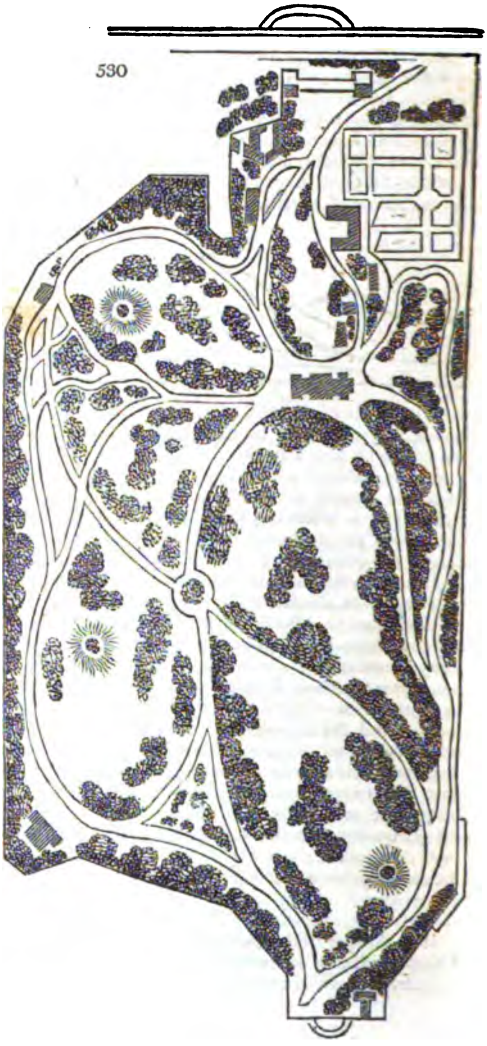

Having already entered on this subject at length in the preceding book, we shall confine ourselves here to a few general observations on the effect of planting in the geometric and modern manners.

1972. In planting in the geometric style, the first consideration is the nature of the whole or *general design;* and here, as in the ground, geometric forms will still prevail, and while the masses reflect forms from the house, or represent squares, triangles, or trapeziums, the more minute parts, characterized by lines rather than forms, such as avenues, rows, clumps, and stars, &c. are contained in parallelograms, squares, or circles. In regard to the parts, masses and avenues should extend from the house in all directions, so far as to diffuse around the character of design; and as much farther in particular directions as the nature of the surface admits of, the distant beauties suggest, and the character of the mansion requires. In disposing these masses, whether on a flat or irregular surface, regard will be had to leave uncovered such a quantity of lawn or turf as shall, at all events, admit a free circulation of air, give breadth of light, and display the form of the large masses of wood. Uniformity and variety as a whole, and use as well as beauty in the parts, must be kept constantly in view. Avenues, alleys, and vistas, should serve as much as possible as roads, walks, lines of fences, or screens of shelter or shade; but where this is not the case, they should point to some distant beauties, or near artificial objects, to be seen at or beyond their termination. The outer extremities of artificial plantations may either join natural woods, other artificial scenes, cultivated lands, or barren heaths or commons.

When artificial plantations join natural woods, the avenues, alleys, and circular glades of the former may be continued a certain length in the latter, so that the point where the natural wood begins, and the artificial plantation ends, may not be discoverable. In aid of this effect, the sort of tree which prevails in the natural scenes, should also prevail in the adjoining parts of the artificial wood. When artificial scenes join other artificial scenes, nothing can be easier than by the reciprocal continuation of avenues, strips, or masses, so far to unite the two seats, as to conceal the boundaries of each, while the two mansions will thus each borrow a splendor from the other.

There are still existing proofs of the attention paid to this subject in former times, an instance of which occurs in the apparent connection by avenues between Blenheim, Ditchley, and Heythrop, though the last mansion is nearly ten miles distant from the first.

When artificial scenes join cultivated lands, if those lands are enclosed, broad strips, hedge-rows, square or round clumps in the angles of the fields, with such reciprocal disposition of lines or forms as the case may suggest, will continue the character of artificial plantation; and where roads are necessary, if utility does not forbid, they should be formed in part as avenues, in continuation of those within the artificial scene.

When artificial plantations are bounded by barren heaths or commons, all that can be done is to advance beyond the boundary of the place, portions of avenues, and rows of trees of different lengths. Sometimes an inequality, crowned by a clump or thicket, may promote the idea. On other occasions, where the heath or waste may be so bleak as to convey no agreeable expression, and therefore is, of course, struck out entirely from the improved scene, a sort of connection may be given, by advancing strips or rows from the boundary plantation into the heath. Even single or scattered trees, if they can be protected in that situation, will have a tendency to produe that sort of connection required; and, while it gratifies the proprietor's love of appropriation, will please the eye of the traveller, who views the country as a whole, and delights to observe the harmony and beauty of its principal features.

Having disposed of the whole, and of the parts, as far as respects their general effect and connection, what remains to be considered is, the sort of tree, manner of disposing the plants, fences, and future management.

1973. The object in view, the expression of art and design, suggests the propriety of employing *different species of trees* to those which are natural to, or most abound in the surrounding country. In a country of common pine; the spruce and silver fir, and cedar, afford a choice. In a country of oaks or elms; chestnuts, limes, and planes, form suitable contrasts. Where the plantations are extensive, the value of the timber must always be a principal object; and, therefore, the contrasted trees should be chosen accordingly. Some species, however, are so happily adapted for this style, and as ornamental trees in both styles, that they ought seldom to be admitted excepting near the house: such, for example, as the horse-chestnut, lime, Spanish-chestnut, plane, lucombe oak, cedar, stone-pine, &c. As the four last species mentioned are in exposed situations, liable to injury from extraordinary severe winters, a few hardier sorts, resembling them in general appearance, should be intermingled in the plantation, to preserve the larger masses in case of accident, but to conform with the general effect in color and style of foliage, as well as in form. Different species ought not in general to be mixed together in the masses; one, or at most two, conforming varieties is sufficient; more would destroy the breadth of color of the mass, and the character of its surface. Different masses, avenues, and more minute parts, may, however, be planted with different species of trees; rare sorts may be also introduced in lines, along the front of many of the masses, ranged along stars, *pâtés des oyes*, &c. The snow-drop tree, from its beautiful blossoms, and the birch and hazel, for the display of their catkins during winter, are well calculated for walks adapted to that season of the year, and should be planted in front of pines, or other evergreens. Such also is the principal situation for flowering shrubs, and no plants can be more showy than the horse-chestnut, common lilac, acacia, guelder-rose, Portugal-laurel, holly, birdcherry, mespilus, and laburnum, in similar situations, and for general purposes. In distributing the species of tree in extensive masses, the same general principles of composition must be attended to, which we have pointed out as far as respects form. The colors and character of the heads of the trees must be connected, and, at the same time, to a certain degree contrasted, in order to produce an artificial and yet harmonious effect.

1974. It may perhaps be asked here, whether the *new varieties* of American, and other shrubs, obtained since the introduction of landscape-gardening, are to be admitted under this style of improvement? We answer, certainly, unless where the object is the imitation of an ancient residence (*fig.* 531.); and there can be no doubt that were such is the object, exotic trees will destroy part of the allusion; but we do not contend for the revival of the ancient style solely as producing imitations and illusive characters, or on account of its antiquity, but as a distinct mode of gardening. We would therefore not copy its faults, or study its defects, but add to its beauties from all the resources furnished by the present improved state of the arts of design, as well as by the continued accession to our stock of trees and shrubs.

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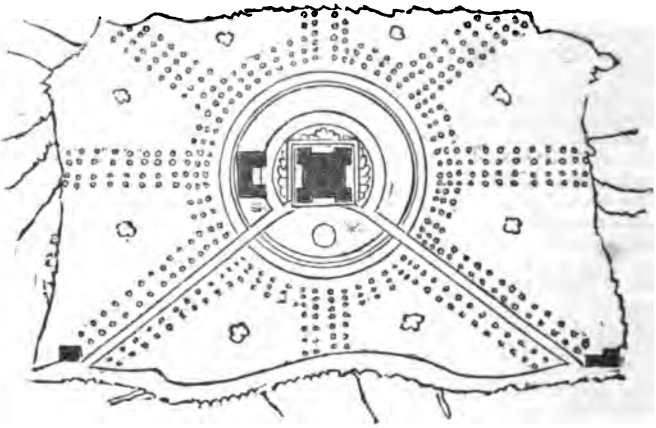

The manner of disposing the plants is influenced by the same principle of avowed art; in rows, equidistant masses, in squares, or in quincunx, and in every case so as never to be mistaken for trees or shrubs sprung up accidentally.

1975. *Fences.* Here the ancient style has a grand advantage over the modern, in which, as far as respects the imitation of nature, all fences are to be considered as temporary, and, therefore, to a certain degree, looked on as nuisances to be afterwards removed. Besides, their irregular and circuitous line is displeasing to many who do not understand ground-plans, with a view to picturesque beauty, when the trees are grown up. But in geometric gardening, fences are to be considered in many cases as objects, and when not regarded in this light, their directions and limits are so minutely pointed out by the determined outline of the plantations, that the eye acquiesces in their situation and use. Fences of any common and economical description are employed to protect the trees of open avenues, open groves, and single open rows. But the more common kind are walls, which in the prominent parts ought to be well built of shaped stone, and substantially finished by raised or flat copings, bearing some relation to the copings of the simpler parapets of the house. The gates necessary in these walls, as well as in some sorts of permanent verdant fences, supply occasion for such architectural forms and lines, as are advantageous in reflecting those of the mansion, and strengthening the prevailing idea of dignity, art, and design. Every sort of fence belonging to the modern style, may be occasionally employed in the ancient; and besides walls, half sunk walls, and raised mounds with a walk at top, we may enumerate hedges of holly, yew, laurel, and other shrubs, either simple or chequered, by alternate deciduous or evergreen species, varied by arcades and standards, shorn into shapes, or in their natural growth. Hedges of flowering shrubs may also be introduced; of creepers on open pallisades; and various others of great beauty may be invented, or are to be found in books on this style of gardening.

1976. *Management.* In this respect also, the advantage is greatly in favor of the ancient style; for as all operations of pruning and thinning in the other should be done under the eye of the landscape-gardener, so all these operations here may be performed by any laborer; the object being simply to produce a straight, upright, smooth stem, to a certain height according to circumstances, and allow each particular tree to attain its full size. Shearing or clipping is always a mere mechanical operation; plain hedges and close alleys require only a line for a guide; and in the case of arcades or verdant sculpture, there is, or always should be, a frame of trellis-work of correct design to guide the operator.

From the comparative brevity of this view which we have taken of planting under the ancient style, the reader will perceive, that we are far from supposing it to take the lead of the natural method to which we now proceed, referring for more particular information to Le Blond, and other French authors; and to Switzer's *Ichnographia Rustica.*

1977. In planting with a *view to natural beauty,* the effect of the whole is here also the first and the grand consideration. All planting, as respects the formation of a country residence, must necessarily be materially influenced by the character and situation of the house, as the capital feature in the composition. To this feature, the leading masses of wood and lawn, answering the end of light and shade in painting, must invite and direct the eye in the general view of the place (*fig.* 532.). Each must embrace it on one or on more sides, and diverge from it in masses suitable to its magnitude and the extent of the grounds, and in forms and characters of woody surface, suitable to the natural situation and the expression to be created. If the mansion is on a declivity, the principal light should embrace the front which looks down, rather than those which look up, or on either side. The views from the windows suggests this arrangement, and will point out in every other situation, whether a flat, a hill, or an irregular surface, on which side or sides the leading masses are to have their origin. To determine their magnitude, form, and number, would be impossible, without a particular case to refer to. To point out their style is sufficient, which must always be irregular like nature; generally stretch along such rising grounds as the situation affords; and, like her, always combine a certain degree of uniformity or recognizable shape, even amidst the greatest seeming deviations from this quality of figures.

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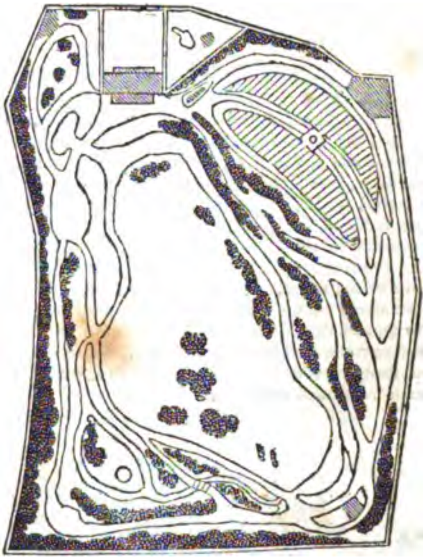

As the house indicates the commencement of the masses, the character of country surrounding the scene of improvement must determine the limits and style of their termination. If the lands are laid out in regular enclosures, bounded by hedges and hedge-rows, fragments of these (*fig.* 533.) must prevail in the margin of the park; at least in as many places, and to such a degree, as will produce connection; and, if possible, as much farther as will harmonize the scene within, with the country without. If it is entirely or in part surrounded by forest scenery, the termination is easily and completely effected, by attending to the style of wood and species of tree

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colors, the shady recesses and flickering lines of light, all depend on trees. These are not to be sparingly or indiscriminately scattered around the margin, but liberally in some places, for the sake of a contrasted mass of grateful color or shade, to relieve the brilliancy of the water; and with discrimination every where to mark the beauties, and heighten the variety of the outline, without destroying breadth of effect, or a whole, either as respects the water alone, or the entire residence.

1983. The *marginal banks* of water in nature, are tame or bold, gravelly or sedgy, stony or rocky, according to the character of the surrounding ground. Art, therefore, must imitate each in its proper place, not always by a studious picturesque arrangement of the marginal accompaniments in each case, but by excavating the ground-work, planting the trees and shrubs, and leaving the rest to the motion of the waves of the water. After the effects of one winter, stones or gravel may be deposited in spots suitable for stony or gravelly shores. But to enter into this, and many other circumstances in the imitation of lakes, would exceed the proper limits. We add two cautions: the first is, in all cases of the beautiful picturesque, so to arrange by puddling and under-draining, that a marshy appearance may not surround the lake; and that rushes, and such aquatic plants, may not extend farther than a few feet or yards from the margin of the water. The other respects islands, which are the greatest ornaments to lakes. But that island which is placed in the centre, or in any situation where it does not connect with other islands, or with the shore, so as to form part of a prominence or recess, is injurious to the effect of the whole inversely as its beauty, when properly placed.

1984. *Rivers and Rills*, we have said, are rather to be improved than created; for we cannot sympathise with that taste which directs the mimicry of so noble a character as a river, or is satisfied with a nearly stagnated rill. We do not consider the river at Blenheim as an exception, because that piece of water was formed by widening a considerable brook. We allude to those wavy serpentine canals, which are never mistaken for natural scenes, and, in almost every case, might be advantageously exchanged for a lake. A rill, however, may have its course rendered more varied, may be expanded at proper places into regular shapes, and all the alterations accounted for and harmonized by planting. (*fig.* 539.)

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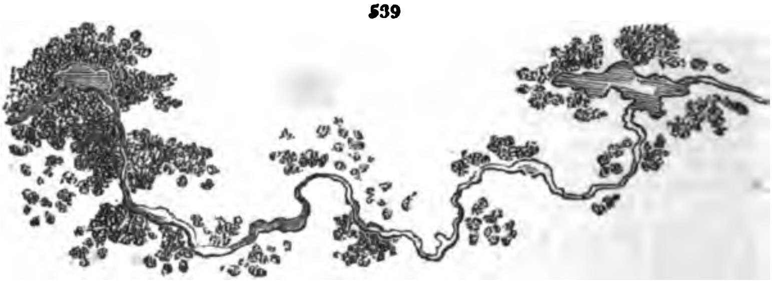

1985. The two leading ideas which belong to running waters are, *progress* and *impetuosity*. The first expression may be heightened by counteracting any tendency to expansion; by removing some of the circuitous and oblong projections of earth or stone in the banks; and sometimes by deepening its bed, or by substituting a more direct line for a circuitous course. The idea of impetuosity is indicated by its effects, in reverberating against high banks, or common banks, on which trees are situated, and may be increased by augmenting the cause or the effect, and thus either digging and undermining the trees, cutting down the high banks on which the water acts, or placing very slight piers as jetties on the opposite shore. Picturesque additions to the marginal accompaniments both of rivers and rills will readily suggest themselves. Cascades and waterfalls may sometimes be created; and the occasional expansion of natural brooks into pools, affords a fine hint for imitation, when this form of water comes within a scene of improvement.

One of the greatest improvements that can be made in many places laid out in Brown's time, and subsequently, consists in widening in some places, and varying the margin in others, of those tame serpentining canals, then so much in fashion. By this means, and by adding islands and trees, they may often, without deranging the place as to other details, be rendered highly beautiful at a moderate expence. (*fig.* 540.)

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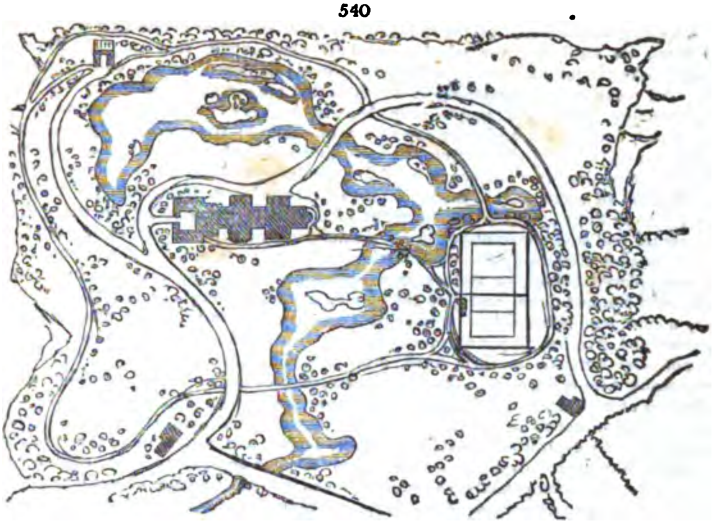

1986. Where a running stream passes through a demesne, an obvious improvement is to form a waterfall or cascade, (*fig.* 541.), by first constructing a bank of masonry, presenting an inclined plane (*a*) to the current, and rendering it impervious to water by puddling (854) or the use of proper cements, and next varying the ridge (*b*) and under side (*c*), with fragments of rock, so chosen and placed, as not to present a character foreign to what nature may be supposed to have produced there. The adjoining ground generally requires to be raised at such scenes, but may generally be harmonized by plantation.

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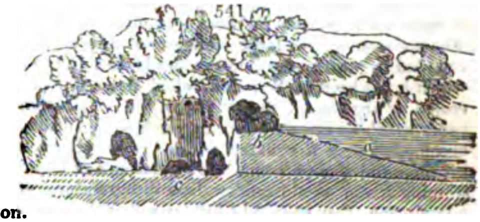

1987. Where running water is conducted in forms belonging to the geometric style of gardening, waterfalls and cascades are constructed in the form of crescents, flights of steps, or wavy slopes; all which have excellent effects of their kind when appropriately introduced, as at Chatsworth, Hatton, and many other places.

1988. A natural stream may sometimes be improved by altering its direction, and bringing it through a more interesting part of the grounds; and we have known an admirable effect produced by bringing a distant river close to the house, even so much so as to wash the base of its terrace-wall, (*fig.* 542.).

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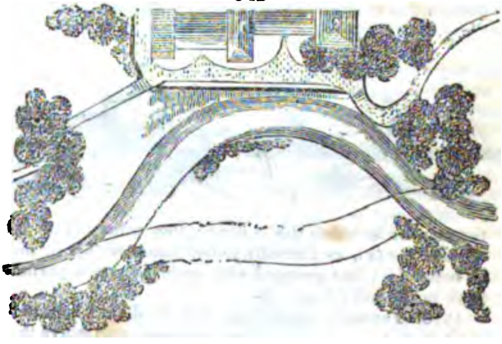

Sect. IV. *Rocks.*

1989. It forms no part of the geometric style of gardening to imitate rocks, which are a material of the natural style, equally unsuitable to be created. But though rocks cannot readily be imitated, their expression may sometimes be heightened when desirable, and concealed when disagreeable.

The character of rocks may be savage, terrific, sublime, picturesque, or fantastic. By attending to the forms of the milder characters, and their connection with ground and trees, we shall discover whether, and to what extent, they may be improved. Savage rocks are too inhospitable to be permanently admitted, in any extent, near the eye. All rocks convey something of this idea that are not accompanied by vegetation; and, therefore, planting among or near them is, in every case, an improvement where trees do not exist. All rocks are expressive of dignity; those eminently so, are not greatly varied by projections from their surface: their beauty is to be augmented, either by increasing their surface in height or depth, or by connecting it if too scattered. The removal of a few feet of earth, or part of the bushes or trees from the bottom of a precipice or ridge, and the implacement of a line of wood along its summit, will increase its real and apparent height; a similar process, with respect to the sides, will add to the idea of stability and continuation. If the parts are too much scattered, a few trees placed before, or bushes or creepers planted in the intervals between the parts, will connect them, and give the idea of a whole, partly concealed. But in this case, a considerable breadth of surface is necessary, at least in one place, otherwise dignity must give way to picturesque beauty. But the least indications of rocks that are not very fantastic in their form, even including such whose chief expression is picturesque beauty, are, to a certain degree, expressive of dignity. The slightest indication of a stratum or ledge appearing above the surface, conveys something of this idea, and ought not to be neglected. When they are discovered by alterations in the ground with a view to the formation of roads, fences, and water, or to the erection of buildings, occasional advantage may be taken of their appearance. A road across a declivity may be accompanied by a ledge of rocks instead of a bank of earth. Grounds which are broken and picturesque, will display a more sufficient reason for the appearance. The walls of a terrace evidently, in part founded on a rock, will give an idea of dryness, dignity, and security to the house; and the margin of a stream displaying even large stones, increases the idea of impetuosity; or, in lakes, of the action of water in washing away the earth. Among imitations of wild scenery, detached stones heighten the illusion, and carry back the mind to the aboriginal state of the country. Loose or detached fragments of rocks may often aid the effect of real or supposed masses. The appearance of a large rude stone near a wooded steep, unless of one evidently rounded by water or art, always leads the mind to the larger mass up the acclivity from which it has been broken and rolled down; if partly sunk in the ground, and concealed by vegetation, the fertility of the imagination considers them as parts of magnitudes which lie buried under the surface. All this, however, can only be successfully accomplished in a country which, by the character of its general surface, does not preclude the idea of rocks. On a flat or a champaign country, the want of truth, or seeming truth, would render them disagreeable; and, indeed, did rocks exist in such a landscape, they should be hidden rather than displayed, unless of such extraordinary magnitude and effect, as to form an exception to general principles.

In situations where rocks and stones are not evidently foreign to the character of soil and surface, wildness and picturesque beauty may be greatly heightened by the judicious distribution of stones on the surface (*fig.* 543.). Every thing, however, will depend on the manner in which this is done; they must not be merely laid down at random on the surface (*a*), or formally joined together (*b*), or merely connected, which, however, is better (*c*); but grouped with taste (*d*), and partially concealed by vegetation and sunk in the soil (*f*, *g*.)

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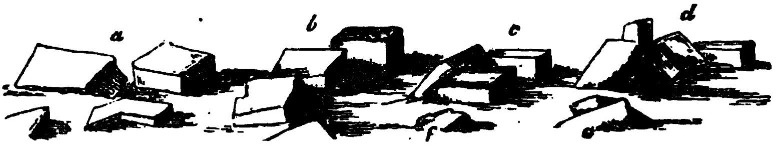

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1990. Fantastic stones (*fig.* 544, *a*) should be avoided in all cases, unless in some peculiar scene; and where there are already indications of stratified or regular masses of rock (*b*), it can never appear natural to place near them round, water-worn stones. (*c*)

Where angular and laminated stones are near; or where such as can be quarried in forms suitable for building may be procured, grand effects may be produced; either by using them in forming imitations of nature, or by combining them in a mixed style of artificial form and natural conglomeration (*fig.* 545.).

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Sect. V. *Buildings.*

1991. Buildings, as materials of scenery, are entirely under the power of man; and, from that circumstance, were carried to an unwarrantable excess in the decline of the ancient, and the infancy of the modern, style. Improvements on ground are forgotten by their effect; that of planting may be accounted too distant or too slow by ordinary minds; but a building is complete the moment it is finished. It affords immediate satisfaction to the owner; and being known as a costly object, full credit is given to him for the expence incurred. Thus wealth, confiding in its powers, multiplied garden buildings to an excess, which ended in creating a disgust, still existing, in some degree, at their appearance in improved scenery.

Before proceeding further, it may be proper to offer some remarks on the style or architecture of buildings. It is a common error to consider nothing as architecture that is not Grecian; to fancy that all architecture must have what are called orders; and to consider the Gothic, Chinese, or Hindoo modes of building, as mere barbarous compositions. But nothing can be more unphilosophical than this mode of viewing the subject; and it may just as well be said that there is no true language in the world but the Greek; that every language ought to correspond with it in the tenses and moods of the verbs; and that every other mode of speech is mere jargon.

A style of building, and mode of oral communication, must have a sufficient claim to be considered as complete, when they answer the purposes for which they are intended; and, applying this principle to the architecture and language of different countries, we shall find that each is complete relatively to those countries. That any style of building, or any language can be universally suitable, is to suppose that the same climate and the same degree of civilization prevails over the whole globe. Thus, as there are different languages, and different manners and customs, so there are different styles of architecture; and though we may prefer the Grecian, as having been used by the most refined nations of antiquity, let us not hastily reject every other style as devoid of congruity, or unsuitable for being applied to constructions of use or beauty.

1992. It is usual to trace the origin of the different styles of architecture to imitations of temporary structures formed of timber or of rough trees; and thus the Grecian column, with its capital ornamented with foliage, has been called an imitation of the trunk of a palm, with the petioles of its recently dropped leaves still adhering; the Gothic arches and tracery have been likened to wicker-work, or the intersecting branches of an avenue; and the Chinese style to the imitation of a tent supported by bamboo. But the imitation of nature is the last thing that occurs in the progress of improvement; and though the above opinions may not be without their use as a sort of hypothesis for composition; yet it appears much more probable that styles of building have taken their origin, jointly from the materials the country afforded, and the wants of the people.

1993. According to this hypothesis, the Grecian may be considered as founded on the use of planks of stone, in the same way as beams of timber (*fig.* 546, 1.); the Gothic, by the use of small stones, held together by their position (2); and the

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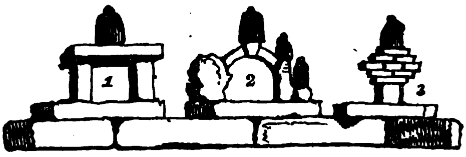

Hindoo, by the use of small stones, held together by superincumbent weight (3).'

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The Doric temple (*fig.* 547.) is easily traced in this way to its prototype of wood; but though the idea be supported by the authority of Vitruvius, it should never be considered as any thing more than mere conjecture.

1994. The progress which, in modern times, architecture has made in Britain, is matter of greater certainty; and H. Repton, with his usual taste, has furnished an ingenious vignette (*fig.* 548.), which indicates that the most remote style of domestic architecture, was that of the castellated Gothic; to which succeeded the ecclesiastic Gothic; next the style prevalent in the seventeenth century, being a mixture of Gothic and Grecian, commonly called the Elizabethean style; after that the Grecian; and last of all, the Hindoo, just coming into notice, and which he considers (*Designs for the Pavilion at Brighton, &c.* 1810), as likely to become fashionable. The most suitable style for domestic purposes in Britain, he considers to be the Gothic, as admitting every description of interior form and arrangement, an unbounded variety in the external forms and lines, and as being favorable to future additions, without deranging the effect or ordonnance of the original composition.

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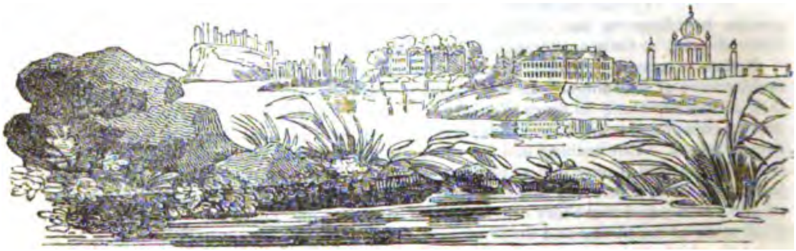

1995. After these general remarks on style, we shall submit some observations on the effects of buildings, as component parts of verdant scenery.

Shenstone observes, that a landscape, to him, is never complete without a building or rocks; and certainly, considering it merely in the light of a picturesque view, a building, in addition to merely verdant scenery, forms a better picture, by giving a desirable feature or resting-place for the eye. Considered, however, in the light of natural expression, the meanness of root-houses and grottos, the absurdity of hermits' cells, heathen temples, triumphal arches, mock chapels, &c.; and the inutility of all of them, render them positive deformities in scenes of natural or picturesque beauty. They break in upon repose, simplicity, and all allusion to natural scenery by their frequency, and suggest ideas of ostentatious vanity in the owner, rather than of propriety and elegance of taste. But though their excess is so general and so obnoxious, the occasional introduction of some sorts may be made with propriety. Garden seats are necessary for shade or shelter; bridges for communication between the banks of rivers or rills; cottages, gate or entrance lodges (*fig.* 549.), as abodes for laborers; and open sheds as places of resort for cattle. Even a prospect-tower is a desirable object in a flat country, affording no other means of obtaining a bird's eye view. A temple, after all, is in many cases but a garden-seat; and if beautiful in itself, and judiciously placed, we can see no objection to its introduction in the garden scene of a princely mansion; certainly none to more than one of them, under the geometric style of planting.

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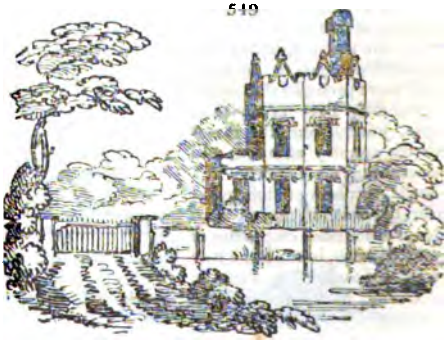

To raise a monument in memory of a great public character, or consecrate an urn to private friendship, or parental memory, can hardly be offensive to any mind. A sun-dial is both a useful and an agreeable object; and statues and busts, in highly polished scenery, by the contrast in the kind of beauty displayed, recall the mind for a moment, from contemplating the wide range of nature, to admire the hand of art concentrated in a single point. In this view there are various objects of this description admissible in the more polished scenes of gardens, &c., as marble fountains, fragments of antiquity, &c. But when simplicity and natural-like beauty are the prevailing idea, all works of art must interfere more or less with the idea; and unless they can raise up and maintain a more interesting expression, they must be regarded as injurious rather than beautiful.

Simplicity and nature, however, continually repeated, become tiresome in their turn, and man is then pleased to recognise the hand of art, if judiciously exercised, even on an artificial ruin (*fig.* 550.); but then the execution must be such as to silence every idea as to its history; it must be so like truth as to interest by the likeness, not by deception, which is disgusting. Artificial ruins, however, need seldom be resorted to while there are so many other architectural decorations to which we can have recourse. Nothing gives more general satisfaction than a neat and comfortable picturesque cottage (*fig.*551.), with a good garden in neat order and cultivation; and such buildings may always be applied to some useful purpose, even in the grounds of small villas or *fermes ornées*. In more extensive scenes, cottages of different styles may be introduced, from that of the Greenlander, or Norwegian, to the Hindoo; and there can be no reason why a proprietor, if he chooses to go to the expence, should not ornament the dwelling of an upper servant in any style he pleases, even in that of a Chinese mandarin (*fig.* 552.).

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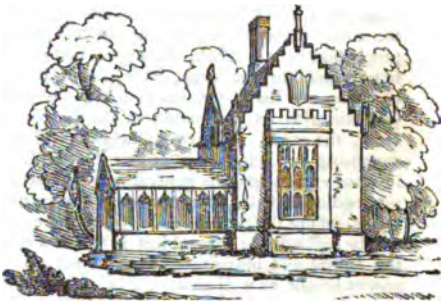

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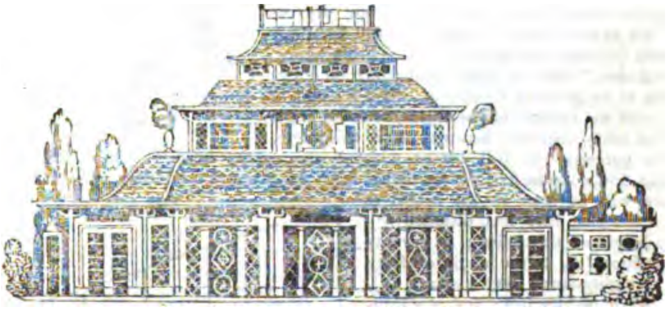

Sect. VI. *Of the accidental Accompaniments to the Materials of Landscape.*

1996. Of these, the first are *roads*; and of roads, the principal is the *approach*. The approach, or road to the house, ought to display to advantage the beauties of that part of the place it passes through, and as many other beauties as may be displayed without shewing the principal, which are generally those of the garden front. In both styles, it ought to ascend to the house rather than descend, and pass along a flat or hollow rather than over inequalities of surface.

In the geometric style, it was generally a wooded avenue, in one or in several lines. In the modern, it is generally a bold, free, gently waving line; every turn of which is, or seems to be, produced either by some gentle variation in the surface, or by the position of a group of trees. It may pass through wood only, or through forest-like scenery. The first view obtained of the house ought to be as favorable as possible, and not of any particular front, but rather an angular view, bosomed in trees. The second, or if there are two or more, the last view, on a nearer approach, should be distinct, and shew the entrance front, and porch, or portico; the road approaching it at such a distance, obliquely, as that the eye may now readily comprehend the whole, and to the greatest advantage.

1997. It may be observed here, with reference to the conducting the spectator to view objects, whether by approaches, roads, or walks, that it is a matter of some nicety to determine, à *priori*, the exact distance at which he should be permitted to obtain a full view. There is a certain point of distance from whence every object appears at its greatest magnitude. The apparent *height* of any object will vary according to its distance, the inclination it makes with the horizon, and our relative elevation or depression. A correspondent of H. Repton states, that "any two of the above three things continuing the same, the apparent magnitude will decrease with the third, though not in exact proportion to it. Thus, the object being perpendicular to the horizon, and our elevation remaining the same, its apparent height will decrease with the distance. Our elevation and the distance remaining the same, the apparent height of the object will decrease with its inclination to the horizon. The inclination and distance being the same, the angle, or apparent height, will decrease with our elevation or depression, supposing our height was at first the middle point of the object. This last being liable to some exceptions, the general rule is, that the distance from the object, measured by a perpendicular to it, being the same, the point at which its apparent height will be greatest, is, where the perpendicular from the eye falls upon the centre."

The difficulty in this subject is to know what the conception is that we shall form of the height and magnitude of an object according to different circumstances; its apparent height, as well as its real height, remaining the same. This cannot be reduced to rules, but depends chiefly on a careful comparison of particular instances. One cause, H. Repton considers, may proceed from the position of the eye itself, which is so placed in most foreheads as to view a certain portion of the hemisphere without any motion of the head. This portion has been variously stated from sixty to ninety degrees. The eye surveys more in breadth than in height, and more below the axis of vision (*fig.* 553, A) than above it. Much depends on the projection of the forehead and eyebrows, prominency of the eye, &c. in different individuals; yet the upper angle (A B) will seldom be greater than one half of the lower angle (AC); and H. Repton ascertained that he could not distinguish objects more than twenty-eight degrees above his axis of vision, though he could distinctly see them fifty-one degrees below it. From hence, he concludes, "that the distance at which an object appears at its greatest height, is, when the axis of vision, and the summit of the object, form an angle of about thirty degrees; because, under this angle, the eye perceives its full extent without moving the head." Thus, supposing the eye (*fig.* 554, *a*) to be five feet six inches from the ground, a tall object (*b*), at thirty feet distance will be seen to the height of twenty feet; at fifty feet distance (*c*), to the height of thirty feet; at seventy feet distance (*d*), to the height of forty feet; at eighty-seven feet distance (*e*), to the height of fifty feet; and at a hundred and five feet distance (*f*), to the height of sixty feet. *Observations on Landscape Gardening*, p. 21.

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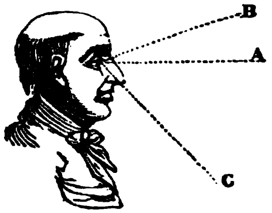

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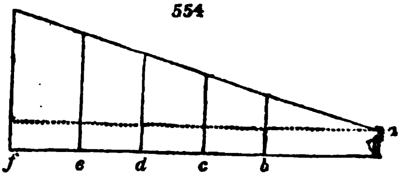

1998. The following excellent observations on the approach, by H. Repton, seem to sum up every thing that can be said on the subject. "The road by which a stranger is supposed to pass through the park or lawn to the house is called an approach; and there seems the same relation betwixt the approach and the house externally, that there is internally betwixt the hall or entrance and the several apartments to which it leads. If the hall be too large or too small, too mean or too much ornamented for the style of the house, there is a manifest incongruity in the architecture, by which good taste will be offended; but if the hall be so situated as not to connect well with the several apartments to which it ought to lead, it will then be defective in point of convenience: so it is with respect to an approach; it ought to be convenient, interesting, and in strict harmony with the character and situation of the mansion to which it belongs.

"*First,* It ought to be a road to the house, and to that principally.

"*Secondly,* If it is not naturally the nearest road possible, it ought artificially to be made impossible to go a nearer.

"*Thirdly,* The artificial obstacles which make this road the nearest ought to appear natural.

"*Fourthly,* Where an approach quits the high road, it ought not to break from it at right angles, or in such a manner as robs the entrance of importance, but rather at some bend of the public road, from whence a lodge or gate may be more conspicuous; and where the high road may appear to branch from the approach rather than the approach from the high road.

"*Fifthly,* After the approach enters the park, it should avoid skirting along its boundary, which betrays the want of extent or unity of property.

"*Sixthly,* The house, unless very large and magnificent, should not be seen at so great a distance as to make it appear much less than it really is.

"*Seventhly,* The first view of the house should be from the most pleasing point of sight.

"*Eighthly,* As soon as the house is visible from the approach, there should be no temptation to quit it (which will ever be the case, if the road be at all circuitous), unless sufficient obstacles, such as water or inaccessible ground, appear to justify its course." *Enquiry into the Changes of Taste in Lands. Gard.* p. 109.

1999. *Walks* are the next accompaniment to home scenes, without which they cannot be viewed but in particular states of the weather and the surface. They were straight, angular, or in regular curves, in the geometric style, and are in easy natural-like lines in the modern manner. Though avowed objects of art, they ought always to bear a certain analogy to the scenes they pass through; with formal-kept edges in highly finished scenery, and edges blending with the gravel in the picturesque manner, recommended by U. Price in more wild scenes. Taste must determine their general course, from the range of beauties to be displayed; and their particular turns, from local beauties and accidental circumstances. The principle of a *sufficient reason* ought never to be lost sight of in laying out walks and roads; that is, no deviation from a straight line should ever appear, for which a reason is not given in the position of the ground, trees, or other accompanying objects.

The finest description of hill or mountain walks is where the path is carried along the declivity on a perfect level, or where it winds round the hill by a gradual and regular ascent, here crossing a smooth slope and there forcing its way through rugged rocks, always preserving the same easy ascent or descent. When the views from such walks are grand and extensive, and especially if they include part of a river, a lake, or the sea seen through a proper foreground of trees, nothing of the kind can be more noble.

Of valley walks, one on the wooded banks of a winding river, with cascades, or running over a rocky bed, the path sometimes accompanying the stream, at other times both retiring or separating from each other, till the sound of the water is scarcely heard through the wood, and then meeting again, accompanied by open glade or meadow, with the other variations of which such scenery is susceptible, may be reckoned among the finest of the kind.

2000. *Fences* are accompaniments common to both styles of landscape; they are either permanent or temporary, and, in both cases, have been treated of in considering the subject of planting (1804.), and wood (1975.).

2001. *Animated nature.* Deer, wild and tame hares, cattle, sheep, game, singing birds, all belong to a residence, and are necessary to complete its beauty. Pheasants and other game, ranging undismayed by man, in garden scenes, give a high idea of seclusion and removal from common nature; the finer sorts may be retained in appropriate structures (*fig.* 555.), and the common left to themselves, but liberally supplied with food.

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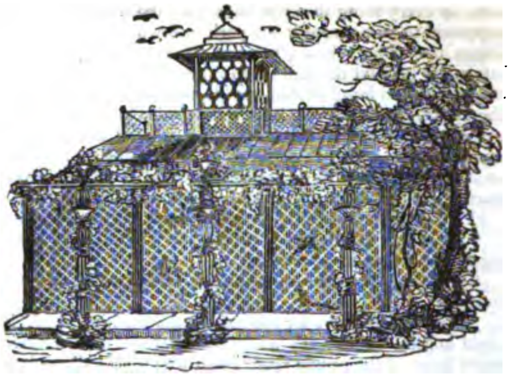

The cawing of rooks, the shrieking of the owl, the screams of peacocks, the notes of birds, are all desirable circumstances in certain situations, and ought to be attended to, by introducing such trees or plants as are favorable to their increase. The smoke of a cottage or a farm house, the view of a distant village, the spire of a church, a water-mill, or a ruin, all become interesting in certain cases; and, with a thousand other instances of natural expression, in a great measure beyond the reach of art, will be sought for, and turned to account by the judicious artist.

Chap. III.

Of the Union of the Materials of Landscape Gardening, in forming the constituent Parts of a Country Residence.

2002. Having now applied the principles of natural and relative beauty to the materials of gardening separately, we shall next apply the same principles to the formation of those scenes of ue, convenience, or elegance, which form the constituent parts of a country residence.

The *Mansion* and *Offices* first demand attention, as the central feature of art and refinement. What relates to the design of these groups of buildings belongs to architecture; but the situation, aspect, style, and accompaniments are within our province.

In determining the *situation*, a great variety of circumstances, some of a general, and others of a local or peculiar nature, require to be taken into consideration. Natural shelter, dry subsoil, the view of the house from a distance, and the distant prospect seen from the house, belong to the former; and removal from the boundary or a public road, suitableness of the adjoining grounds for the garden scenes which accompany mansions, trees already there, or so situated as to aid the effect, &c. belong to the latter.

According to H. Repton, the choice of a situation ought to be founded on, "*First*, The natural character of the surrounding country. *Secondly*, The style, character, and size of the house. *Thirdly*, The aspects or exposure, both with regard to the sun and the prevalent winds of the country. *Fourthly*, The shape of the ground near the house. *Fifthly*, The views from the several apartments: and, *Sixthly*, the numerous objects of comfort; such as a dry soil, a supply of good water, proper space for offices, with various other conveniences essential to a mansion in the country; and which in a town may sometimes be dispensed with, or at least very differently disposed.

" It is hardly possible to arrange these six considerations according to their respective weight or influence; this must depend on a comparison of one with the other, under a variety of circumstances; and even on the partiality of individuals, in affixing different degrees of importance to each consideration. Hence it is obvious, that there can be no danger of sameness in any two designs conducted on principles thus established; since in every different situation some one or more of these considerations must preponderate; and the most rational decision will result from a combined view of all the separate advantages or disadvantages to be foreseen from each. It was the custom of former times, in the choice of domestic situations, to let comfort and convenience prevail over every other consideration. Thus the ancient baronial castles were built on the summits of hills, in times when defence and security suggested the necessity of placing them there; and difficulty of access was a recommendation: but when this necessity no longer existed, (as mankind are always apt to fly from one extreme to the other,) houses were universally erected in the lowest situations, with a probable design to avoid those inconveniences to which lofty positions had been subject: hence the frequent sites of many large mansions, and particularly abbeys and monasteries, the residence of persons who were willing to sacrifice the beauty of prospect for the more solid and permanent advantages of habitable convenience; amongst which, shelter from wind, and a supply of water for store fish-ponds, were predominant considerations." *Enquiry*, &c. p. 83.

2003. In hilly countries, or in any country where the surface is varied, the choice is neither made in the bottoms (*fig.* 556, *a*), nor on the summits of the eminences (*c*), but generally on the south-east side of the latter (*b*), on a raised platform, the rising grounds behind being planted both for effect and shelter.

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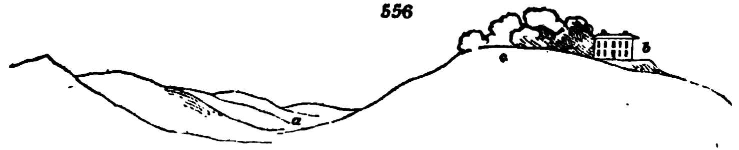

2004. The field of vision, or portion of landscape which the eye will comprehend, is a circumstance frequently mistaken in fixing the situation for a house; since a view seen from the windows of an apartment will materially differ from the same view seen in the open air. Much evidently depends on the thickness of the walls (*fig.* 557.), the width of the windows (*a*), and the distance of the spectator from the aperture. Near the centre of the room (*b*), the spectator will not enjoy above 20 or 30 degrees of vision; but close to the window (*c*), his eye will take in from 70 to 100 degrees. Hence, to obtain as much of the view from a room as possible, there should not only be windows on two sides of a room, but one in the angle, or an oblique or bow-window on each side, instead of the common form. *Obs. on Landscape Gardening*, p. 24.

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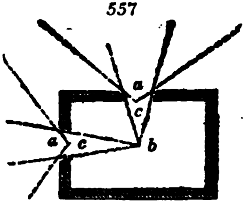

2005. The aspect of the principal rooms deserves particular attention in every case, and most so in bleak or exposed situations. The south-east is, most commonly, the best for Britain (*fig.* 558.); and the south, and due east, the next best. The south-west H. Repton considers the worst, because from that quarter it rains oftener than from any other; and the windows are dimmed, and the views obstructed, by the slightest shower, which will not be perceptible in the windows facing the south or east. A north aspect is gloomy, because deprived of sunshine; but it deserves to be remarked, that woods and other verdant objects look best when viewed from rooms so placed, because all plants are most luxuriant on the side next the sun. "The aspect due east," he considers, "nearly as bad as the north, because there the sun only shines while we are in bed; and the aspect due west is intolerable, from the excess of sun dazzling the eye through the greatest part of the day. From hence we may conclude, that a square house, placed with its front duly opposite to the cardinal points, will have one good and three bad aspects." *Fragments on Landscape Gardening*, &c. p. 108.

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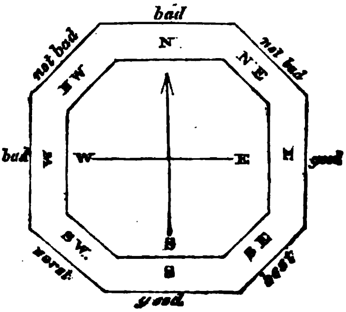

2006. A mansion for the country, if a mere square or oblong, will thus be deficient in point of aspect, and certainly in picturesque beauty, or variety of external forms, lights, and shades. An irregular plan, composed with a combined view to the situation, distant views, best aspects to the principal rooms, effect from different distant points, and as forming a whole with the groups of domestic offices and other masonic appendages or erections, will therefore be the best; and as the genius of the Gothic style of architecture is better adapted for this irregularity than the simplicity of the Grecian, or the regularity of the Roman styles, it has been justly considered the best for country residences. Another advantage of an irregular style is, that it readily admits of additions in almost any direction.

2007. Convenience, as well as effect, require that every house ought to have an entrance front, and a garden front; and, in general cases, neither the latter, nor the views from the principal rooms, should be seen fully and completely, but from the windows and garden scenery. Not to attend to this, is to destroy their contrasted effect, and cloy the appetite by disclosing all, or the greatest part of the beauties at once. The landscape which forms the back ground to a mansion, the trees which group with it, and the architectural terrace which forms its base, are to be considered as its accompaniments, and influenced more or less by its style. The classic pine and cedar should accompany the Greek and Roman architecture; and the hardy fir, the oak, or the lofty ash, the baronial castle.

2008. *Terrace and Conservatory.* We observed, when treating of ground, and under the ancient style, that the design of the terrace must be jointly influenced by the magnitude and style of the house, the views from its windows, (that is, from the eye of a person seated in the middle of the principal rooms,) and the views of the house from a distance. In almost every case, more or less of architectural form will enter into these compositions. The level or levels will be supported partly by grassy slopes, but chiefly by stone walls, harmonizing with the lines and forms of the house. These, in the Gothic style, may be furnished by battlements, gateways, oriels, pinnacles, &c.; or, on a very great scale, watch-towers may form very picturesque, characteristic, and useful additions. The Grecian style may, in like manner, be finished by parapets, balustrades, and other Roman appendages.

The breadth of terraces, and their height relatively to the level of the floor of the living rooms, must depend jointly on the height of the floor of the living rooms and the surface of the grounds or country to be seen over them. Too broad or too high a terrace will both have the effect of foreshortening a lawn with a declining surface, or concealing a near valley. The safest mode in doubtful cases is, not to form this appendage till after the principal floor is laid, and then to determine the details of the terrace by trial and correction.

Narrow terraces are entirely occupied as promenades, and may be either gravelled or paved; and different levels, when they exist, connected by inclined planes or flights of steps. Where the breadth is more than is requisite for walks, the borders may be kept in turf with groups or marginal strips of flowers and low shrubs. In some cases, the terrace walls may be so extended as to inclose ground sufficient for a level plat to be used as a bowling-green; or a flower-garden. These are generally connected with one of the living rooms or the conservatory, and to the latter is frequently joined an aviary and the entire range of botanic stoves. Or, the aviary may be made an elegant detached building, so placed as to group with the house and other surrounding objects. An elegant structure of this sort (*fig.* 559.) was designed by H. Repton for the grounds of the Pavilion at Brighton.

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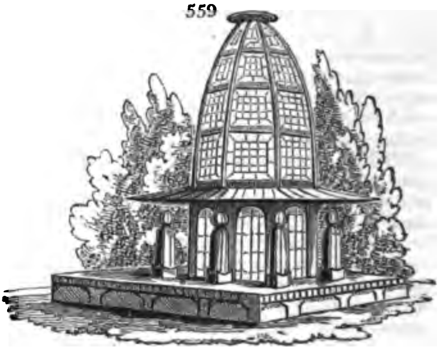

2009. The *Flower-Garden* should join both the conservatory and terrace; and, where the botanic stoves do not join the conservatory and the house, they, and also the aviary and other appropriate buildings and decorations, should be placed here (see 1598, and 1605.).

2010. The *Kitchen-Garden* should be placed near to, and connected with the flower-garden, with concealed entrances and roads leading to the domestic offices for culinary purposes, and to the stables and farm buildings for manure (see 1074.).

2011. The situation of the *Orchard* should, all other circumstances being suitable, be near to the kitchen-garden; and between them may be very properly placed the gardener's-house, connected with the furnace, sheds, fruit-rooms, &c. (see 1110.)

2012. The term *Lawn* is applied to that breadth of mown turf formed in front of, or extending in different directions from the garden front of the house; in the geometric style, varied by architectural forms, levels, and slopes; and in the modern by a picturesque or painter-like disposition of groups, placed so as to connect with the leading masses, and throw the lawn into an agreeable shape or shapes. In very small villas the lawn may embrace the garden or principal front of the house, without the intervention of terrace scenery, and may be separated from the park, or park-like field, by a light wire fence; but in more extensive scenes it should embrace a terrace, or some avowedly artificial architectural basis to the mansion, and a sunk wall, as the distant separation, will be more dignified and permanent than any iron fence. The park may come close up to the terrace garden, especially in a flat situation, or where the breadth of the terrace is considerable.

2013. The *Shrubbery* generally connects the house and flower-gardens, and forms, strictly speaking, a part of the pleasure-ground scenery. It is a scene in which the object is to arrange a collection of foreign trees and shrubs in a dry border, generally on the north side of a walk, or in dug groups and patches.

One very principal consideration is, to connect, partly in appearance only, the dug patches. The distinct unconnected obtrusion of such scenes is justly reprobated by U. Price, who gives excellent instructions for creating the beautiful picturesque among dug groups, and preserving all the polish and appearance of high keeping with the most delicate culture of the plants (see 1580.).

2014. The *Pleasure-ground* is a term applied generally to the kept ground and walks of a residence. Sometimes the walk merely passes, in a winding direction, through glades and groups of common scenery, kept polished by the scythe, and from whence cattle, &c. are excluded. At other times it includes a part of, or all the scenes above mentioned; and may include several others, as verdant amphitheatres, labyrinths, a Linnean, Jussieuian, American, French, or Dutch flower-garden, a garden of native, rock, mountain, or aquatic plants, picturesque flower-garden, or a Chinese garden, exhibiting only plants in flower, inserted in the ground, and removed to make room for others when the blossom begins to fade, &c.

2015. The *Park* is a space devoted to the growth of timber, pasturage for deer, cattle, and sheep, and for adding grandeur and dignity to the mansion. On its extent and beauty, and on the magnitude and architectural design of the house, chiefly depend the reputation and character of the residence. In the geometric style, the more distant or concealed parts were subdivided into fields, surrounded by broad stripes or double rows, enclosed in walls or hedges, and the nearer parts were chiefly covered with wood, enclosing regular surfaces of pasturage.

In the modern style, the scenery of a park is intended to resemble that of a scattered forest, the more polished glades and regular shapes of lawn being near the house, and the rougher parts towards the extremities.

The paddocks or small enclosures are generally placed between the family stables and the farm.

2016. The *Farm*, or that portion of agricultural surface, retained in the hands of the owner for private cultivation, was, in both styles, placed without, but adjoining the park; and when circumstances admitted, near to the paddocks. In some cases, on a moderate scale, part of the park constitutes the whole, or a part of the farm and is kept in aration. The trees in this cultivated space are arranged in natural-like masses, so as to give the idea of part of a forest-scene subjected to the plough. When the park is extensive and truly forest-like, the effect of the whole is much improved by the contrast, and recalls to mind those charming scenes in the woody districts of Germany, where cultivation smiles in the glades and recesses of eternal forests.

2017. The *Riding* or drive, is a road indicated rather than formed, which passes through the most interesting and distant parts of a residence not seen in detail from the walks, and as far into the adjoining lands of wildness or cultivation, as the property of the owner extends. It is also frequently conducted as much farther as the disposition of adjoining proprietors permits, or the general face of the country renders desirable.

Though this arrangement of the component parts of a residence will be found, in general, the most convenient on a flat surface, or one gently varied, we are far from recommending its universal adoption. Situations are always fertile in suggesting new ideas, which

> "Start even from difficulties, strike from chance;"

and a mind already stored with a knowledge of every part of the subject, works from principles, and fortuitous suggestions, rather than models. We would rather see an original idea attempted than the most beautiful arrangement imitated.

Chap. IV.

Of the Union of the constituent Scenes in forming Gardens or Residences of particular Characters; and of laying out Public Gardens.

2018. In the preceding chapter we have given a general idea of the parts or scenes, and their connection, which enter into a palace or a complete residence of the first order. We have now to notice their arrangements in different gradations of residences and these, we must previously acknowledge, are so intimately blended, that we hardly know how to separate them, and give a distinctive character to each; every country gentleman, from the occupier of the palace to the cottage, adopting such luxuriant scenes as suits his particular taste, without reference to any thing but his own desires; and this happy circumstance contributes, perhaps, as much as the difference of situations, to the variety in the beauty and style of British country residences.

Mansions, villas, temporary residences, cottages, and public gardens, may be said to include the leading distinctions. Public gardens are much less various than private ones, because there are fewer publics than individuals; so there is less variation in taste.

Sect. I. *On laying out Private Gardens, or Residences.*

The specific distinctions of private residences may be considered as the mansion and demesne, the villa, the farm, the temporary residence, and the cottage; but each of these branches out into a number of subspecies and varieties.

2019. The *Mansion* and *Demesne*. As a specimen of this style, we shall give the arrangement at Michel Grove in Sussex, the residence of R. Walker, Esq. from the works of H. Repton.

" In determining the situation for a large house in the country, there are other circumstances to be considered besides the fences and appendages immediately contiguous. These have so often occurred, that I have established in imagination certain positions for each, which I have never found so capable of being realised as at Michel Grove.

" I would place the house, with the principal front, towards the south-east.

" I would place the offices behind the house; but as they occupy much more space, they will of course spread wider than the front. I would place the stables near the offices. I would place the kitchen-garden near the stables. I would put the home-farm buildings at rather a greater distance from the house; but these several objects should be so connected by back roads as to be easily accessible.

" I would bring the park to the very front of the house.

" I would keep the farm or land in tillage, whether for use or for experiment, behind the house; I would make the dressed pleasure-grounds to the right and left of the house, in places which would screen the unsightly appendages, and form a natural division between the park and the farm, with walks communicating to the garden and the farm."

The characteristic of the *mansion* and *demesne*, is the demesne or surrounding lands in tenancy. Any residence of which the dwelling-house is of a higher character than that of the *mansion* and *demesne*, as the castle, abbey, and palace, has the same general arrangement in the grounds, and differs chiefly in extent, and in the arrangements of the courts and other exterior appendages of the house.

2020. The *Villa*. Here there may be nothing more than a park with a house of smaller size than that of the *mansion* and *demesne*, surrounded by a pleasure-ground, and with the usual gardens. Moderate extent and proximity to other villas, constitute the characteristic of this class of residences; but though adjoining lands are not necessary to the character, they do not, where they exist, change it, unless their extent be considerable. Two villas joined together often mutually aid each other in effect, especially as to water and trees (*fig.* 560.)

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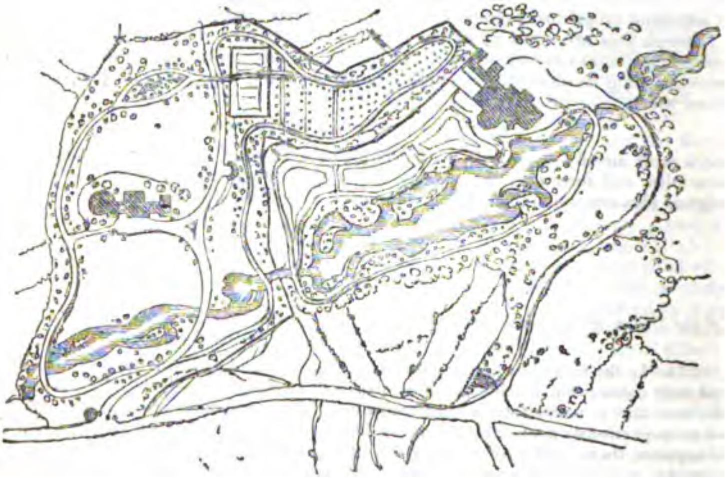

2021. The *Villa Farm*. A villa being originally a farm-house, we think that the Roman arrangement, in which the farm-offices were joined to, or at least so near, as to form with it and the domestic offices one group of buildings, might be adopted as the characteristic distinction of this class of residences. The farm buildings should, in that case, be dignified with more architectural design than when placed at a distance; but still in due subordination to the mansion. Instead of deer, sheep may graze the park on the garden front, separated from the house by an architectural barrier, or in some situations, with a platform of gravel, and walks and knots of flowers. A glacis of turf, with a light fence below the slope, will be sufficient protection from sheep or cattle, and not impede the view of the lawn from the windows. The entrance-front may be approached through grass fields, not separated with common hedges, but with picturesque fences (*fig.* 561.) in the modern, and double hedges and slips of planting in the geometric style.

All or any part of the other constituent parts of a *mansion* and *demesne* residence, such as hot-houses, gardens, orchards, pleasure-grounds, &c. may or may not be added, according to its extent, and the particular taste of the proprietor.

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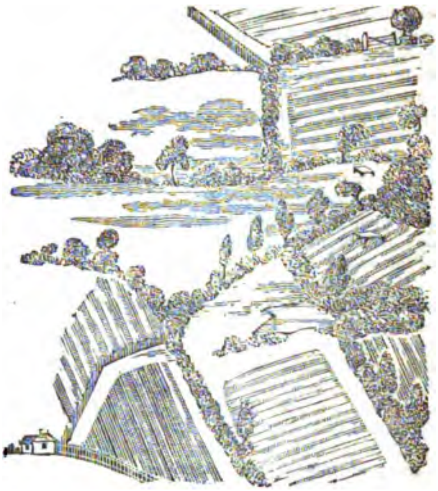

2022. The *Ferme Ornée* differs from a common farm in having a better dwelling-house, neater approach, and one partly or entirely distinct from that which leads to the offices. It also differs as to the hedges, which are allowed to grow wild and irregular (*fig.* 561.), and are bordered on each side by a broad green drive, and sometimes by a gravel walk

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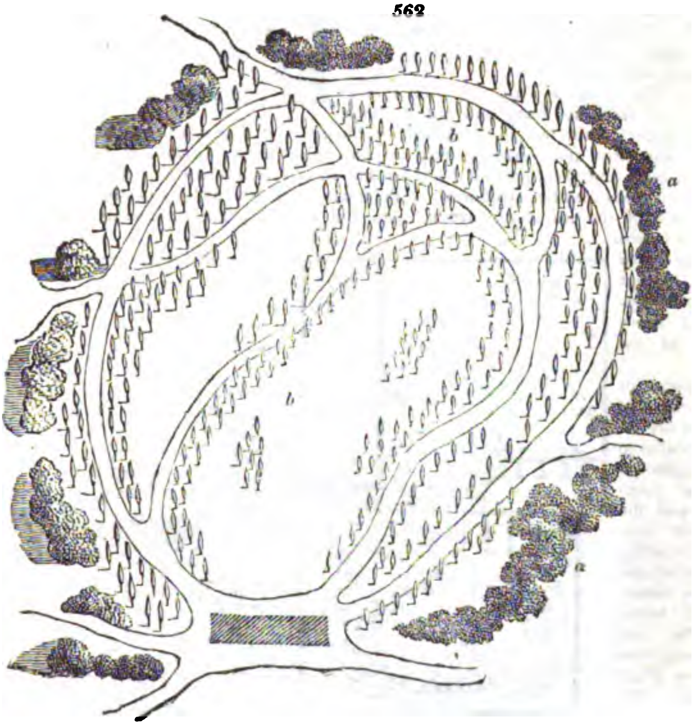
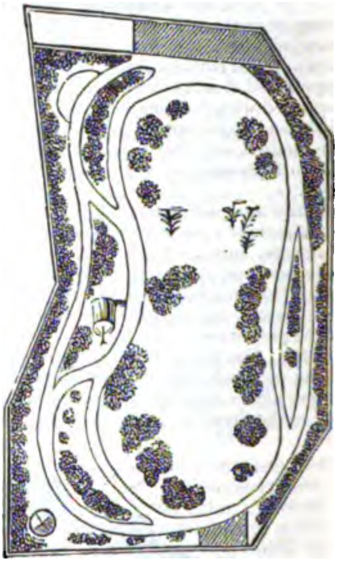


and shrubs. It differs from a villa farm in having no park. A dry hilly soil is best suited for this description of residence, of which there are some fine examples in Surrey, Kent, and the Isle of Wight.

2023. *Temporary Residences*, as marine villas, sporting or shooting boxes, seldom contain much land attached. No hot-houses, and but little pleasure-ground is here required. What land there may be, should be applied to use rather than to beauty. Speaking of hunting-boxes, Marshall observes, " a suit of paddocks should be seen from the house; and if a view of distant covers can be caught, the back-ground will be complete. The stable, the kennel, the leaping-bar, are the appendages, in the construction of which simplicity, substantialness, and conveniency should prevail."

563



2024. A *Cottage Ornée*, we think, might be characterised by the garden front opening into a picturesque orchard; or a lawn, varied by groups of fruit-trees, instead of a lawn or park planted with forest-trees. It may contain any part of the scenes of the villa, at the will of the owner.

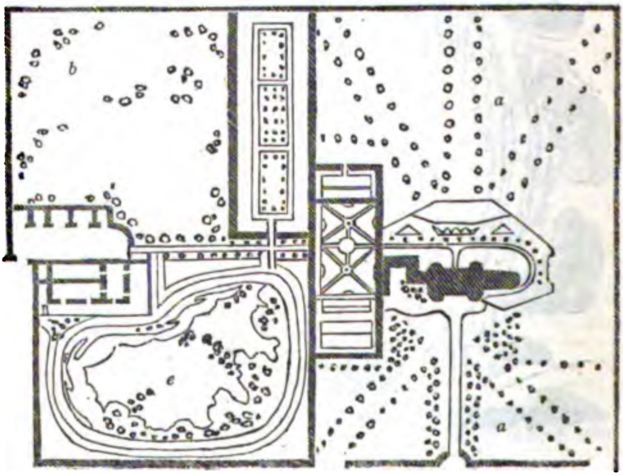
If the situation of the house is elevated, so as to give a view from the principal rooms of a great part of the farm, it will be the more desirable. A desirable foundation for this improvement is an old English farmhouse; by adding to which one or two principal rooms, a very interesting group may be formed at little expence.

2025. *Cottage en verger.* An agreeable variety of this species sometimes adopted in France, consists in surrounding an inclosed space of one or two acres with an irregular strip of walnut, cherry, chestnut, and other tall-growing trees (*fig.* 562, *a*), which produce both fruit and timber; and then planting the interior space (*b*) with the finer sorts of fruit-trees, especially pears and plums, as standards, on turf. Winding walks are led through the whole, and groups of flowers and kitchen-vegetables introduced.

2026. The *Citizen's Villa* (*fig.* 563.) is a spot of one or more acres laid out in lawn and shrubbery, but without a kitchen-garden. As the space contained is very limited, and often under an acre, only the most select trees, shrubs, and flowers should be employed; and great part of the trees and shrubs should be evergreens. Seats and other decorations may be introduced, of the most select designs, and best workmanship; and what is of the last consequence, none but a good gardener should be employed in order to preserve the whole in the highest order and keeping, at every season of the year.

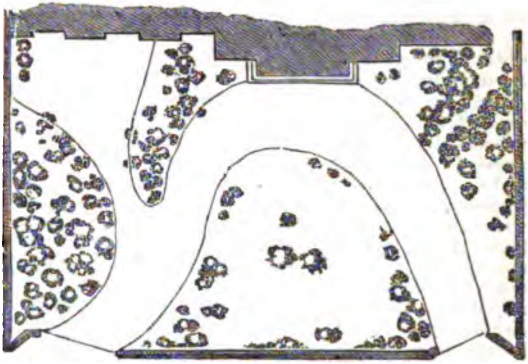
Gardens or residences of this sort are almost peculiar to the neighbourhood of London; and the occupant procures his culinary productions & fruits cheaper and better than he can grow them, from that first of all gardens, Covent-garden.

564



2027. The *Suburban Villa* (*fig.* 564.), is of limited extent, but contains a small kitchen-garden, and stables, with a field planted either in the ancient style (*a*), or modern style (*b*); with a neat lawn, and groups of flowers (*c*). Such villas are occupied more by professional men and artists, than by the lesser merchants and rich tradesmen, who (those of the metropolis at least) prefer the citizen's villa. When two or more of such villas can be formed adjoining each other, the happiest effects may be produced if their owners act in concert at their first planting; and a sort of community of scenery may be enjoyed, without lessening individual privacy and comfort. On the contrary, a gain might result to each proprietor rather than otherwise; for if two villas, adjoining each other, are laid out in the modern style, then by placing the masses of wood of the one, against the masses of the other, less ground would require to be occupied in plantation by each. Office buildings might be placed against, or near office buildings, so as to be shut out, or partially concealed with less than the usual quantity of trees, and so on. In the ancient style, avenues, and vistas might be contrived to pass through each other's grounds, and the ornamental objects which formed their termination, serving both parties, only half the usual number would require to be erected by each.

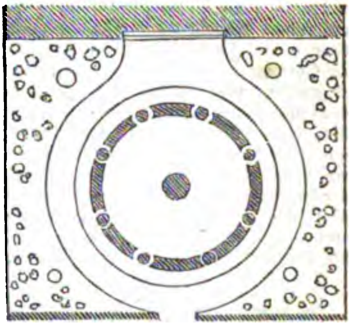
565



2028. The *Suburban House* (*fig.* 565.), is a large, commodious dwelling, in a village-like collection of houses, or streets, on the outskirts of the metropolis, or of large towns; and occupied as the constant residence of wealthy professional men or merchants. It has a carriage entrance to the house and stables in front, and a small kitchen-garden behind.

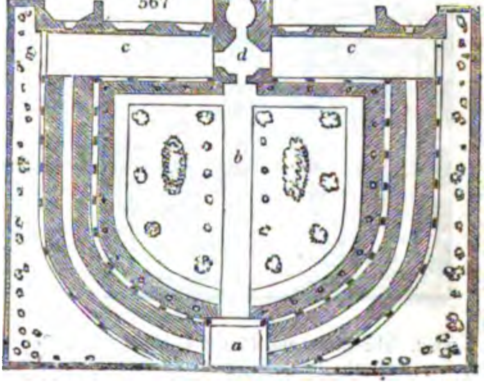
2029. The *House with Carriage Entrance* (*fig.* 566.) occurs very commonly in the suburban streets of large cities; it contains a small garden behind, not however sufficient to employ a gardener; and it is without stable or coach-house: the fore-court is varied by shrubs and a few trees, and the central circle of turf, ornamented with baskets of flowers or roses; and in the middle a statue, sun-dial, fountain, pond, or a cedar, or other evergreen tree.

566



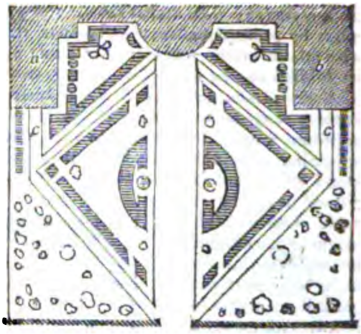
2030. The *House with covered Entrance* (*fig.* 567.) is similarly situated to the other, but generally further from town, to and from which the occupant passes by the local public conveyances. It contains a garden-court before, and a garden behind the house, like the other; but the former is entered by a porch (*a*), connected with the house by means of a glass or opaque roofed passage (*b*); and along the front of the house is an open varandah (*c*, *c*,) communicating with a vestibule (*d*). This sort of suburban-house is well suited for invalids, who may take exercise, and enjoy the plants under the glass-roofs in rainy weather.

567



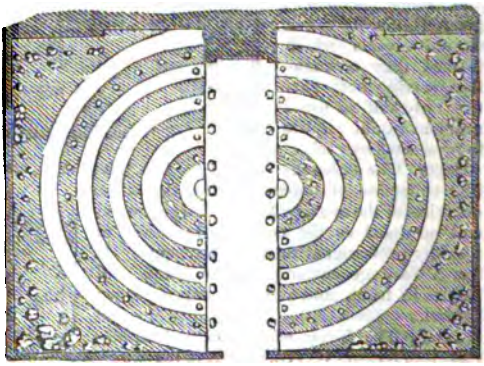
2031. The *House and Conservatory* (*fig.* 568.) is similarly situated to the last, with one or two wings (*a* and *b*), as conservatories; or, the one a conservatory, and the other a botanic stove, or a vinery. These communicate with the two principal living-rooms, and also with the fore-court (*c*); the latter entrance is that made use of by the gardener. Heat is supplied from the under-ground offices of the house; and if the latter is heated by hot-air, in Sylvester's excellent manner, or by the more simple operation of steam, it will be accomplished so much the more readily and effectually. They may be also lighted up by gas, if there is a public gasometer in the neighbourhood.

568



2032. The *House* and *Flower Garden Entrance* (*fig.* 569.), requires a more airy situation than either of the three last varieties; and is generally situated in some road or street, a mile or two from town, or in some suburban hamlet. The flowers may be variously arranged, and may be either florist's flowers or herbaceous perennials, with a mixture of dwarf-ornamental shrubs. A very complete mode, is to grow the flowers in the garden behind the house, and bring them to the front as they come in flower. This sort of residence is well suited for retired tradesmen, who act as their own gardeners; and some fine examples are to be found at Hammersmith, Hampstead, and round Manchester. The French and Dutch, and also the Germans, excel in this kind of garden, and produce the most pleasing effects by a judicious combination of very few species of flowers. They take care to select such as are showy, of brilliant and distinct simple colors, as white and scarlet lilies, red and white roses, nasturtium, candy-tuft, daisey, larkspur, &c. They admit few yellows, or small scattered flowering plants; but study to have masses of the same colors and forms, contrasted by different colors also in masses. There are many fine gardens of this sort in Picardy and the Netherlands, and some in Hanover.

569



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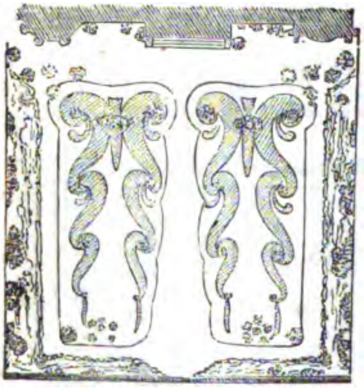

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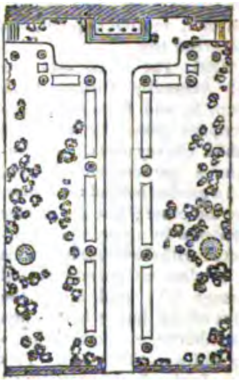

2033. The *House* and *French Parterre* (*fig.* 570.), can hardly be considered a distinct variety from the last; though it differs in this, that the front garden of the latter contains turf around the flower compartments, whereas the former is composed entirely of earth, and gravel, edged with box, or some other plant.

2034. The *common Front Garden* (*fig.* 571.), is a variety so well known as to require no description; but, like the six preceding varieties, it is introduced here chiefly to suggest, that these humble scenes may be greatly improved in design, and also in cultivation and keeping. There is little danger of the gardens of the wealthy being neglected; but it is of great importance to the advancement of gardening, that the art should be displayed to as great perfection as possible in those gardens which are most universal; which are continually under the eye of a large city population; seen by the whole country inhabitants when they visit the towns; — and which chiefly come under the eye of foreigners.

2035. The *Farmers' Garden* should not be placed adjoining the rick-yard, on account of the straw liable to be blown into it: and should be well inclosed to exclude poultry, pigs, and other domestic animals. Supposing the farm buildings to occupy three sides of a square, and the farm-house to be placed in the middle of the south side, and the rick-yard to be placed beyond the north side; then the kitchen-garden may be placed adjoining the east or west side of the square; the grass orchard, which may also be the drying-ground, and area for rearing young poultry, on the opposite and corresponding side; and a small flower-garden may serve as an entrance-court to the farm-house. But in the case of farmeries on a larger scale, where the house is detached from the court of offices, the three gardens should be united with a small portion of lawn, and a pond, so as to form about an acre (more or less, according to circumstances,) of garden and pleasure-ground round the house (*fig.* 503.). The part destined for the growth of culinary vegetables should be laid out in right lined plats and borders; the orchard trees planted in rows or quincunx; and the flowers and flowering shrubs arranged in groups or beds on turf. The most useful and prolific fruit-trees should be chosen; including some plants of hops, and one or two walnut or chestnut-trees in the exposed side of the orchard, if the climate is such as will ripen their fruits. No class of men have it in their power to form and cultivate a garden at less expense than that of the farmer; but unfortunately few farmers have a taste for the subject; perhaps, because gardening is not sufficiently contrasted to agriculture, to afford the farmer that sort of relief sought for in recreative and pleasurable pursuits.

2036. The *Laborers' Cottage* and *Garden*. This may be reckoned too humble a country residence for the consideration of the landscape gardener; but we conceive it to be of very great importance to the general good, that these should be improved, and there inhabitants ameliorated. What we shall advance is founded on the principle, that whatever renders the cottager more comfortable and happy at home, will render him a better servant and subject, and in every respect a more valuable member of society. Besides one of the most constantly occurring objects in the country is the laborer's cottage, whether detached by the road-side, or grouped in hamlets and villages; and therefore to render such buildings and their scenery more ornamental must, independently of every other consideration, be a very laudable object.

The accommodation contained in the cottage, and the size of the garden, should, no doubt, be regulated by the family of the cottager, and the facilities afforded him by his line of employment to live well, or bring up a large family, &c. But we shall take the lowest case that can occur, and state what we consider to be the minimum of accommodation, which a humane employer in England, would wish to be enjoyed by his serving laborer, even if he had no other family than his wife.

The *whole space* to be inclosed, including the garden and the site of the house, cannot be less than one-eighth part of a statute acre. The cottage should, if possible, be placed in the centre, fronting the south-east, by which means, if it be a square or a paralellogram, the sun will shine on each of the four sides a part of every day in the year. Its floor should be raised two steps above the level of the garden; its principal windows to the south-east. A gutter should be placed under the eaves, to prevent the ground, at the base of the walls, from receiving extreme moisture, and thus rendering the interior damp and unwholesome.

The cottage should consist of the following parts:

A *Porch* to throw off the rain from the steps of the door, and prevent it from being blown in by the wind. On the smallest scale, two broad boards, or two slates or flag-stones, placed pediment-wise over the door will suffice.

A *Lobby, broad Passage*, or other space inside the door, to contain lumber, fuel, garden-tools, and to serve as a place for washing, or working at coarse work, &c.

A *Cooking* and *Living-Room* entered by the lobby or outer room; the fire-place, with an oven and small boiler, both included in a cast-iron grate.

A *Sleeping-Room* over the living-room, and entered by a stair from the lobby or outer room.

A *Garret*, or children or lodger's sleeping-room, or small room for any purpose, over the lobby or outer room.

A *Pantry*, taken off the lobby, with a small window to the north-west.

A *Closet*, for utensils and articles used in the living-room, taken off that room, with a window to the north-west or south-east.

A *Hen-roost*, forming part of the garret over the lobby, and entered by a poultry-ladder, to a small opening in the outer wall.

In the Garden should be a Well, with a pump, if deep; unless some other source of good water is near.

A *Water-Closet* placed in a hidden part of the garden, behind the house, so contrived that the visitor may neither be seen from the windows of the cottage or the public road, with a going and returning, or an incidental approach, instead of the direct *cul de sac* paths which commonly lead to such places.

A *Pigstye* attached to the north-east or south-east front.

A *Dunghill*, or a small spot adjoining the pig-stye, surrounded by a dwarf wall.

A *Nitch in the Wall* of the south-east front of the house, to hold two or more bee-hives, with two iron-bars, joined and hinged at one end, and with a staple at the other to lock them up to prevent stealing.

The surrounding fence may be a wall, close pales, a holly, thorn, sloe-thorn, or damson-plum hedge, according to circumstances; if a hedge of any kind, then standard plum, pear, apple, or cherry trees, may be planted in it; if a wall, the same sorts may be trained against it. Next to the fence, a border should be carried round the whole; a similar border may be formed round the house; and the area for culture will then be thrown into two quarters, one behind the house, and one in front of it. The quarters may be surrounded with a line of gooseberries and currants, and a few standard apples or plums, (as being the two most useful cottage fruits,) scattered over the whole. Against the house may be planted currants, pears, or a vine, according to the situation and climate. Honeysuckles and monthly roses may be planted next the porch; ivy against the water-closet; and the scented climatis against the pigstye. The border round the house should be devoted to savory pot-herbs, as parsley, thyme, mint, chives, &c. and to flowers, and low flowering shrubs. The surrounding border under the wall or hedge, should be devoted to early and late culinary crops, as early potatoes, pease, turnips, kidney-beans, &c. No forest-trees, especially the ash and elm, should be planted in, or if possible, even near the cottager's garden; as these are ruinous to crops; the first both by its shade and roots, and the latter by its roots, which spread rapidly to a great extent, close under the surface. The oak is the tree the least injurious to gardens.

This extent of accommodation may be varied in appearance, by adopting a different form for the ground-plan of the plat; by different inclinations of surfaces, kinds of fence, sort of materials used for the roof and walls of the house, coloring of the walls, and above all, by adopting different styles of architecture.

SECT. II. *Public Gardens.*

These are either designed for recreation, instruction, or commercial purposes. The first include equestrian and pedestrian promenades; the second, botanic and experimental gardens; and the third, public nurseries, market gardens, florists' gardens, orchards, seed gardens, and herb gardens.

2037. *Public Parks*, or *Equestrian Promenades*, are valuable appendages to large cities. Extent and a free air are the principal requisites, and the roads should be arranged so as to produce few intersections; but at the same time so as carriages may make either the tour of the whole scene, or adopt a shorter tour at pleasure. In the course of long roads, there ought to be occasional bays or side expansions to admit of carriages separating from the course, halting or turning. Where such promenades are very extensive, they are furnished with places of accommodation and refreshment, both for men and horses; this is a valued part of their arrangement for occasional visitors from a distance, or in hired vehicles.

Our continental neighbours have hitherto greatly excelled us in this department of gardening; almost every town of consequence having its promenades for the citizens *en cheval* and also *au pied*. Till lately, *Hyde Park*, at London, and a spot called *The Meadows*, near Edinburgh, were the only equestrian gardens in Britain; and neither were well arranged. But in 1810, the Regent's Park was commenced from a suggestion of W. Fordyce, Esq., the late surveyor of woods and forests, and it promises to be a scene worthy of the metropolis. It is only to be regretted, that the space available to the public is so much curtailed by interspersed villas, and surrounding rows of houses and gardens: for though from the number of trees, the wealthy citizen who can view the scenery from his horse or coach may recognise the park character; yet by rendering so great an extent of the surface private property, the wanderings of the pedestrian are limited, and his views of the scenery confined.

The public garden of Carlsruhe (*fig.* 572.), and the town itself both formed to correspond with each other by the prince. The palace (*a*), is noticed by Sulzer (*Theorie des beaux Arts, &c.*) and by Hirschfield (*Theorie des Jardins, &c.* vol. iv. 416.), as one of the finest in Germany, and remarkable for having the wings at an oblique angle to the main building. Behind, exactly in the centre of the circular carriage promenade (*b*), is a tower (*c*), which commands a bird's-eye view of the whole park, pleasure and kitchen-gardens (*d*), and the town and church (*e*). The whole is on level ground, and joined to a natural forest. Among the trees near the palace, are some of the finest old tulip trees, planes, bignonias, sumachs, acacias, cedars, and other exotic trees in Germany.

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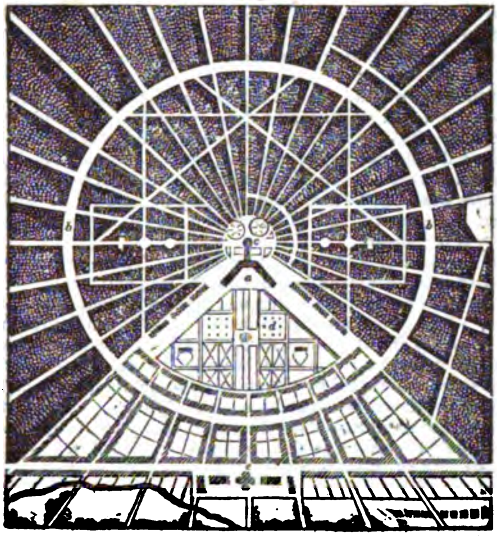

2038. *Boulvards* (*Boulvard*, Fr., or round work, a bulwark, or great bastion, or rampart, generally round). Many of the continental cities have a species of equestrian promenade within their boundary, which is deserving of imitation. These are broad roads, accompanied by rows of trees, near the margin of the city, originally formed on the ramparts, or surrounding fortifications, and completely encircling it. They are highly interesting promenades, especially to a stranger, to whom they give an idea of the topography and most remarkable points of the scene in the most agreeable manner. The boulevards at Paris, Vienna, and Moscow, are particularly to be admired in these respects. A similar promenade, of a very interesting kind, might be formed in the margin of London, by continuing the street called the New-road through Hyde-Park, entering close to where Kensington-Gardens leave off, proceeding thence across the Serpentine-river, and coming out exactly opposite Sloane-street: then along this street and part of the King's-road, to the road leading to Vauxhall-bridge; from this bridge along roads already formed, and as may be seen by the map, well suited to lead to Blackheath; turn towards London through Greenwich Park, so as to display the best views of the metropolis over Greenwich-Hospital; form a viaduct or road, on a cast-iron colonade across the river, sufficiently high to admit ships in full sail to pass under; descend this, and then join the Commercial-road, which joins the New-road, and completes the circle.

This course which, with the exception of the bridge, might be formed at no great expense or derangement of property, would give a grand view of the metropolis, and by now and then deviating from the direct road and returning to it, Kensington-gardens, Hammersmith-nursery, the King's-road gardens, Chelsea-garden, the garden of Loddiges' at Hackney, the Regent's-park, Highgate, Hampstead, and all the most interesting gardens, scenery, and objects close to London, might be rapidly glanced at in one day.

2039. *Mountain Promenade.* One of the finest equestrian promenades that can be imagined might be formed on the hill of Arthur's seat at Edinburgh. From the base at Holyrood Park, let a road ascend winding round the hill, including the appendage of Salisbury Craigs, and the knoll to the east, if desirable, to the summit, at a rise not greater than two inches in six feet. Having arrived at the summit, let it wind down again at a similar slope, intersecting the other road, and arriving also in Holyrood Park. Then let or sell the ground to individuals to build on or plant, each according to his taste.

The slope of the road would be found so gradual that a two-wheeled chaise might be driven up or down at a trot, which can be done on the Simplon road, where the slope is 2½ inches in six feet. Taking the height of the hill from the park at 700 feet, this would give less than five miles of ascending promenade, and the same number descending. By the formation of these two roads, hundreds of the finest situations in the world, for summer villas and cottages would be formed, and probably in time let or sold, so as to cover much more than the expence, both of purchasing the hill as it now is, and forming the roads in the very best manner.

2040. *Public Gardens*, or *Pedestrian Promenades.* These, with very few exceptions, have been in all ages and countries laid out in the geometric style. The Academus at Athens is an ancient example. The summer garden at Petersburgh, a modern one. Even in China, where irregularity in gardening is so much desired in general, Ellis (*Journal of the Embassy of* 1816.) informs us, that " the Fatee gardens at Canton, the resort of the fashionables, consists of straight walks." And however much our gardening has been praised and copied by private persons on the continent of Europe, yet, with the exception of Count Rumford's walk at Munich, and the late Earl of Findlater's at Carlsbad, almost all the others are very properly in straight lines.

The object of public gardens is less to display beautiful scenery than to afford a free wholesome air, and an ample uninterrupted promenade, cool and shaded in summer, and warm and sheltered in spring and winter. In a limited extent, these must be attempted in one principal walk, which, for that purpose, should as much as possible be laid out in a north and south direction. In more extensive scenes, certain covered walks may be devoted to summer, and certain east and west open walks, to spring and winter. The broad open, and narrow-covered avenues of the ancient style, are valuable resources on a large scale; these conjoined (*fig.* 406.), and laid out in a south and north direction, give in the centre an opened, sheltered, sunshine walk in mid-winter; and a close or covered avenue being lined out along each side of the open central one, will afford shady walks for summer, and occasional places of retreat from casual showers in spring. Oxford and Cambridge afford some fine open and covered avenues, though far inferior to many on the continent.

2041. *Public Squares*, of such magnitude as to admit of being laid out in ample walks, open and shady, are almost peculiar to Britain. The grand object is to get as extended a line of uninterrupted promenade as is possible within the given limits. A walk parallel to the boundary fence, and at a short distance within it, evidently includes the maximum of extent; but if the enclosure is small, the rapid succession of angles and turns becomes extremely disagreeable, and continually breaks in upon the *pas des promeneurs*, the conversation of a party, or individual contemplation. The angles, therefore, must be avoided, by *rounding them off* in a large square; in a small one, by forming the walk into a circle; and a small parallelogram, by adopting an oval form."

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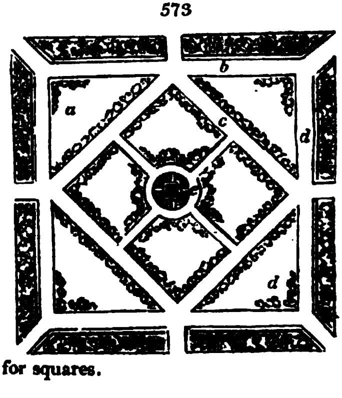

In a large square, (*fig.* 573.) three objects ought to be kept in view. 1. Sufficient open space (*a*), both of lawn and walk, so as the parents, looking from the windows of the houses which surround the square, may not long at a time lose sight of their children. 2. An open walk, exposed to the sun, for winter and spring (*b*). 3. A walk shaded by trees, but airy for summer (*c*). 4. Resting-places (*d*); and a centrical covered seat and retreat (*e*), which, being nearly equidistant from every point, may be readily gained in case of a sudden shower, &c. The statues of eminent public men are obvious and appropriate decorations for squares.

Russel Square, laid out from a design of H. Repton in 1810, is one of the most complete in these respects in London. It has been objected to as over-planted; but this is only a piece of vulgar injustice, applied indiscriminately to every rural artist; all of whom, as a matter of course, conclude, that when magnitude effects the purposes of number, the superfluous plants will be rooted out.

Sloane Square is very ingeniously laid out as a botanic garden, by which means the surrounding inhabitants have an easy opportunity of blending recreation with instruction. This plat being a parallelogram or long square, and the ground being low, H. Repton proposed to form it into a winding valley, containing a piece of water; the walks to be winding, the trees grouped, and the whole contrived so as to produce an appearance of nature in the midst of art: but his advice was not complied with.

The late poet-laureat, H. Pye (*Essays*), purposed to lay out a square, in imitation of a wild overgrown quarry or gravel-pit, and plant it with thorns, hollies, furze, brambles, ferns, &c. This mode he would adopt on account of its originality.

Edward's Square, Kensington, was laid out, in 1819, in groups and winding walks, in a manner different from most other squares, by A. Aiglio, an eminent landscape painter. A small city square might be laid out in terraces, like the Isola Bella, or the gardens of Babylon, and the space beneath usefully disposed of as vaults for goods, or a cattle market.

2042. *Botanic Gardens.* The primary object of botanic gardens is to exhibit a collection of plants for the improvement of botanical science; a secondary object to exhibit living specimens of such plants as are useful in medicine, agriculture, and other arts; and a third is, or ought to be, the acclimating of foreign plants, and their dissemination over the country.

In choosing *a situation* for a botanic garden, the leading object must be proximity to the town, city, or university to which it is to belong; and the next, if attainable, a variety of surface and soil, to aid the necessary formation of composts and aspects for different plants. In general, however, there is little choice in these respects, it being sufficiently difficult to procure an adequate extent of surface of *any kind* near large towns.

As the leading object or feature in the view of a botanic garden is the range of hot-houses; and as these must always face the south, it is generally desirable that ground on the north side of the principal public street or road by which it is to be approached, should be preferred to ground on the south side. In the latter case, the hot-houses must be approached from behind, and then the spectator must turn round to look at them, by which their grand effect is lost. The Liverpool and Oxford gardens are in this respect unfortunate; that of Edinburgh fortunate.

The *extent* requisite for a botanic garden depends upon that of the collection intended to be formed; as well as on the magnitude to which the tree plants are intended to be grown. A good deal will depend also on whether tender exotics are to be principal or secondary objects of collection, and also on the manner of growing the hardy herbaceous plants. An immense collection of herbaceous plants may be included in a small space, if the soil is loamy, rather inclined to moisture, and if the plants are separated from each other in the rows by bricks or thin tiles, which at once completely separates them and stints their growth, so as to admit the number being planted on the same space. The extent of the Chelsea garden is little more than three acres; that of the Liverpool garden is five acres; and in both are extensive collections. Messrs. Loddiges' have above a thousand species of herbaceous plants, which they keep constantly in small pots, set on beds of scoria. These occupy very little space, and the plants thrive well. Of course the larger growing kinds are excluded.

The *form* of a botanic garden is a matter of very little consequence: where the extent is small, a square or parallelogram may undoubtedly be made to contain most plants; but where it exceeds four or five acres, any form will answer; and, indeed, if there is a sufficient quantity of ground, the more irregular the form, so much the more variety will there be in the circumferential walks of the garden.

The Chelsea, Cambridge, Oxford, and Edinburgh gardens, are square, or nearly so; those at Liverpool, Glasgow, Hull, and the Dublin Society's garden, are irregular. The two latter both in outline and surface.

The most irregular botanic gardens, both as to form and surface, with which we are acquainted, are those of Konigsberg and Warsaw. A small rill runs through the former, with the most irregular wavy banks on each side; and the latter is on the steep, broken, and almost inaccessible banks of the Vistula.

2043. *In laying out the area of* a botanic garden, the objects already mentioned, and various others, must be kept in view. If it be merely desired to have a general collection, then a surrounding border for the trees and shrubs; internal quarters for the beds of herbaceous plants; and a space at one end or side for the hot-houses, frames, compost-yard,

&c. will be sufficient; surrounding the whole with a walk, which may also cross the garden in one or more places. Such a walk to display in succession every remarkable feature, is essential to all gardens, whatever may be their extent or kind.

In a *complete Botanic Garden*, the following seem to be requisites.

1. A *Curator's House*, with seed-room, office for business, library of reference, herbarium, room for lectures or demonstrations. This is most generally situated at or near the entrance of the garden. Some consider it preferable to place a lodge at the entrance for the under-gardeners, and to place the curator's house with its accompaniments as above, in connection with the range of hot-houses; and this the more especially as botanic gardeners are rarely family men, at least in Britain.

2. A *Range of Hot-houses*, either in one line, or in a semi-circle, circle, square, half square, &c. according to taste and other circumstances; with back sheds for all the usual purposes of such, including rooms for the journeymen, where there is no odge; and lodgings for one man, even if there is a lodge, in order to attend to the fires.

3. An adjoining arrangement of *pits and frames*, but not in front of the range of hot-houses, as in a nursery.

4. A *Compost-Ground* for all the usual purposes.

5. An *Aquarium*, including a bog, pond, spring, and salt-water cistern, for marine algæ.

6. A *Rock-work*, and underneath pendant walls, tunnels, vaults, and caves, open in different degrees and directions for the growth of mosses, ferns, &c.

7. *Borders*, shaded and kept moist in different degrees for ferns and other appropriate plants.

8. A *Fungi-Ground*, shaded by trees or vaults, and containing stumps and roots of trees of different kinds, and other means for the preservation, as far as art will go, of a collection of native or hardy fungi, edible, and poisonous.

9. An American, or *Bog-earth Ground*, either a border, or connected groups, or a composite figure surrounded by walks.

10. An *Estivatium*, or paved area, for setting out the green-house plants in summer for air and exercise by wind. In the pavement ought to be holes, in which to insert iron rods to be connected with wires, to which to tye the taller and more flexible plants.

11. A *Grass-Ground*, or *gramineum*, for bringing all the grasses together.

12. A quarter for the *plants used in medicine*, according to the Pharmacopœas of the different universities, &c.

13. A quarter for the *hardy poisonous plants*.

14. Quarters for the plants and trees used in *agriculture*, *horticulture*, *dyeing*, and other branches of general economy.

15. A quarter for *florist's* and *border-flowers*.

16. A quarter, or, what is generally preferable, surrounding border or belt, for trees and shrubs.

Various other sub-arrangements or quarters of this nature may be contrived, as for creeping plants, climbing natives of particular countries, succulents, bulbs, &c.; and the association of plants in this way by strong natural and artificial (alluding to their use) affinities, is well calculated to facilitate both their culture and study. The most complete arrangements of this kind are to be found in the Paris, Dublin Society's, and Glasgow gardens.

The size and shapes of these sub-arrangements will, of course, be various, which will add greatly to the interest of the walks. They will, in general, be most advantageously placed round the outskirts of the garden, within the marginal plantation, and should be separated by different sorts of rustic walls, or mounds of rock-work, hedges, thickets of evergreens, and other means. They should all be connected by a walk in such a way as that a general spectator may see each scene without being obliged to enter minutely into it; and that whilst none can escape the botanist, he may have an easy opportunity of entering minutely into each or any of them.

17. The *central*, or principal part of the ground, should be devoted to one general arrangement of all the phanerogamous plants, including hardy exotic trees and natives. The trees may be kept dwarfed, by being propagated from cuttings, or layers, and by planting in pots, and pruning; and the stove, and other exotics, will of course only be plunged in their appropriate places for a few weeks in the warmest part of each summer, as in the Paris garden. Every plant ought to have its name painted on strong cast-iron talleys, on a bevelled face, in letters so large as to be legible without stooping. If to the name, systematic and English, could be added the Linnæan and Jussieuean class, native country, and time of flowering, it would obviously greatly facilitate the peripatetic study of plants. The talleys once placed there, should never be removed,

excepting when the arrangement is to be enlarged, because the name will shew that the plant exists, or ought to exist, somewhere in the garden; and will or ought to be placed there in the proper season. Such a collection should, in short, be a transcript of the catalogue of the garden; some of the filicæ, and most of the fungi, algæ, and musci excepted.

Whether the *arrangement* of such a general collection in the quarters or main area of the garden ought to be Jussieuean or Linnæan, must depend on the opinion of those concerned. In the present state of botanical science, that of Linnæus is the best for the study of nomenclature and technology: it is that generally adopted in Britain and the north of Europe; whilst that of Jussieu is almost universally adopted in France and Italy.

The *botanical arrangement* in the hot-houses, and as far as that kind of arrangement is applicable, in the different subsidiary or *habitat* arrangements, should, in our opinion, decidedly be Jussieuean, as presenting the strongest natural affinities, and calculated to promote variety in general appearance, facility in recollecting names, and often answering as to *kind of* culture.

The Paris garden is the most complete in Europe as to comprehensive arrangement; though the collection of plants is inferior to that at Kew or Liverpool. It is remarkable also for its menagerie, containing a collection of living animals of many kinds, lodged in appropriate buildings with surrounding enclosures of different degrees of extent. It also contains specimens of all the different soils, composts, and operations of horticulture and agriculture. A plan of this garden has been given by Professor Thouin, in the *Annales du Musée*; and a plan of it published more recently by the professors brother, G. Thouin, (*Artiste Jardinier*,) in *Plans, Raisonnées des Jardins, &c.* This plan (*fig.* 574.) not only contains the ichnography of the garden (1 to 21), but in the margin are placed elevations (22 to 42), of the houses in which the living animals are kept, of the immense buildings in which the museum of natural history is contained, and of the hot-houses and entrance gates.

The garden is entered through a handsome iron railing between lodges, (1, and the elevation 32) opposite the bridge of Austerlitz (42). On the left is the menagerie, commencing with the ferocious animals, in a long building, with wings and a fore court; and next in order is a number of small irregular-shaped inclosures of pasture, covered by trees, each devoted to one genus of animals, and containing a building in the centre for their repose or shelter (2 and 3). Passing these we arrive at the dwelling-houses of the professors of natural history; and the large amphitheatre (4, and elevation 26), (7, and elevation 23, 34, and 35) in which the lectures are given. Here is also the hot-house department with a sunk area in front for pots and frames; a space called the seed garden for raising seeds, and for nursing them till they flower. Adjoining is an artificial mount, crowned with a kiosque (5, and elevation 33) which overlooks, not only the whole garden, but great part of Paris; it contains a sun-dial, which, by means of a lens, is contrived to discharge a cannon every day at noon. The museum of natural history is a large building at the upper end of the garden, exactly opposite the entrance (6 and elevation 24); it is separated by a handsome low wall and iron rails from the open garden, which consists of 36 plats, enclosed by open lattice-work from the walks, which are at all times open to the public. These plats contain specimens of the mode of propagating all herbaceous vegetables (8); the same of all trees and shrubs; a department which is particularly rich in specimens of grafting and inarching (9); a large basin for aquatics, and aquatic birds and reptiles, situated at the bottom of an excavation, more than ten feet below the level of the general surface of the garden (10); the sides of this excavation are planted with marsh trees and shrubs. The next divisions consist of florist's flowers arranged according to their colors and times of flowering (11); medicinal plants (12); illustrations of the operations of agriculture on plants, as the different kinds of hedges, live fences, rows, &c. (13); all the sorts of fruit-trees, vines, and fruit-shrubs, which grow in the open air in France, with different modes of pruning and training them (11); all the sorts of vegetables used in rural œconomy throughout Europe, the more tender sorts, as the *convolvulus battatas*, being protected early in the season by glass (15). The general arrangement of all the plants grown in France, tender and hardy, occupies ten plats (16); the classification adopted is that of Jussieu. The tender species are brought from the hot-houses in June, and plunged in their places in the beds, where they remain till September; the hardy tree and shrub kinds are kept dwarf by pruning, and brought into flower by ringing. The different sorts of annual plants, and the mode of raising seeds of every kind, is displayed in a large plat (18). There is a general aboretum (17); one of winter or evergreen trees (19); of trees in perfection in autumn (20); of summer trees (21); and of spring trees.

The principal buildings are the menagerie for ferocious animals (22); the conservatory (23); museum (24); lodge for East India deer (25); lecture theatre (26);

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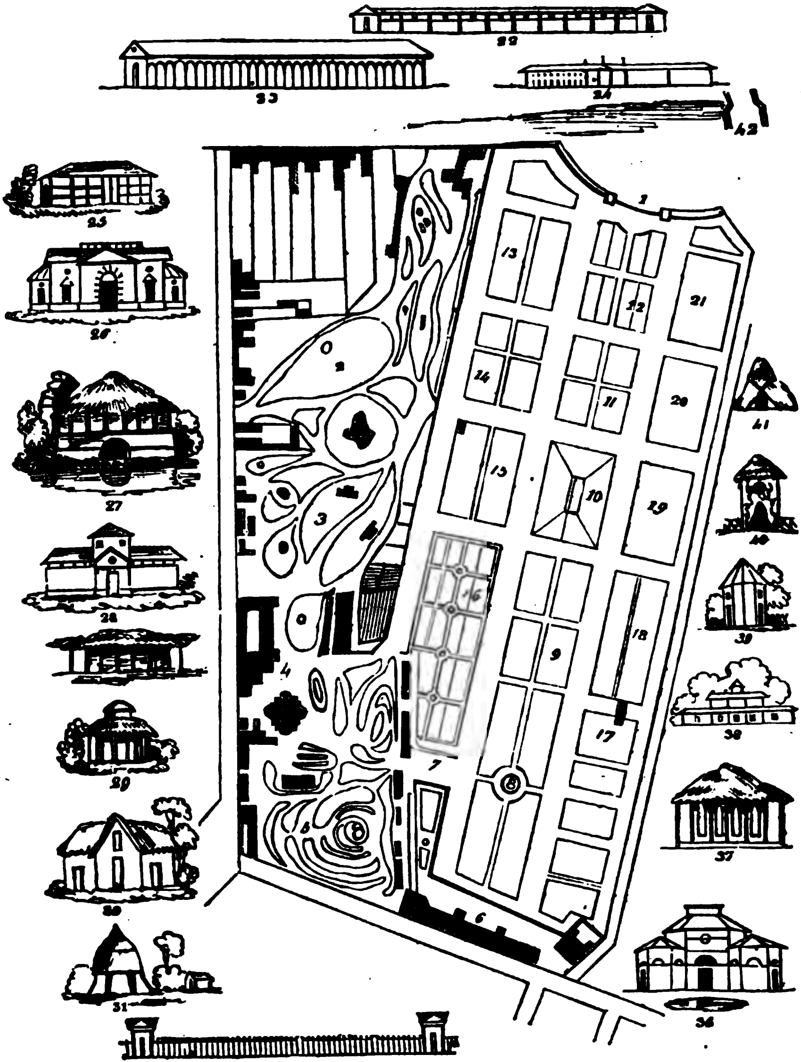

retreat for buffaloes (27); stable for the equus tribe, with pigeon-house over (28); Merino and other sheep-cots (29); cot for goats (30), for camels (31), for elephants (36), for foreign oxen (37), for red deer (39), for the dromedary (40), for packing plants (41), and for a public coffee and milk house, situated at the base of the mount (38); and a restaurateur in the spring arboretum.

2044. *Public Nursery Gardens.* In choosing a situation in which to establish a nursery, two points are to be considered — fitness as to the disposal of the produce, and fitness as to shelter, aspect, and soil. Where it is intended to attempt a general nursery business, regard must be had to the leading roads of the district, the means of carriage by land or water, the kind of objects that will be most in demand, whether seedlings, fruit-trees, or tender exotics, or all of these. Where a local business is to be commenced, it is evident much will depend on the choice of a conspicuous situation in some line of road of general resort, and as near as possible to some town or city.

As far as respects shelter, aspect, and soil, the remarks already submitted in reference to private nurseries (1875) may suffice. The best general soil, is evidently a free tender loam; and the best general aspect or exposure, one inclining to the north; as precocity is no advantage in a nursery, but the contrary, and all seedlings and tender plants will be the safer till they come up, and come up more vigorously, when brought on not so much by the direct rays of the sun as by his indirect influence on the atmosphere. Another great advantage of a northern exposure is, that plants and trees may be taken up, as well as planted, later in the season, than in one of a contrary nature. Grafting also, and making good deficiencies and other nursery operations, which are generally deferred to the last moment, may be done with less injury to the trees and plants.

The Extent of a Nursery must depend on the means of the occupier, and the probable extent of market. It will also depend, in some degree, on the kind of articles to be chiefly cultivated, and the mode of cultivation to be pursued. Where manure is scarce, such a system of alternate nursery and market garden crops, must be adopted as shall preserve the ground in heart; but where manure is more abundant the severe crops may succeed one another more closely. Where thorns and seedling forest trees are to be the chief articles grown, it is evident less ground will be required than when transplanted forest-trees are to be the chief article produced.

In laying out a Nursery, the objects to be cultivated, and the kind of business to be expected, must be leading guides in the design, and the duration of the tenure will naturally have a material influence on the execution.

2045. The following seem objects desirable for a *complete* nursery:

The *Dwelling-house* of the master; this in a nursery for local demand, and in which public attraction is an object, ought to be placed near the road; and at the same time as centrically as possible in other respects. In general, the living-rooms ought to be elevated so, that their windows may command, as far as practicable, the whole nursery; but, at all events, the following objects, more or less.

A *Seed-shop* and counting-house or office, which should be connected with the house for the master's convenience; but, at the same time, have each distinct entrances. The counting-house should have a good clock, and a rope or chain communicating to a bell placed over, or in some conspicuous situation for regulating the hours of labour; also a speaking-pipe to the packing-court and centre of the hot-houses.

A *common living-room*, and a number of sleeping-rooms for the whole or a part of the journeymen employed by the year, or otherwise, communicating with the packing-court, or in some cases, on a small scale, occupying part of the ground-floor of the house. From this appendage should be a speaking-pipe and bell to communicate with the counting-house and the master's sleeping-room.

A *tool-house*, sufficiently commodious and properly arranged, communicating with the seed-shop, and the tools when brought to which, should be at least weekly examined by the foreman before paying the men. The larger number — sticks or talleys, not in use, should also be kept here.

A *museum and herbarium-room*, in which models (in plaister, *terra cotta*, or *papier maché*), of all the fruits and dried specimens of all or most of the plants grown in the nursery, should be kept, in order to show to purchasers, in seasons when the plants to be purchased are not in fruit or in flower.

Packing-sheds, surrounding a part or three sides of a packing-court, one of these being open to, or commanded by the windows of the office and common living-room of the house. Over these should be a range of seed and store lofts.

A *stable, cart-shed, cow-house, and pig-stye*, if such conveniences are desired, communicating on one side with the packing-court, and on the other with the wall, coal-shed, a horse-dung heap, and other similar objects in the back area of the dwelling-house.

A store-ground, or *laying in-ground*, three or more times the size of the packing court in which to inhume the roots of plants taken up, to be ready for sale or packing.

A square, octagonal, or polygonal *plat for the hot-houses*, in the circumference or boundary, and the central part for the pits, and all the framing, hand-glasses, &c. with space sufficient for setting out the green-house plants during summer. If the whole boundary cannot be at once, or perhaps not at all, covered with glass, the naked part may be a wall for training fruit-trees, and the north border for auricula frames or stages, striking cuttings, &c. But in a general nursery, the whole of the boundary of a square may be very properly covered with glass, facing the centre; that of northern aspect being well adapted for striking plants, and preserving, or retarding such as are in flower. The exterior of this boundary line should be arranged for pots, potting, tan-furnace, and general working sheds; or, if this be not wanted on the south side, that part of the wall may be devoted to the training of fruit-trees.

A *Compost-ground* for different sorts of earths, gravel, manure, and rubbish heap.

A *Rotting-ground*, for depositing tree seeds, in layers of sand or ashes, in order to rot off their external coats, and promote the decay of nuts or other hard covers of seeds (1876.).

A *Parterre* for the culture and display of such of the border and florists' flowers as are grown in the nursery, and for a specimen of rock work, an aquarium, apiary, and covered seat for visitors.

2046. These parts may be considered as constituting the chief arcana of the nursery, and may be distinguished by the home division. The *rest of the nursery* should be laid out, as nearly as the circumstances will admit, in parallelograms, of any convenient dimensions, but not wider than the ordinary length of a garden line, say under 150 feet, which allows of a row sufficiently long for any purpose. The chief reason for the parallelogram form is, that all rectangular figures are most easily cultivated and measured, and the reason for their being all of the same size is, in order that the master may readily, after a little experience, form a tolerably accurate idea of the quantity of every kind of nursery labor requisite for a plat of this shape and size. Thus, supposing each division to contain half an acre; then one man will dig it in one day, trench it in two days, hoe it, if in wide rows, in a fourth of a day, if in narrow rows, in half a day. A woman, if in beds, will weed it, if very thick of weeds, in two days; if thin of weeds, in one day, and so on.

The quarters should, as much as possible, be cropped with one general class or kind, and by rotation. As, for example, for seven years: 1st, Break up from grass with turnips after trenching. 2d, Transplanted forest-trees, two years. 3d, Green crop, one year. 4th, Annual flowers, for seed, one year. 5th, Seedlings, one year. 6th, Transplanted fruit-trees, four years. 7th, Bedded thorns, two years; and so on.

Some quarters must be set apart for common stools; and if the circumferential borders are not sufficient or proper for stools of rare or peculiar sorts, others must be contrived by means of hedges, pales, or walls, to produce shelter and shade for cuttings, fit situations for bog-earth borders, American stools, bog-plants in general, and similar purposes. If the borders are all of the same width, say ten or twelve feet, it will simplify all future calculations as in the quarters.

A grand *central, and a circumferential Walk*, with some cross walks, should be contrived to display the whole nursery to the best advantage. A narrow or common sized border should accompany these walks, excepting where the broad circumferential border comes in; and in the narrow borders should be displayed single specimens of all the more rare trees and shrubs grown either from seed, or by other means, for sale, and of all the perennial, biennial, and annual border-flowers sold to the public in the form of plants, roots or seeds. Those may be excepted which are grown in the flower-garden, rock work, and aquarium.

Some quarters near the house must be set apart as a *Nursery-orchard*, and in these, one or better two plants of each of all the hardy standard fruit-trees should be planted, in order to come into bearing, and admit of proving the kinds; and from which alone the grafts and buds should be taken, (unless on the introduction of new and valuable sorts, in which case such grafts as can be got must be taken till some of the progeny moved to the nursery-orchard come into a bearing state,) which are to be used in the nursery.

This orchard should be surrounded by a wall, on which to grow specimens of such sorts of plums, cherries, and pears as do not ripen well as standards; the hardier sorts of grapes, and peaches, nectarines, and apricots. The tenderer sorts of vines, and some few peaches, which are tender in the northern counties, may be grown, one of a sort, under each rafter in the range of hot-houses.

In general, it may be observed that the quarters for stools of every description, and the borders for cuttings, should be as near the house as possible, as on these, men are employed a greater number of days in the year than on any other of the quarters, and therefore it is desirable such quarters should be more immediately under the eye of the master.

Fruit-tree and seed-bed quarters should come next; then transplanted shrubs; next young forest-trees transplanted; and, in the most distant parts, the larger forest-trees, as requiring least culture of all. But a proper attention to rotation will not admit of this arrangement being completely attended to; and to keep the ground in good heart is as essential to success as keeping the men at work.

In some of the principal nurseries which have risen to their present degree of eminence by degrees; and where consequently one building or additional object has been added to another as wanted, without having any general plan in view, the greatest confusion in appearance, and a considerable loss of labor, is the final result. The best way in such a case is to pull down great part of the hot-houses and outbuildings and re-arrange the whole on some plan which will admit of a regular tour of inspection, either by the master or stranger visitants. A fine example of this has been given by Messrs. Loddiges'; whose arrangement, and mode of displaying the whole to strangers, is so perfect, that the time saved in conducting visitors through the premises will more than repay the expence of the alterations.

2047. Of *Florists' Gardens* there are two sorts; the first for the purpose of forcing flowers in pots, for drawing-room gardens, and raising others in the open air for the flower-market; the second for the propagation and culture of florists' flowers, in order to vend their bulbs and plants. Both should be situated near a large town, as a market for the produce of the first kind; and to insure visitors to the flower-shews of the second. A low situation, if possible near the sea, but at all events with a humid atmosphere, is to be preferred for the culture of bulbs; and no florists' flower will thrive in an atmosphere impregnated with coal smoke.

Very little skill is requisite for laying out either of these gardens to those who understand the culture they require. The hot-house, pit, and frame departments should be kept together; close to them the compost, dung, and tan-grounds or sheds; next the ground where pots of roses, &c. are plunged; and the least near parts remain to be devoted to the culture of flowers or flowering shrubs in the open ground. For the conveniency both of culture, without treading on the plants, and of gathering the flowers, the whole is generally laid out in beds, sometimes with box-edgings, but more commonly without any, which for bulbs and plants to be annually removed, admits of more effectual culture.

2048. *Market-gardens* are of two kinds; those cultivated by manual labor, and those wholly or in part by the plough. In choosing a fit situation for a market-garden, regard must not only be had to the requisites for a good kitchen-garden, as to shelter, soil, water, &c. (1074. to 1109.) but to the probable market-kind of produce to be grown, &c. The extent must depend jointly on these circumstances and the capital to be employed. The smallest extent of surface and capital is that in which a man performs the whole of the labor himself, and this so entirely depends on the articles cultivated, the nature of the soil, and mode of culture, that it may vary from one to two acres, and where grain and seed crops are introduced, to a greater number. As to the quantity of ground which a man of capital may manage by this way, no limits can well be assigned to an active and vigilant master. Some London gardens of this description, entirely cultivated by manual labor, exceed 100 acres. In laying out a market-garden there cannot be said to be any thing peculiar: the general points of order, distinctness of compartments, and keeping the plats as much as possible in squares and parallelograms are of obvious importance.

2049. *Public Orchards* are of various kinds; garden orchards, where the ground is cultivated and cropped, with culinary vegetables or small fruits; arable orchards, where the trees are in rows, and the spaces between in aration; and pasture orchards, when the trees are scattered over pasture lands. In fixing on a situation for either kind, the three chief points are soil, sub-soil, and shelter, which have been already considered in treating on private orchards, as well as the planting and kinds of fruit-trees.

2050. *Physic* or *Herb-gardens*, if for growing aquatic herbs, as mint, should be situated in a low moist soil; if for aromatic herbs, as lavender, rosemary, &c. on a dry, poor soil; and if for roses and similar plants, for producing flower-leaves for the distiller, the soil should be loamy and rich. In laying out this kind of garden, the only point in which skill is requisite, is the contrivance of a system of irregation for the mints.

2051. *Seed-gardens*, or seed-farms, require a dry soil; and two should never be situated together, if destined for the same sorts of seeds. All the art in them consists in cropping, so as to insure seeds true to their kind. Indeed, the culture is by far the most important consideration, not only in this, but in the four preceding descriptions of public gardens; and this is still more the case with respect to *gardens for peculiar crops*, as for the bulbs of white lily, rhubarb-roots, liquorice, &c. which, as to laying out, require no further notice.

Chap. V.

Of the Practice of Landscape Gardening.

2052. The question has been agitated by some respectable authorities, whether every proprietor ought not to become his own landscape gardener; to which Repton replies, "that had the art still continued under the direction of working-gardeners or nurserymen, the proprietor might supersede the necessity of such landscape-gardeners, provided he had previously made this art his study; but not (as it is frequently asserted) because the gentleman who constantly resides at his place must be a better judge of the means of improving it,t han the professors, whose visits are only occasional; for if this reason for a preference were granted, we might with equal truth assert, that the constant companion of a sick man has an advantage over his physician.

"Improvements may be suggested by any one; but the professor only acquires a knowledge of effects before they are produced, and a facility in producing them by various methods, expedients, and resources, the result of study, observation, and experience.

"He knows what can and what cannot be accomplished within certain limits. He ought to know what to adopt, and what to reject; he must endeavour to accommodate his plans to the wishes of the person who consults him, although in some cases they may not strictly accord with his own taste." *Observ. on Landsc. Gard.* p. 10.

A more wise plan than that of doubting on the subject would be to have the separate opinions of different landscape-gardeners and architects; for no opinion need be followed if disapproved of; while the probability is, that there would be something valuable in each, and the proprietor might finally, aided by the artist he preferred, decide for himself, never, however, forgetting the idea of a consistent and beautiful whole. As to the expence of opinions, Girardin observes on this subject, "N'allez pas le regarder... il vous en coutera bien d'avantage pour des variations, et des retouches continuelles."

The intimate connection between landscape gardening and architecture; the propriety and advantage of the joint consultations of the landscape-gardener and the architect, as to the situation, aspect, and style of the house; together with the almost unavoidable encroachments of the former on the latter, by designing and executing garden buildings, has given rise to an opinion, that the landscape-gardener ought to combine the functions of the architect. Repton justifies the idea, by referring to the many excellent houses built by Brown, with no other knowledge than that acquired by observation of all the best houses; and of Kent, who was at once landscape-gardener, architect, and historical painter. We are of opinion, that in the case of garden buildings and small villas, or ornamented cottages, the knowledge both of the theory and practice of architecture, which it is necessary every landscape-gardener should possess, will enable him to combine the duties of both professions; but such are the advantages of a division of labor in the fine, as well as in the useful, arts, that in all more extensive buildings, and indeed even in those we have mentioned, we would recommend the employment of a regular architect, jointly with a landscape-gardener, as a surgeon consults with a physician in important cases.

The duties of the landscape-gardener resolve themselves into the formation of a plan or design, and the carrying of it into execution.

Sect. I. *Of the Study of the given Situation, and Circumstances, and Formation of a Plan of Improvement.*

2053. On whatever occasion the opinion of a landscape-gardener is desired, he should be furnished with a written or verbal instruction as to the points to which he should chiefly direct his attention; with a complete map of the estate, and an accurate detailed history and description of its localities and peculiarities. From these, from topographical and county surveys, and a residence of a few days or weeks, according to the extent of the subject and season of the year, (spring, before the leaves expand, being the most favorable time,) he will be able to procure every requisite information, and to establish in his memory every thing relating to the situation and vicinity. He is then, and not before, to embody and mature his ideas of improvement, directing his attention first to the situation and aspect of the house and offices, the extent of the park, and the emplacement of the kitchen-garden; next to the general masses of wood, and then successively to the breadth of lawn, the situation and character of water, the pleasure-ground, farm, and other details. Before making up his mind on any part of the subject, he will often find it of importance to have sections taken of the grounds in different directions, levels of springs, and rills, &c. and most frequently he will have occasion for stakes, for marking out lines on the ground; of flag-staffs or poles, from six to fifty feet high, to represent the effect of trees (*fig.* 575.) and other objects; of strips of white sheeting, to shew the effect of water, by forming a white outline on a perfect level; of frames partially covered with boards, to shew the effect of buildings; and he may even require boring-irons, or pits dug, in order to inquire into the nature of the subsoil. Being furnished with a plan of the present state of the grounds, (such as 241.) he will, as he makes up his mind on particular improvements, mark them down on this map in pencil, and when the whole is finally adjusted, he will put them in red, or in any distinguishing color. And on one or more general or panoramic views (*fig.* 245.), as well as on the particular views which he may have taken on different spots, he will also mark in red the outlines that will be made by the improvements adapted to the different situations. In addition to these, he will shew the effect, by geometrical sections taken in different directions across the grounds (*fig.* 239.), to shew the ground's surface. His next operation is to make a vertical profile (*figs.* 243 and 244.), shewing the effect of the whole, supposing the alterations to be fifteen or twenty years completed, with corresponding, panoramic, or general views (*fig.* 245.), and with particular landscapes. It remains for him to give reasons in writing for all that he proposes; a practice which no employer or artist should ever omit to have done, as such opinions remain as data, to be referred to concerning the management and future effects; as well as in point of present or future justification of the taste, both of the artist and proprietor. This may be done in the following order: 1. Recapitulating the given instructions. 2. The characteristic of, features, and other details, of the given situation and vicinage. 3. A description of, with the reasons for, the general outline of improvement. 4. The description of, with the reasons for the detail. 5. An outline of the future management. 6. Directions for the execution; and, 7. An estimate of the expence.

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In all these discussions proper references will be made to the maps and sketches. Simple language will of course be employed in describing future effects; but, above all, simple sketches, which shall owe little of their effect to shading, and none to coloring, or finishing, are essentially necessary.

M. Girardin seems to have been the first who suggested this mode of obtaining an opinion systematically; and his remarks on the fallacious effect of beautiful drawings instead of outlines, are well deserving of attention. "Vous tâcherez même que cette esquisse ne soit qu'un simple trait; et ne présente d'abord que les formes principales des objets, et la disposition générale des grandes masses de votre ensemble. Un dessein bien finie ne manquera pas de vous seduire par l'agrément de la touche d'un habile artiste; vous vous determineriez d'après un dessein dont vous ne reussiriez peut-être pas à obtenir l'effect dans la nature, et il faut bien mieux avoir à gagner qu'à perdre dans l'execution."

H. Repton has the merit of first employing this system elegantly and extensively in England, and of adopting, instead of one entire landscape to shew the previous taste, and another to shew the effect of the alterations, a slip of paper of the size and shape of those parts of the landscape which require alteration. This is fixed at one edge of the entire landscape, and lies flat over part of it, so that when lifted up it shews the full effect. It must be confessed, however, that, though an elegant mode, it is not perfectly fair, since the view in which the cut paper forms a part can never look so well as the other, even from the mere circumstance of the bounding line of the paper. For some cases, however, it may be used, though in general it will be found, that two entire landscapes afford the most impartial means of judging of the effects of an improvement. The discussion and sketches of the place, and improvements being finished, and bound in a book, the ground or working plan is to be put on canvass, or copied on parchment, for the common use of the gardener, or whoever sets out the work; and the profile put on rollers, to be preserved along with the book of notitia. These being delivered to the proprietor, he will determine, after mature deliberation, whether or not he will adopt the whole, or any part of the improvements, previously consulting those friends whose taste or judgment he considers adequate to forming a judicious opinion on the whole, or on any one part of the subject. "Lorsque l'esquisse de votre ensemble sera faite, alors vous réfléchérez, vous concerteréz, vous discuteréz avec des gens de goût, l'ordonnance générale de la disposition qu'elle vous presente."

In this example of forming a plan, we have had in view a dull and nearly flat site, where nothing has been done; but it is evident that the same general principles are applicable to such places as are to be altered, diminished, or enlarged.

2054. By a general plan of this description, accompanied by others more detailed, of the kitchen-garden, pleasure-grounds, terrace, &c. and by the explanatory details of the book of notitia, any gardener of ordinary intelligence may execute the most intricate design, and if this design has been carefully formed from inspecting the premises, and proper general views have been minutely taken from different points, the landscape-gardener may shew the effect of future improvements with confidence, and leave behind him the *Notitia, or Book of Improvements,* or, in other words, such plans, sections, views, and written instructions, as may enable the gardener gradually to produce them, with nearly as much certainty as an architect directs a builder to raise an elevation of masonry. Distantly situated proprietors, ambitious of displaying some refinement of ideas on rural matters, might in this way first procure, and then work to a general plan; instead, as is often the case at present, of working according to their own crude notions; and producing scenes which afford no pleasure to any one but their owner, and only to him whilst he remains in *statu quo* as to taste.

Sect. II. *Of carrying a Plan into Execution.*

2055. Whether this must be done by contractors, or by the proprietor at his own risk, must depend on circumstances, both respecting the knowledge, taste, and leisure of the proprietor, and the nature and extent of the improvements. Where an entire new house and grounds are to be created, an eminent substantial contractor for the buildings, and another for the ground operations, will be found the most speedy and certain as to expence; the work, in both cases, being liable to be regularly examined at stated periods by a neutral surveyor, accompanied by the original designers of the improvements.

If this mode is not adopted, the whole or greater part may be done under the eye of the owner and his steward; various, and as many parts as possible, being let by the job. We shall take a cursory view of the chief objects of alteration or addition; and indicate some things in each, which may in most cases be more profitably done by the job, premising, that whenever the cost or intricacy of any piece of work is considerable, unless a contractor of some respectability is employed, the work is much better done by the laborers of the proprietor.

2056. *Buildings.* All alterations or new erections may be readily estimated and executed by contract, and, almost in every case, at less expence to the proprietor. The mere difference between the trade price and the gentleman's price of the materials and labor, and between the hours kept, and quantity of work done in a given time by a journeyman to a master tradesman and to a gentleman, will (if the former should, by error in estimating, find no other gain), afford a certain profit to the tradesman; and thus, suppose a contractor to estimate a piece of work at 1000*l.*, and which the proprietor, changing his mind, instead of letting to the contractor, executes himself, and finds the amount 1100*l.*, the contractor, had he got the job, would have actually had a profit, and the owner been a gainer of 100*l.*

The mansion, domestic, and farming offices, garden walls, and hot-houses, may all be separately contracted for.

2057. *Ground.* The removal of ground, fences, or digging, may in every case be let by the job, and with decided advantage to both parties. The extent of particular contracts should, of course, be in proportion to the responsibility of the contracting parties.

2058. *Planting.* The enclosures and the preparation of the soil may, in all extensive cases, be executed by contract; but the planting or insertion of the plants, on which so much depends, should uniformly be done by day-work; excepting, however, those cases in which a respectable nurseryman will engage to put in a certain number of plants of a certain kind, size, and age, and maintain them there for at least three years. In some extensive cases, the land may be prepared by fallowing, which the adjoining farmers will generally undertake at a very moderate price per acre. In most cases, the contractor for fences, of whatever description, should undertake to uphold them for a given number of years; and in cases of thorn hedges, or other live fences, until they become sufficient barriers.

2059. *Road* and *Walk making* may frequently be contracted for; but in this case, as in every other, much will depend on the skill, activity, and experience of the gardener or general overseer.

This subject will be found illustrated at greater length, and in a manner incompatible with the nature of this work, in the second edition of our *Treatise on Country Residences.*

PART IV.

STATISTICS OF BRITISH GARDENING.

After having considered gardening as to its history, as to the scientific principles on which it is founded, and the application of these principles to the different branches of practice; it remains only to take a statistical survey and estimate of its present state and future progress in the British isles.

BOOK I.

OF THE PRESENT STATE OF GARDENING IN THE BRITISH ISLES.

The present state of gardening, as to knowledge, has been the subject of the former parts of this work; but its importance, in the general economy of society, can only be learned by a statement of the manner in which it is actually carried on; the modifications to which it has given rise in the pursuits of those who have embraced the art as a source of livelihood; of the kinds of gardens employed by men of different orders in the state; of the principal gardens as distributed in the different counties of Britain and Ireland; of the British authors who have written on gardening; and of the private or professional police, and public laws relative to gardeners and gardens.

Chap. I.

Of the different Conditions of Men engaged in the Practice or Pursuit of Gardening.

These may be arranged as operators or serving gardeners; dealers in gardening or garden tradesmen; counsellors, professors, or artists; and patrons.

Sect. I. *Of Operators or Serving Gardeners.*

2060. The lowest grade in the scale of this class is *garden labourers.* These are occasionally employed to perform the common labours of gardening, as trenching, digging, hoeing, weeding, &c. Men for the more heavy, and women for the lighter employments. They are not supposed to have received any professional instruction, farther than what they may have obtained by voluntary or casual observation. In all gardens where three or four professional hands are constantly employed, some laborers are required at extraordinary seasons.

2061. *Apprentice.* Youths intended for serving, or tradesmen gardeners, are generally articled or placed under master or tradesmen gardeners, for a given period on terms of mutual benefit; the master contracting to supply instruction, and generally food and lodging, or a weekly sum as an equivalent; and the parents of the apprentice granting the services of the latter during his apprenticeship as their part of the contract. The term agreed on is generally three years; or more if the youth is under sixteen years of age, but whatever may be the period, by the laws as to apprentices it must not extend beyond that at which the youth attains the age of manhood.

No one can ever expect to attain to the rank either of master gardener or tradesman, who has not served an apprenticeship to the one or the other. In general it is preferable to apprentice youths to master gardeners, as there the labor is less than in tradesmen's gardens, and the opportunities of instruction generally much greater.

2062. *Journeyman.* The period of apprenticeship being finished, that of journeyman commences, and continues, or ought to continue till the man is at least twenty-five years of age. During this period, he ought not to remain above one year in any one situation; thus, supposing he has completed his apprenticeship in a private garden at the age of twenty-one, and that his ultimate object is to become a head-gardener, he ought first to engage himself a year in a public botanic garden; the next year in a public nursery; that following, he should again enter a private garden, and continue making yearly changes in the most eminent of this class of gardens, till he meets with a situation as head-gardener. The course to be followed by an apprentice intended for a tradesman gardener is obvious; having finished his period in a private garden, let him pass through a botanic and nursery-garden, and then continue in the most eminent of the class of public or tradesmen's gardens, to which he is destined.

2063. *Foreman* (before-man, or first man). In extensive gardens where a number of hands are employed, they are commonly grouped or arranged in divisions, and one of the journeyman of longest standing employed as foreman, or sub-master, to the rest. Whenever three or more journeyman are employed, there is commonly a foreman, who has a certain extent of authority at all times, but especially in the absence of the masters. This confers a certain degree of rank for the time being, but none afterwards.

2064. *Master Gardener.* A journeyman has attained the *situation* of master-gardener, when he is appointed to the management of a garden, even if he has no laborer, apprentice, or journeyman under him; but he has not attained to the *rank* of master-gardener, till after being a year in such situation. Afterwards should he be obliged to work as journeyman, he still retains the rank and title of master-gardener, but not of head-gardener.

2065. A *Head-Gardener* or *Upper Gardener*, is a master who has apprentices or journeymen employed under him. Out of place and working as a journeyman, he retains the rank and title of master-gardener, but not of head-gardener.

2066. *Nursery Foreman.* This is an important situation, the foreman being entrusted with the numbered and priced catalogues of the articles dealt in; authorized to make sales; intrusted to keep an account of men's time, &c. (see *Time Book*, 1057.); and in consequence it entitles the holder to the rank of head-gardener while so engaged, and to that of master-gardener ever afterwards; the same may be said of foremen to public botanic gardens, and royal or national gardens.

2067. A *Travelling Gardener* is one sent out as gardener, or collector of plants, along with scientific expeditions; he is generally chosen from a botanic garden; and his business is to collect gardening productions of every kind, and to mark the soil, aspect, climate, &c. to which they have been habituated.

2068. *Botanic Curator.* This is the highest situation to which a serving gardener can attain next to that of being the royal or government gardener. He superintends the culture and management of a public botanic garden; maintains an extensive correspondence with other botanic curators; exchanges plants, seeds, and dried specimens, so as to keep up or increase his own collection of living plants, and *herbarium siccum.* Abroad, for want of sufficiently intelligent practical gardeners, they have what are called *directors*, and inspectors of botanic or other government gardens; but no such office is requisite in this country.

2069. *Royal Gardener, Court Gardener,* or *Government Gardener; Jardinier de la Cour,* Fr.; *Hoffgartner,* Ger.; and *Giardinaio de la Corte,* Ital. This is the highest step, the *summum bonum* of garden servitude. In foreign countries, the court-gardener wears an appropriate livery, as did formerly the head-gardeners of the principal nobility, as well as the court-gardeners of this country. At present this remnant of feudal slavery is laid aside in every grade of garden servitude.

Sect. II. *Tradesmen Gardeners.*

2070. The first grade here is the *jobbing gardener*, who makes and mends gardens, keeps them in repair by the month or year, generally using his own tools, in which he is distinguished from the serving gardener, and sometimes supplying plants from a small sale-garden of his own.

2071. *Contracting Gardeners,* or *New-Ground Workmen,* are jobbers on a larger scale. They undertake extensive works, as forming plantations, pieces of water, roads, kitchen-gardens, and even hot-houses, and other garden structures and buildings. Formerly, and especially in Brown's time, this branch of trade was combined with that of the artist gardener, but now since the principle of the division of labour has been so much refined on, they are generally separated.

2072. *Seed-Growers* are as frequently farmers as gardeners; their gardens or fields are situated in warm districts, and they contract with seed-merchants to supply certain seeds at certain rates, or to raise or grow seeds furnished to them by the seedsmen on stipulated terms. The great test of excellence here is never to grow at the same time such seeds as may hybridize the progeny by impregnation.

2073. *Seed-Merchants,* or *Seedsmen,* deal in garden seeds and other garden productions; in general they combine the business of nurserymen or florists, but sometimes confine themselves entirely to dealing in seeds wholesale, or to a sort of agency between the seed-growers and the nursery seedsmen.

2074. *Herb Gardeners* grow herbs, either the entire herb, as mint, or particular parts, as the bulb of lilium, and the flower of the rose for medical purposes, or for distillation or perfumery.

2075. *Physic Gardeners, Herbalists,* or *Simplicists,* not only grow herbs for the purposes of medicine, or perfumery, but collect wild plants for these purposes. Formerly, when it was the fashion among medical men to use indigenous plants as drugs, this was a more common and important branch of trade. They have commonly shops appended to their gardens, or in towns, in which the herbs are preserved, and sold in a dried state.

2076. *Collectors for Gardens;* the first variety of this species is the gipsey gardeners, who collect haws, acorns, and other berries and nuts, and sell them to the seedsmen; the next are those who collect pines and fir cones, alder, catkins, and other tree-seeds, which require some time, and a process to separate the seeds from their covers, and clean them before they can be sold; and the highest variety, are those gardeners who establish themselves in foreign countries, and there collect seeds, roots, and prepare dried specimens of rare plants for sale.

2077. *Orchardists* of the simplest kind, are such as occupy grass orchards, where the produce is chiefly apples, pears, and plums, for cyder or kitchen use; the next variety, occupy cultivated orchard grounds where fruit-shrubs, as the gooseberry, currant, strawberry, &c. are grown between the fruit-trees; and the highest variety, occupy orchards with walls and hot-houses, and produce the finer stove-fruits and forced articles.

2078. *Market Gardeners,* grow culinary vegetables and also fruits; the simplest kind are those who grow only the more common hardy articles for the kitchen, as cabbage, pease, turnips, &c.; a higher variety, grow plants for propagation, as cauliflowers, celery, and artichoke plants, and pot-herbs, as mint, thyme, &c.; and the highest variety possess hot-beds and hot-houses, and produce mushrooms, melons, pines, and other forced articles and exotic fruits. They have often shops at their gardens, or in towns, for the disposal of their produce; and these, when fruit is chiefly dealt in, are called fruit-shops; where culinary vegetables are joined, green-grocery shops. Most commonly, however, the culinary vegetables are carried to market, and there disposed of to such as retail them in shops or on stalls. Occasionally they are deposited for sale in the hands of agents or brokers, and sometimes shops are supplied regularly on certain conditions.

2079. *Florists,* are either *market-florists* who grow and force flowers for the market, and of this subspecies are two varieties, those who grow only hardy flowers to be cut as nosegays, and those who deal chiefly in exotics or green-house plants to be sold in pots. The other sub-species is the *select florist,* who confines himself to the culture of bulbous rooted and other select or florist's flowers, who has annual flower shows, and who disposes of the plants, bulbs, tubers, or seeds.

2080. *Botanic Gardeners,* are such as devote themselves exclusively to the culture of an extensive collection of species for sale; these may be either limited to indigenous kinds, as was the botanic garden of the late G. Don of Forfar, embracing all hardy plants, or extending to tender exotics. Botanic gardeners also collect and dry specimens of plants, and also of mosses, fungi, algæ, &c. for sale: to this they often join the collecting of insects, birds, and other animals and insects.

2081. *Nursery Gardeners* or *Nurserymen.* This is the highest species of tradesman gardener. His business is to originate from seed, or, by other modes of propagation, every species of vegetable, hardy or exotic, grown in gardens, to rear and train them for sale, and to pack or encase them, so as they may be sent with safety to distant places. The nurseryman is commonly also to a certain extent a seed-grower, and is generally a seed-merchant, supplying his customers annually with what seeds they require for cropping their gardens as well as with the trees they use in stocking them. The simplest variety of nursery gardener is he who confines himself to the rearing of hedge plants and forest trees; the highest, he who to all the hardy trees and plants maintains at the same time a collection of tender exotics.

Sect. III. *Garden Counsellors, Artists, or Professors.*

2082. The first species of this genus of gardeners, is the *garden surveyor or valuator.* His business is to estimate the value of garden labour and produce, and of garden structures, edifices, and gardens, themselves. When a proprietor lets his house and garden to a tenant for a certain number of years, the stock of the garden is valued, and either entirely paid for by the tenant, or it is again valued when the latter quits the premises, and the difference in value paid either by the tenant to the landlord, or by the latter to the former, as the case may be. It is the business of the garden surveyor to estimate the value of the stock crop and business of nurseries, and other tradesmen gardeners, quitting or entering on premises, or purchasing or disposing of their establishments. The garden surveyor is sometimes also a garden auctioneer; but generally his business is confined to valuing, and practised by nurserymen or other tradesmen gardeners.

2083. The *Tree Surveyor,* or timber surveyor, limits his occupation to arboriculture;

he measures and values standing timber or copsewood; estimates the value of young plantations; the expense of forming them; of managing them during a certain number of years; of enclosing with live hedges of every kind, and their management till fence high; he determines what trees should be felled, thinned, or pruned, and directs the manner of performing these operations.

2084. The *Horticultural Architect* (*Planner*, Scotch,) gives designs for kitchen gardens and flower gardens, with their structures and buildings: he sometimes also lays out shrubberies and pleasure-grounds, when on a small scale. In this case he takes the title of ornamental gardener (*Planner of Policies*, Scotch,) or ground architect.

2085. The *Horticultural Artist* is employed in designing and painting fruits, flowers, plants, implements, and horticultural structures and gardens, but chiefly in drawing fruits and flowers, the gardens and structures being more commonly drawn by the horticultural architect or landscape gardener.

2086. The *Landscape Gardener*, or *Layer out of Grounds*. *Artiste Jardinier*, and *Jardinier Païsagiste*, Fr.; *Garten Künstler*, Ger.; and *Artiste Giardinaio*, Ital. This species of counsellor gives designs for disposing of the plantations, water, buildings, and other scenery, in parks or landscape gardens, and generally for every thing relating to the arrangement of a country-seat, excepting the architecture of the mansion, offices, and other buildings; but in what respects the site of these, and the exposure of the principal fronts and apartments of the house, his counsel is required jointly with that of the architect.

2087. The *Gardening Author* may be considered the most universal kind of garden-counsellor, since his province extends to every branch of the art. The simplest variety of this species, is the author of remarks, or an essay, or treatise on one particular plant or subject; the most comprehensive, he who embraces the whole of the science and art of gardening; but the most valuable he who communicates original information.

SECT. IV. *Patrons of Gardening.*

2088. Every man who does not limit the vegetable parts of his dinner to bread and potatoes, may be said to be a patron of gardening, by creating a demand for its productions. He is a *consumer* which is the first species of patron, and the more valuable varieties are such as regularly produce a dessert after dinner, and maintain throughout the year beautiful nosegays and pots of flowers in their lobbies and drawing-rooms.

2089. *Amateurs*, (lovers of gardening); these promote the art by the applause they bestow on its productions, of which, to a certain extent, they become purchasers.

2090. *Connoisseurs*, (critical or skilful lovers of gardening); these promote the art in the same way as the amateur; but much more powerfully in proportion as approbation, founded on knowledge, is valued before that which arises chiefly from spontaneous affection. By the purchase of books, engravings, and drawings, from which, in great part, this species of patrons acquire their knowledge, they may be said to be eminent encouragers of counsellor gardeners.

2091. *Employers* of gardeners, whether of the serving, tradesman, or counsellor classes, are obvious and undoubted patrons of the art.

2093. *Occupiers of Gardens* of necessity employ both serving and tradesmen gardeners, and when they are amateurs or connoisseurs, are often great encouragers of the art; for every one is not so fortunate as to rank among the

2094. *Proprietors of Gardens*, who are the most eminent of all patrons, promoting every department of the art, and employing serving, tradesmen, and artist gardeners. A man whose garden is his own for ever, or for a considerable length of time, whether that garden be surrounded by a fence of a few hundred feet, or a park-wall of ten or twelve miles, will always be effecting some change in arrangement, or in culture, favorable to trade and to artists. "I pity that man," says Pope, "who has completed every thing in his garden." "Après mes enfans et deux ou trois femmes que j'aime, ou crois aimer à la folie, mes jardins sont ce qui me fait le plus de plaisir au monde; il y en a peu d'aussi beaux." *Lettres et Pensées du Prince de Ligne*, tom. i. 117.

CHAP. II.

Of the different Kinds of Gardens in Britain, relatively to the different Classes of Society, and the different Species of Gardeners.

IN order to form an estimate of the importance of gardening to a people, and of the duties of gardeners in filling different situations, it is not only necessary to notice the different species of gardeners to which it has given rise, but also the different kinds of gardens; the classes of society which enjoy them; and the species of operators and patrons who cultivate and encourage them. In this view, gardens may be arranged as private, commercial, or public establishments.

Sect. I. *Private British Gardens.*

2095. The most numerous class of gardens, and those the most regularly distributed over the British isles, are those of the country labourer, or what are usually denominated *cottage-gardens.* Next to his cottage, the labourer finds his garden the most useful and agreeable object; by supplying a part of his food, affording an agreeable source of recreation, and presenting an opportunity of displaying his taste in its cultivation. To the labourer who has no cottage or garden, human life presents no hopes; his future extends only to a few days: he has no consolation but in the contemplation of fixed wages, which the most fatiguing exertions can in no degree increase, and of which, in the case of illness, he has only the amount of a week to interpose between a measured existence and the absolute want of lodging and food. But the laborer who rents a cottage and garden is secure at all events of a roof to cover him; he can multiply his pleasures and pains by the addition of a wife and children; and he knows that he can live for a certain time on the produce of his garden. By these hopes he is consoled. Besides, he has that most desirable object, something that he can call his own; and is thus enabled to participate in the feelings which belong to the love of property and progeny; feelings often, indeed, mixed with pain, but which, nevertheless, have been an object of ambition from the earliest ages of the world.

In a moral and political point of view, cottage-gardens are of obvious importance; by attaching the cottager to his home and to his country, by inducing sober, industrious, and domestic habits; and by creating that feeling of independence which is the best security against pauperism.

The garden of a labourer ought never to be so large as to interfere with his employment as a labourer; unless it is sufficiently so to enable him to dispose of part of the produce in the manner of a market-gardener; or to keep a cow and dispose of her produce. But as it will rarely happen that in either case he can compete in the market with the regular market-gardener or farmer, the most useful extent of garden is that which shall occupy his own leisure hours in the operations of digging and planting, and those of his wife and children in hoeing, weeding, and watering. This will generally, as already stated, (2026.) be something between one-eighth, and three-sixteenths of an acre, including the space on which the cottage stands.

The *Vegetables* which may be most profitably cultivated by the occupants of this description are, cabbages of the early heading sorts, hardy borecoles, as the German greens, early potatoes, parsnips, turnips, carrots, onions, leeks, peas, beans, and kidney-beans; a plant or two of celery (not to be blanched), thyme, mint, and chives for seasoning; and a few plants of rhubarb for tarts.

The *Fruit-Shrubs,* which ought never to be omitted, are, the gooseberry, and black and red currant, as standards, in the margins of the plats, or against the walls or pales, if the garden is surrounded by these: the kinds of gooseberry should be those which grow with straight upright shoots, as the Manchester and Warrington reds, the amber, yellow globe, rough green, and crystal. The fruit-trees should be of the best bearers among the baking apples and plums; as the hawthorndean, and any of the codling apples for early use, the grey russet and winter pearmain for winter and spring; and the damson, bullace, and winesour plums; the may-duke cherries, or yair, and a winter-bergamot pear may be added. If the climate and aspect is favorable, the most southerly sides of the house may be covered with a white muscadine, or black July grape, or otherwise with pears in the best aspects, currants in the worst, and a rose and honeysuckle on the porch. (See 2026.)

In the *Management of Cottage-Gardens,* no opportunity should be neglected by the cottager of collecting manure from the highways; from the grass, weeds, and mud of ditches, and lanes; leaves of trees, soot-ashes, and all household refuse, should be collected, and the whole mixed together in the dung-hill (2026.), and turned frequently over before using. In the culture of these gardens, the principle of a change of surface (1115.), and of a rotation of crops (1118.), should be attended to; and also that of continually stirring the soil among growing plants as deep as possible; of watering in dry weather, regularly every evening, and of gathering by hand all worms, snails, slugs, grubs, and other insects, as soon as they appear. Of potatoes only the early sorts should be cultivated in the cottage-garden, because that plant is now so generally a subject of field culture, that for a main supply the cottager will find it cheaper to purchase from the farmer; or to rent a few square yards of a field devoted to drilled green crops, and cultivate himself as many as may serve his family and his pigs and poultry. Besides, in either of these ways, he is more certain of obtaining potatoes of good quality, as even though the sorts be changed, still the quality is much deteriorated by repeated culture on the same spot.

It would be a most desirable circumstance, if proprietors who keep head-gardeners would desire them to attend to the gardens of the cottagers on their estates; to supply them with proper seeds and plants; to propagate for them a few fruit-trees, and distribute them in the proper places in their plats; to teach them modes of culture suitable for their circumstances; and to enforce them by adequate motives of hope or fear, of of reward or removal, as the case might require. In this way, at no additional expence whatever to the proprietor, much happiness might be diffused; and constantly recurring objects too often indicating wretchedness, or at least slovenliness, rendered useful, neat, and even ornamental.

It would also be a very desirable circumstance if some of the female servants, or even some of the charitably disposed female members of the family, would instruct the cottagers' wives on their estates in improved modes of cookery, washing, making and mending. It is astonishing how ignorant, and how extravagant the humblest classes are in these respects; it is rare to find in operation any *principle* of action, or much regard to economy in domestic management. It appears to be all work of random, from the making of soup to the baking of pastry. Much might be done by taking any one cottager's dish, and cooking it in different ways before her. For example, soup from vegetables, water, and a little butter only. How different that made by merely boiling the ingredients *au naturel*, and that by burning a part of the butter; adding toasted crumb of bread, a few leaves of chives, and half a leaflet of green salary! How few cottagers know how to make the most of their bees, which, besides honey, afford a most refreshing and enlivening drink, little inferior, when properly made, to champaigne. Man, in the condition of a day laborer, is generally so much engaged in procuring the raw materials of subsistence, that he is without leisure to invent the machinery, or resort to the manipulations necessary for manufacturing them into the best fabrics. But let him once be properly instructed in this matter; let him once feel the enjoyments of which, even *his condition of life*, is susceptible, and he will not easily afterwards relinquish them. In a state of labor and servitude, man is generally so dull and stupid, that almost every degree of refinement, or sensation beyond that of mere animal feeling, is lost on him. The rich man is happily willing to put his hand in his pocket to help him; but that merely affords a temporary relief from evil. To supply instruction in plain practicable economy, and patiently to follow it up till it becomes a habit in the instructed, is to effect a radical improvement in this condition of life; which will be felt by the subjects of it during their lives; and being transferred to their posterity, like other habits and customs, must ultimately ameliorate this most numerous and efficient order of society.

Something in furtherance of the above ideas might be effected by distributing tracts on cottage gardening and house economy; but man, grown up in ignorance and without the habit of reading, does not readily receive instruction from books. His want of experience in book knowledge prevents him from discerning what is practicable from what is speculative, and consequently he cannot, like the man who is conversant both with books and practice, seize on what is valuable and appropriate it to his use. The mind requires a certain preparation before it will receive new ideas, and its faculties must have been exercised on ordinary matters, before reason can be properly employed on any subject not common. Tracts, therefore, among the laboring classes, are chiefly useful to their children; and if children were taught the common labors and operations of husbandry and domestic economy at school, which they might easily be by the Lancasterian method of instruction, it would fit them for entering on a life of labor with superior advantages, both in point of performing their labor, and in making the most of its reward.

2096. *The Cottage Gardens of Artificers*, that is, of operative mechanics and manufacturers, small tradesmen, and other country artizans, differ from those of the common laborer in being somewhat larger, and in having a larger portion of the space devoted to the culture of fruit-trees and flowers. They are cultivated by the occupier and his family, and very frequently sufficient ground is connected with these gardens to enable the occupier to keep a cow or horse. These indeed are often half-starved animals, producing little benefit to their owners beyond the feelings of satisfaction which the idea of possessing them confers.

In several parts, and especially the north of England, and generally in Scotland, the gardens of artisans differ from those of the cottager, in being held on a long building lease, and in being situated in or around large towns. The most remarkable gardens of this description for riches, order and beauty, are at Norwich, where they first originated (117.), at Spitalfields, near London, among the residences of the silk-weavers; at Manchester, and other Lancashire and Cheshire towns; and at Paisley and Glasgow. The occupiers are generally their own masters, having their looms, or other implements of trade within their dwellings, and being employed by merchant manufacturers, or taking their goods to a common market. They are generally an intelligent, industrious class of men, who take great delight in their gardens, and the point of practice in which they excel is in the production of florists' flowers. Norwich is, or used to be, noted for carnations. Spitalfields is still noted for all the competition flowers, but especially for auriculas and tulips. Manchester for auriculas and polyanthuses, and also for the production of new varieties, and large specimens of gooseberries, and Paisley and Glasgow for pinks. The florists in Lancashire, indeed, excel in every branch of their profession, and are also famous for their success in cultivating the potatoe, which was in general use in this country long before it was known in many others. The artisans of Paisley are, perhaps, the most intelligent of their order in the world; even the speeches of what were called the radical reformers of this town, astonished by their argument and style; and the success of the florists, and the laws of their association, as such, are not less surprising. See Lancashire and Renfrewshire in the succeeding chapter.

2097. *Farmer's Garden* (2035.) varies in extent from an eighth part to a whole acre or upwards, according to the kind of farm. Lord Kaimes (*Gent. Farm.* 297.), considers a fruitful kitchen-garden as the chief accommodation of a farm; yet farmers in general pay very little attention to their gardens, even where the best systems of agriculture are preserved. They are managed in the smallest farms by the farmer himself, with the occasional assistance of his men, and of the female part of his family; in those of a higher kind, where the farmer is not personally an operator, they are managed by a laborer, who is generally kept on the farm for cleaning hedges, clearing out furrows, and doing such extra field-work as cannot be performed by the regular hands of the farm.

In tradesmens' farms, large, or what are called gentlemen's farms, villa farms, and *ferme ornées*, the gardens are commonly managed by a gardener, who is expected to assist in the field during the hay and corn harvests; and, therefore, he seldom ranks high in his profession.

The products of common farmers' gardens are of the most useful and hardy kinds; but those of villa and ornamental farms contain hot-houses, and often produce many of the luxuries of regular villa or mansion gardens. Indeed, were farmers disposed to excel in gardening, no class of country residents, excepting landed proprietors, have an opportunity of indulging their taste so variously and extensively, and at so little expence. In the first place, supposing a farmer to have a lease for twenty-one years, at a fair rent; whatever state he finds the farm in, if it be inclosed and subdivided, he may render it a *ferme ornée*, by leaving strips of pasture round all the arable fields, and connecting these by gates in such a way as that he may form a *drive* or *riding* (2017.) round and through the whole. Secondly, he may form, or enlarge and arrange, the kitchen-garden, flower-garden, orchard, and the portion of lawn and pleasure-ground round or beside the farm-house, at pleasure. Thirdly, he may heat hot-houses, pits, and hot-beds, at the expencé of labor only, by fermenting his farm-yard dung in such pits as West's (*fig.* 312.), in such vineries as Anderson's (*fig.* 319.), or in other vaults for pines (*fig.* 320.), or behind walls or pales, to force fruit-trees. Perhaps one of the simplest modes for a farmer to take the benefit of his fermenting dung would be to have a line of pales to serve as a wall for training on, hinged at the surface of the ground. On these, when placed in a position forming an angle with the ground of 45°, the trees should be trained. Then, when the dung is to be placed behind, the pales should be elevated to the perpendicular, and the dung dropped down in cart-loads, and laid up in a regular ridge, sloping towards the pales, but perpendicular on the north side. This being formed, the pales should be folded back on the slope, and the advantage of this plan over that of fixed upright pales would be, that as the dung sunk the pales would sink with it, and by being always in close contact, would receive more heat than by the usual mode, in which, when the dung sinks, it separates from the pales, and then the whole surface of the dung being exposed, the heat ascends, and is lost. But an exceeding good plan for every description of forcing or exotic culture, would be to construct houses on the plan of West's pit, with all that part of the north wall under the level of the earth or floor for the pots substituted by cast-iron or stone pillars, and wooden gates between. These would facilitate the putting in and taking out of the dung, and, being shut close, no part of the heat would escape.

These plans are only for amateur, or propretor farmers, for the common commercial or market-farmer could not devote either sufficient capital or attention to the subject. He, in general, leaves the care of his garden to his wife, whose taste and ambition does not often carry her ideas farther than a cucumber frame; though a small green-house, and even a vinery, as it requires so very little attention (see 1226.), might often be added, in order to enhance the enjoyments of this class of society.

2098. *Street Gardens*, and the *Smaller Suburban Gardens* (2034. and 2028.), are the next classes in point of number. They differ from the former in being almost always gardens of pleasure, consisting of a grass plat, with a border, or a few patches of flowers in front of the house, and a gravel plat or other grass plat behind, and sometimes a plat for culinary vegetables, and small fruits behind. Their extent may be from an eighth to half an acre, and they are managed by jobbing-gardeners by the day or year. As the plants and turf are soon injured by the smoky and confined atmosphere incident to their situations, the finer plants and trees do not thrive in them, and the sorts which do succeed, and even the turf, require frequent renewal. Evergreens and early spring flowers, both of the tree and herbaceous kinds, are most to be desired as permanent plants for these gardens, and in summer a display of annuals is made from transplanted plants furnished by the jobber, whose great object ought to be to keep up a succession of flowers, and to keep the grass and gravel in order, and the whole perfectly neat.

2099. *Tradesmen's Villas* (2027.), of the smaller kind, may contain from a fourth part to a whole acre, and are commonly managed by a sort of hybrid gardener, who acts also in the capacity of groom, or of house servant. On a larger scale they are managed by master gardeners of the lowest kind, as from such situations they can seldom rise to be head-gardeners. Besides attending to the duties of the jobber, as to suburban gardens, the citizen's gardener ought to study to procure early and late crops of the vegetables most in use; as pease, kidney-beans, potatoes, turnips, &c. because at these seasons they are dear to purchase. Main summer crops are of less consequence, as they may be procured cheap at market. For similar reasons, he ought never to be deficient of salads, pot and sweet herbs, tart plants, &c. as these are dearer to purchase in proportion to other vegetables, because less in demand. If there are frames, hot-beds, and hot-houses, the same general principles are to be observed, viz. when the whole of what is necessary for the consumption of the family cannot be raised, to raise such crops as, whether from their kind, or the seasons at which they are grown, are most dear to purchase.

2100. Where *amateurs of gardening* have gardens, they are generally cabinets of rural beauty, however small. We may offer as examples that of R. A. Salisbury, esq. which consists entirely of plants in pots, which fill a court of a few yards square in Queen-street, Edgeware-road, London; and that of the Countess de Vande, at Bayswater, which contains two acres, and displays a fine botanical collection, both hardy and exotic, kept in the highest order and neatness by J. Mackie, an intelligent man, and a gardener of great promise.

2101. The *Gardens of Connoisseurs* vary in extent; perhaps the largest and best furnished is that of T. A. Knight, esq. the first of all connoisseurs, at Downton Castle, which, with the experimental ground, contains several acres, and various hot-houses, pits, and frames. In general these gardens are to be considered as horticultural work-shops, and beauty and order is not to be looked for. Regular gardeners are very seldom employed. T. A. Knight says, (*Hort. Trans.* iv. 17.) "My gardener is an extremely simple laborer, he does not know a letter or a figure." One horticulturist with whom we are acquainted, employs only women; another only boys; and several do all the work themselves.

2102. *Suburban* or *Citizens' Villas* (2026.) may be considered as occupied by a more wealthy class of citizens; or if not more wealthy, possessing more of the taste and ton of good society. These gardens or residences contain always a portion of lawn or field, as well as a kitchen-garden and shrubbery, and may extend from one to ten acres. They generally contain hot-houses of some kind, and are managed by a regularly-bred master gardener. Besides attending to the duties of a tradesman's gardener, he must bear in mind two things; first, as the families who occupy such places are generally constant residents, he must provide enjoyment both of the agreeable kind from the flower-garden and plant hot-houses, and of the useful kind from the culinary and fruit-garden, for every month in the year; and, secondly, he must attend to the habits of the family as to the kinds of productions and enjoyments preferred. The great art of deriving enjoyment from a country residence of this description, is to provide an interest, a hope, and a fear, for every season, or even for every month in the year. By observing the chapter of monthly productions of horticulture (1547.) and the table of monthly Floricultural productions (1757.), the resources which these branches afford are readily discovered. There are also other resources in the nature of culture; such, for example, as raising flowers or fruits from seed. In this view it is good to have some seedlings of early and late flowers, as of the polyanthus and dahlia; of early and late fruits, as of the currant or strawberry, and apple, to come into flower and bearing every season. Other devices for exciting and keeping alive interest will readily occur to the reflecting gardener.

With respect to the habits of a family, it is not only the duty of a gardener to grow those vegetables, fruits, and flowers of which the members consume the most, or of which they are fondest; but he must also look for other habits of enjoyment; as whether they are fond of walking in the garden, and at what times and places, so as to have every thing in the condition and order best adapted for those purpuses. Some delight in smells, and for such, the most odoriferous plants should be distributed along the walks; others in sounds, and for these, the trees and plants which produce the fruits preferred by singing birds should be planted; or birds, in portable avaries, distributed through the grounds. Some, in walking, may prefer not being seen by workmen, or at least not meeting them in the paths on which they enjoy this mode of recreation; others may take delight in seeing work going forward, and even in asking questions at the operators.

In all families, at some time or other, there are invalids, and a great object is to render the garden an alleviation to their sufferings. Some afflicted in the lower extremities can only walk on grass walks; others, from asthma, may not be able to stoop to smell to or gather a rose or a gooseberry; others may require to be carried round the hot-houses in a chair, or wheeled along the walks reclining on a couch, and covered with a glass-case. Grass walks, standard roses, and gooseberries, elevated pots of plants, hot-house paths uninterrupted by pots, and gravel-walks smoothly rolled, are obvious luxuries for such persons. A sick horticulturist, confined to his chamber, may derive some enjoyment from having pots of plants brought before him for a few minutes, to show him their progress; and also by relations of what work is going on, and what articles are vegetating in the garden. When life is under the pressure of disease, any object or measure which can divert the attention for a moment affords relief; for though night cannot be turned into day without the presence of the sun, its darkness may be lessened by a speck of the dimmest day-cloud.

It does not often happen that residences are laid out purposely for invalids; but where this is the case, the designer ought to contrive gently inclined planes instead of steps or stairs, and to avoid all corners in walks and paths. Easy turnings in walks are also a great luxury to studious persons, who think as they walk. For this reason, an author, if he can afford any other garden than a pot of mint, should surround his plot with an oval path, that he may walk on without end, and without any sensible change in the position of his body.

Whether a family is of retired or public habits ought to be noticed by the gardener. A retired family will derive most satisfaction from the useful products, and the personal recreation they can take in their garden. A public or fashionable family, on the contrary, from its beauty, high order, and keeping. Beautiful objects are formed to be admired, that is their use, and what renders them so desirable, and their possessors so much envied; therefore those who possess beautiful objects in order to derive the enjoyment they are calculated to confer, must court applause by inviting such friends as are likely to become admirers. Let no man shut himself up in the midst of beautiful rural nature and think he will be perfectly happy, lest he should be forced with the satirist to ask

> What is nature? ring her changes round,
> Her three flat notes are water, plants, and ground.

To be condemned to pass an eternity in a pleasure-ground, would be perhaps as dull as to pass it in a conventicle. Man is a social being, and never can reject the habits to which this part of his nature gives rise with impunity. To be happy he must see and be seen: it is the operation of this principle that has rendered the most beautiful seats of the country *shew places*; or places which all the world are invited to come and admire, as Blenheim, Mount Edgecumbe, Hackfall, &c.; which induces others to publish accounts of their seats, as Dr. Letsom of Grove-hill, the late T. Johnes, Esq. of Hafod, &c.; which leads the citizen to place his box or lodge, and the artisan or laborer his cottage or cabin by the road-side; and which, in short, impels the humblest individual to court applause by making himself known. A gardener, therefore, must attend to these general principles of our nature, and apply them in his department as well as he can; for much, it is evident, depends on his studying the effect of the scenes under his charge, and keeping them in the most perfect order and neatness for public inspection.

2103. *Villas* (2020.) The grounds and gardens of this class of residences may occupy from ten to a hundred acres, or upwards; they are generally managed by a head gardener, with one or more journeymen, and probably an apprentice, and with the occasional assistance of men and women laborers. The kitchen and flower-garden of places of this sort are generally good and well-furnished with hot-houses; the shrubbery also is carefully laid out, and planted with choice shrubs and trees; and as the proprietor is generally an opulent commercial man, he is liberal in his annual expenditure. The gardeners at such places are generally well paid, no limits put to the dung, implements, structures, or assistance they may want, and left more entirely to their own discretion than those in the service of country gentlemen. Their responsibility is, therefore, so much the greater, and they are quite upardonable if they do not excell in their art, and, above all things, in keeping the whole scene under their charge in the utmost order and neatness. It frequently happens, however, that soon after a gardener has got into such a situation, and become familiarized with his garden, and the habits of his family, he begins to consider his place as a sinecure, (*sine*, adv. and *cura*: i. e. without care,) and instead of arduously endeavouring that the productions of the current year shall surpass those of the year past; instead of adding more and more to the enjoyments of his employers, he begins to try with how little they may be put off; and the object of his ambition, which ought to be to delight and astonish his family, is ultimately lowered to that of contenting them.

This sort of lethargic indifference, brought on by plenty and ease, is not peculiar to gardeners; it is a condition of our nature, which also furnishes checks to its increase after a certain period; but it is the business of cultivated man to apply these checks at an early stage, and thus to lessen the evils to all parties. The simplest check to indolent gardeners is the demands of their masters, who seeing at other tables, and in other gardens productions superior to their own, and knowing that they spare no expence, &c. naturally enquire into the cause of the default. This sort of observation when abroad, and comparrison with home, ought never to be neglected by those who wish to keep servants of any description to their duty. The deficiences and bad points of other gardens and gardeners may be let alone; but their excellencies should always be particularised, and dwelt on to our own; and where a failure happens in the one case, the reasons required for the other's superiority in that particular, and our inferiority. If the master ultimately becomes dissatisfied with the condition and produce of his garden, let him first call in the nurseryman who recommended the gardener, as counsel for both sides; and let him consign him to this nurseryman, with such a character as he may be considered to merit.

So much of the beauty and effect of gardening depends on the order and neatness with which the whole is kept, that often as we have mentioned the subject in the course of this work, we must again advert to it. Many excellent gardeners are deficient in these particulars, from causes which, at first sight, would seem calculated to have a contrary effect; such as staying constantly at home in their own gardens, and daily inspecting every part of them. The consequence of this is, that the changes which take place in the growth, decay, or deterioration of objects is so gradual as not to be observed, and that an object seen twice every day for ten days, seems the same thing the twentieth time which it did the first, when, in fact, and to the person who has only seen it two or three time, it is something different.

To illustrate this, let us suppose a collection of green-house plants, newly shifted, surfaced, pruned, trimmed, tied, washed, and replaced on the stage, and that one man attends to the watering of them regularly every day for a month. They are newly shifted plants the first day, and consequently require nothing done to them; so they are the second, third, fourth, and so on, even after a week or ten days they are so considered, and this notion now becomes habitual to the attendant. Every day as he enters the green-house to water, he sees, without even opening his eyes, (that is, the idea recurs,) a stage of newly-shifted plants, all fresh, and free from weeds and decayed leaves, and wanting nothing; therefore weeds and decayed leaves he never thinks of looking for, but waters on, whilst a stranger, or one who has not seen them for a few days, is struck with the slovenliness displayed, and though perhaps the same thing may take place in his own garden, or his own department in the same residence; he goes away not willing to benefit the other by corrective advice, but thanking God he is not like this man.

There are few gardeners, we presume, who will deny the correctness of this view of the cause of slovenlines; and we think, the cause being discovered, the remedy very easily presents itself. Let master gardeners not inspect every part of what is under their care *every day* at the *same time*, and in the *same order*, but let them omit some parts on some days, occasionally omit the whole, and often vary the time and order of their visits. Let them also, instead of going round to look if such and such scenes are in order, let them go impressed with the idea of finding them in bad order, in search of particular sorts of weeds, of decayed, damaged, or straggling parts of plants, insects, &c. It may seem ludicrous to add, let him go round sometimes in the night instead of during day; but we are persuaded that viewing particular scenes by the light of a lantern would present them in such a new aspect, as would probably show deformities or deficiencies. It is a common observation of servants, that after their master has been a day or two confined with illness, or on the morning after an evening of dissipation, he is generally very apt to find fault and be cross, and difficult to please. This is actually the case, and is satisfactorily accounted for without reference to humour or temper; the master sees faults which before escaped him, because the machinery of his faculties has been deranged, and he sees differently. But why does he see faults rather than beauties? Because it is his business to seek for them, and this impression being habitual on his mind, the strongest images reflected by the eye are of that nature.

Another important part of a head-gardener's duty, with a view not only to order and neatness, but also to good culture, intelligence as to the state of gardening, &c. is that of frequently visiting his neighbours' gardens; not merely those near him, but all the principal gardens for forty or fifty miles round; and he should, at least, once a year, visit the capital or the metropolis, to inform himself, by means of the nurserymen, and among the numerous first-rate gardens that are always found round capital cities, the horticultural societies, and agricultural libraries, of what is going on in the gardening world.

2104. The *Villa and Demesne* (2019.) is less common than the villa near large towns, but more so in the country. The proprietors are sometimes commercial men, but more generally country gentlemen. Their extent varies from a hundred to a thousand acres, or upwards, and, in addition to the park and gardens, they contain a home or family farm managed by a bailiff. The garden scenery, as in the case of the villa, is managed by a head-gardener, sometimes more circumscribed in his operations, but always respectably provided for, both as to his person and garden. The worst point attending residences of this description is, that the business of gardener and bailiff is, sometimes in England, and often in the other districts of the empire, united; and the consequence almost universally is, that the business of both situations is very imperfectly performed. The master's object in attempting this union is obviously the saving of a bailiff's wages, which, it is allowed, is an apparent saving, though certainly not always so ultimately. The gardener and bailiff cannot be present at one time, both in the garden and on the farm; he must pass alternately from the one to the other, and it may be questioned whether the time lost in his absence from both, while going between them or at market, and from the one, while on the other, does not more than counterbalance the wages of a bailiff, independently of any other consideration. But the loss both to the farm and garden, in cases of this sort, though not very obvious at first sight, is very considerable when details are entered on. No man brought up as a gardener, can at once become a good bailiff; and admitting that he may become one in time, yet he acquires his experience at his master's expence. It is generally imagined that a gardener makes a good arable farmer; but this he does not become without experience; for though he may know what good culture is, and may bring the fields of corn or green crops under his charge into a state of good cultivation, yet he may do this at much too great an expence to afford any profit. But the management of arable land is but a small part of a bailiff's duty; the grand object is the breeding, rearing, fattening, buying, and selling of live-stock; and a knowledge of these parts of farming cannot be acquired under several years' experience. In the mean time, the losses to the master by bad marketing must be most considerable. Suppose the gardener and bailiff goes to purchase a few scores of sheep, and a dozen of oxen for feeding, every grazier knows that on the nature of the *feel* alone, which no man can communicate to another by description, much of the value of the animals depends. But a gardener knows nothing of this feel, and the tact of discovering it is not to be acquired but after such a course of experience as no prudent master, who knows any thing of the subject, would wish a bailiff to acquire in his service. As much might be said on the correctness of judgment required in selecting animals to breed together, and in the shrewdness required for marketing; the latter, a duty totally inconsistent with the retired habits of a gardener.

That some gardeners may become good bailiffs we readily allow, because a man of moderately good natural faculties and persevering application, will acquire any thing; but from the nature of the duties which a bailiff has to perform, and the time he must occupy on the farm and at market, it is impossible he can attend sufficiently to the garden. We have never yet known an instance where the duties of both the offices were well performed by the same person, but almost universally found both the garden and farm deficient in the products expected from them. That the master is content is no proof to the contrary, for knowing no better, he naturally considers what he has as the best.

From the country gentleman's gardener, who does not unite the duties of bailiff, a good deal is expected; he must know his profession well; he cannot probably from limited extent and means produce all he could wish, or that a garden should afford, but what he undertakes to raise he must raise in perfection, according to the kind and season, and the main crops in sufficient quantity, because he cannot, like the citizen's gardener, have recourse to Covent-garden, nor like the villa-gardener, surrounded by neighbours, borrow from them melons, mushrooms, or asparagus, in cases of emergency. He has one duty also which does not belong to either of these classes of gardeners, that of packing and sending fruits and other garden products to town when the family reside there.

2105. The *Mansion Residence* (2019.) may be considered as including all those between the villa and the royal palace. The dwelling-houses are called houses, halls, courts, or palaces, according to the custom of the country where they are situated, or castles, abbeys, or Grecian buildings, according to their style of architecture, and mansions or palaces, according to their extent and magnificence. The mansion residence consists of the same parts as in the demesne villa; it may contain from five hundred to ten thousand acres, or upwards, and the whole is managed in the first-rate establishments by the following officers:

A *secretary*, who receives the commands of the master, and conveys them to the *house steward*, who manages the expenditure of the house and offices, and game-keeper; to the *land steward*, who manages the tenanted lands, receiving rents, and seeing to the fulfilments of covenants in leases, repairs, &c.; to the *bailiff*, who manages the family farm; and to the *gardener*, who manages the garden-scenery, including the park, as far as respects the trees and grass, and the internal plantations or forests.

The gardener who occupies such a situation has under him a forester, for the demesne woods and park-trees; a pleasure-ground foreman for the lawns and shrubbery; a flower-garden foreman, a forcing-department foreman, and a kitchen-garden foreman. A horse and two-wheeled chaise is kept for his use, by a boy, who also acts as his messenger and house-servant. He lives in a respectable house, near the kitchen-garden, with a stable and cow-house not far distant. His wages are from 150*l.* to 300*l.* a year, independently of a free house, fuel, and other advantages.

A gardener who undertakes such a situation should be at the head of his profession when he enters on it; and keep himself at the head of it, by taking care to be informed of every improvement and invention in his line, as they are discovered and made public. He must not only know all that is in books, but must be in advance in knowledge; not only ready to apply all the best practices, but fertile in expedients on extraordinary occasions, and in cases of novelty, difficulty, or emergency.

Necessities and difficulties, as they occur, excite the inventive faculty far beyond reflection or study; and, therefore, we can afford little assistance here, except recommending the gardener who is ambitious to excel in his professsion, first to store his mind with all the resources of gardening, and next to lay up in his memory as many ideas as he can on all other subjects, but especially on art and science. Next to books on gardening and agriculture, and the topographical surveys of every kind, he should have frequent recourse to the best encyclopædias of general knowledge, and observe the operations, and converse much on professional subjects with mechanics and artificers of every description. Much useful information is to be obtained from carpenters, millwrights, and smiths, and all kinds of information may occasionally be applied to use in so varied and extensive an art as gardening.

Some idea of the extent of the duties of a head-gardener who fills a first-rate situation may be had from the chapter of monthly horticultural productions, the table of floricultural productions, and arboriculture and landscape-gardening, as treated of in this work; and therefore all that we shall attempt here, in addition to what has just been offered on the subject of the duties of gardeners holding inferior situations (to), is to enumerate a few of the expedients, some of them common and others uncommon, which every description of gardener will have occasion to practise more or less; but which more particularly demand the attention of gardeners of the highest class, who, not being limited in expence, are expected not to be deficient in producing all the comforts and luxuries that a garden can afford. We shall arrange these hints under the four departments of practical gardening.

2106. *Expedients and anomalous Practices in the Horticultural Department.*

To have early Crops of Herbaceous Vegetables in the open Air. Sow in pots early in spring, one seed in a pot of the smallest size, place them in a gentle hot-bed, shift into larger pots as they grow, and when all danger from frost is over, transplant with the balls entire in the finely pulverized rich soil of a warm border. Pease, beans, turneps, potatoes, carrots, salading of all sorts, and spinach may be had very early in this way.

Stable-Dung is very scarce, and a great Quantity is wanted for Hot-beds and Pits. Collect the spray of trees, copsewood, and hedges; cut it into lengths of three or four inches, with a straw-cutter, and mix it with the dung. Add carpenters' shavings, flax-dressers' refuse, leaves, reeds, rushes, peat, moss, heath, or any substance capable of undergoing the putrescent fermentation.

Tanners' Bark is scarce. Add spray, furze, or heath, chopped with the straw-cutter to the length of the chips of bark, also chopped shavings of wood, parings of leather, &c.

Autumn planted Cabbages and Cauliflowers, and also Spinach and Onions have failed. Sow early in spring single seeds in small pots on heat, shift often, and transplant in the warmest situation when all danger from frost is over.

To forward early Seedling Crops. Sow in the usual way under cold frames, and remove them when all danger from frost is over. Pease, spinach, and turneps, may be had three weeks earlier than usual by this practice.

All your Ground is cropped, and some Crops not likely to be removed in time to let those which are immediately to succeed them, be got in in Season. Forward the succeeding crop in pots, and as soon as the preceding crop is removed, transplant with the balls entire.

The Garden is too small for the Culinary Productions. Forward the brassica tribe in pots, and only head or flower them in the quarters. Instead of hot-beds, which occupy much horizontal space, have cucumbers and melons on hot-walls covered with glass: train other creepers, as love-apples, New Zealand spinach, gourds, &c. on upright trellis work or pales: the potatoe haulm to stakes; stick all pease; train gooseberries, currants, and all dwarf trees as espaliers.

Sorts of Fruit not approved of. Engraft or inoculate other sorts.

Trees old and not productive. Head down and renew the soil, and see that the roots are not too deeply buried.

To have late Crops of Hardy Legumes and Leaves. Plant the latest crops in large pots or boxes; keep them plunged in the open air, and remove them when there is danger of frost to any of the forcing-houses not in operation. In damp weather, light gentle fires in the day-time, but not at night; in frosty weather, light gentle fires at night. In this way peas, beans, kidney-beans, cauliflower, spinach, &c. may be had in a good state till January or later.

The Furnaces or Flues of a House in action are suddenly deranged during a severe Frost. Distribute pots of burning charcoal or peat over the floor or paths of the house, and cover the glass with mats.

To lessen the Danger of the Sun scorching Plants in Hot-houses or Hot-beds. Fill them with clouds of steam, by pouring water on the ground or otherwise.

You have lately renewed your Tan-bed, and the Heat is too great for the Pines which are plunged in it. Begin at one end of the pit, and take out a row across the pit; then whelm hot saucers at the bottom of each hole left by the pots; lift the second row, and set the pots on the saucers; they will thus be surrounded by air instead of earth. When the tan cools replace them as before.

Grafts of fine Fruits are received, for which you have no Stocks, and you do not wish to put them on Old Trees. Dig up some roots of trees of the proper kind, and make stocks of them; grafting, and afterwards planting in T. A. Knight's manner, (901.)

2107. *Expedients and anomalous Practices in Floriculture.*

The Gravel Walks earthy and ill-colored; a large party is expected, and you wish to give the walks a fresh and good appearance. Water them with water impregnated with lime and yellow or red ochre, according as the natural colour of the gravel may be yellow or brown.

The Pleasure-Ground is deficient in Singing Birds. Distribute cages of Canary and other birds in song, hanging them on the trees in unseen situations.

The Flower Garden and Shrubbery deficient in odoriferous Plants, to produce an immediate Remedy. Distribute pots of mignonette (or Persian iris early in the season), and also bottles of water, containing the ends of sprigs of sweet briar, birch, balsam poplar, balm of gilead, and other firs; place these so as not to be conspicuous, and renew them as they decay.

To diffuse Odours in the Atmosphere on particular Occasions and during dry Weather. Sprinkle the odoriferous plants with the water-engine.

A large Party is expected at a particular time: to give freshness and odour to the whole Flower-Garden. Sprinkle every part with water, excepting the walks; if with rose-water, which may be made at little expense where there is extensive shrubberies (1683.), and kept for sprinkling the hot-houses; so much the better.

You expect a large Party to visit the Plant Hot-houses, and they have been fumigated with Tobacco the Night before. In one distribute sprigs of terebinthinate trees, as the spruce and silver fir; in another, sprigs of briar; in another, birch; *Verbena triphylla*; mignionette; bruised leaves of acorus calamus, and so on: then sprinkle with pure water. Or do not use plants, but merely water the whole with rose-water; or, use a little musk, orange skins, or other artificial odours.

Some of your Houses are very unsightly from Accidents to Plants, Insects, or other Causes; but Company is expected to go through them at a particular Hour. Contrive to have them filled with sweet smells at that time. Distribute a few choice things in pots near the eye; which, by attracting the attention of the spectator, will help to divert his eye from defect or disease, and to estimate what is concealed by what is seen.

After a dry Summer your Lawn is covered with brown Blotches, on account of the shallowness of the Soil, it is desired to give a temporary Green Appearance. Water these places with lime water, mixed with green colour, the lime serving as a body.

A Quantity of large Green-house Plants suddenly arrive, and no House is ready to put them into. Place poles against a south wall, and place the sashes of your spare hot-beds over them in the manner of slates.

To form temporary Jets of Water. Procure one or any number of cast-iron, or other strong vessels, which may hold from six to thirty, or fifty gallons or upwards: let each vessel have a tube reaching from what is to be its top within an inch of its internal bottom; this tube must have a nozzle to unscrew, and also a stop-cock. The vessel being half filled with water, an air condenser is to be screwed to the pipe, and the air powerfully condensed, then turn the stop-cock to prevent the escape of the water; unscrew the condenser, and screw on the nozzle for the jet. All is now ready for operation, and the vessel may be placed in the situation where the jet is desired: here it may be either set in an excavation made to fit; or concealed by plants; or the vessel may be a vase, or made in any ornamental form. Being placed where it is to operate, it may remain for any length of time before using: to set it at work, it is only necessary to turn the stop-cock, and according to the diameter of the orifice of the nozzle, it will throw the water from ten to fifty feet or more in height, gradually diminishing in height, as the water is expended, and lasting in joint proportion to the quantity of water contained in the vessel, the orifice of the jet, and the compression given to the air. This principle admits of great variety, extension, and modification, and might be made to produce very splendid effects; and though these effects would be but temporary, they would not be objectionable on that account, as in this climate, already cold and moist, the constant play of jets of water is by no means desirable.

To produce harmonious Sounds in the Flower-Garden, in the Hot-Houses, or near Arbors, Seats, &c. Place Æolian harps in proper situations, as in Germany.

To disperse an agreeable Odour suddenly and powerfully. Charge one of the jet vessels with air, having previously introduced some of the odour in the form of oil or essence, &c. then produce the discharge at the proper time and place, or charge with rose-water.

To direct a Stream of deleterious Air against Insects in Hot-Houses at a Distance from the Path. Direct the stream through a long tin tube, or charge a jet vessel with the smoke or air.

To syringe Plants without a Syringe or Engine. Use a brush or birch broom dipped in water.

To recover Plants in Hot-Houses injured by Frost. Shade two or three days from the sun, and keep the temperature very little above the freezing point.

2108. *Expedients and anomalous Practices in Landscape-Gardening.*

To render a dull Part of the Park more interesting. Build a hay-stack there; or erect a shelter for cattle; or on temporary occasions pitch a tent; or place a portable hay-rack with food to attract deer or cattle; or send some men to work on the spot.

To vary on an extraordinary Occasion a dull uninteresting part of the Horizon. Cause a fire to be lighted of green wood, or such materials as by the ascending smoke will break the line in the proper place.

To vary for a few Seasons the Front of a Mass of Wood. Disbark one or two trees at proper places at the surface of the ground, and when dead they will produce a break. *For a few weeks*:— cut a tree while in leaf, so as its leaves may wither and remain on, or water with the engine and lime-water.

To give an Idea of the Effect which a Piece of Water in a particular Place, and of a particular Shape, will have. Mark out the shape, and water the surface with lime-water; when dry the effect will be obvious.

To give a fore-Knowledge of the Effect of a Gravel-Walk in any particular Place. Mark it out, and water with lime and yellow ochre.

To show the Effect of Trees. Use poles with crosses at top, or better, use entire trees, the thinnings of plantations.

To show the Effect of Buildings. Erect poles, and stretch canvas, or nail boards on them, so as to form the sky outline of the proposed edifice.

To show the Effect of raising Ground. Stud it over with stakes of the height intended to elevate the earth, and stretch here and there strips of green canvas, bunting, bass mats, or even green straw or hay-ropes, over these. Hay-ropes, from well-got hay, are cheapest, and, if of sufficient number, answer perfectly.

To give a Poetical and Pastoral Air to a Scene for the Moment. Employ a person with a flute to play at particular times; drive cattle to drink at a stream; pass a flock of sheep that way, &c.

To give a Forest Character to particular Parts of the Park or Woody Scenery. Introduce shagged horses, and asses; show the remains of a fire; leave some branches or felled trees, &c.

To direct the Eye to a particular Point, either to observe its Beauties, or to prevent it from observing some Deformities in the same Scene. Place a white object there, as a hay-rick; man at work with his coat off, white cow, or horse, &c. if the back-ground be ground or wood; and a dark object, if the sky or water. If the scene be a lake, then place a boat at the point to which you would attract the eye.

2109. *Expedients and anomalous Practices in Arboriculture.*

A Quantity of valuable Trees arrive from a Distance, very much injured and dried up, and too late for planting in the usual way. Immerse in water, or bury entirely in earth; then puddle and plant; or plant for one season in a shady part of the nursery; or plant in pots, and place these on peat for rare kinds till they begin to grow.

A violent Wind has blown down a Number of Trees. Lop their tops, and prune and arrange their roots, replacing them upright; they will produce effect much sooner than young trees.

A handsome Tree has lost some Branches on one Side, or is disfigured by the removal of another Tree. Try and arrange the branches by cords or strong wires, as is done in green-house plants with threads.

To cover a Tree rapidly with Creepers. Place leathern bags of earth, containing plants of the sort of creeper desired, here and there on the trunk and principal branches; tie them flat to the tree, so as they may not appear conspicuous.

It may be objected to some of these expedients that they are deceits or temporary tricks; but if they are so, they are in the spirit of the scenery to which they belong, and they are calculated only to produce pleasure, not pain to any one; none of them are falsehoods, or calculated to make one nature appear to be of another.

We have not directed the display of artificial fruits on wall-trees, of the fruiting of orange-plants from the shops, of milliners' flowers in green-houses, or living figures placed on pedestals as statues, of fountains in mourning by making them run out ink, of altars and temples, with persons in proper costume sacrificing on them, of mock-buildings scoops or painted perspectives; all which and other deceptions are recommended and practised by the French and Dutch.

2110. *Gardens of Royal Palaces.* The government gardens of this country are those of Windsor, Hampton court, and Kensington; that of Kew being a private royal garden. None of them are in any respect worthy of their rank: the garden at Windsor is without hot-houses; that at Hampton-court consists chiefly of some pine-pits and a vinery; at Kensington, great part of the kitchen-garden is cultivated by the plough, and the only two things which render it worth notice are its pine-stoves, and the public garden or pleasure-ground. The garden structures at Kew are in a state of decay, and the gardens are never in first-rate order, often slovenly, and always confined as to arrangements. It is said these things arise from want of funds; and from the low rate at which the operators are paid in these gardens. This seems to be the case, and it is much to be regretted, as it prevents the royal gardeners from displaying their skill and taste. Judging from the pine-apples grown in the forcing departments at Kensington and Hampton-Court, there is reason to believe this would be highly creditable to themselves, and exemplary to the nation.

The royal gardeners were formerly much consulted by private gentlemen on the subject of their profession: this is still the case, though in a much less degree, and more now as to garden structures or culture, than as to matters of design and taste. With reference to this circumstance, the professional skill of royal gardeners ought to be of the first order, as their opinion will always be law to a certain number of the court; but for the culture and produce of the gardens, (situated as these now are,) less professional skill is wanting in a royal gardener than in a private head-gardener, as deficiencies in products can always be made up from the commercial gardeners, or from Covent-garden.

SECT. II. *Commercial Gardens.*

2111. The lowest species of these are what are called *ploughed or farmers' gardens.* One or two are to be found near all large towns, and a number round London. They extend from fifty to a hundred and fifty acres or upwards, and are almost entirely cultivated by the plough and other agricultural implements. Their possessors are small farmers, and the chief difference between this *farm gardening*, and common farming is, that the green crops that intervene between the corn crops are more highly cultivated, and instead of being consumed on the farm, are sent to market as culinary vegetables, or food for stall-fed cows. The crops of every kind, but especially the green crops, are cultivated in drills, two close together, with a wide interval, by which means abundance of room is left to plough and horse-hoe the broad interval, and to sow a succeeding crop there before the other is removed. In this way two crops are obtained most years, as a specimen of which we shall mention one of the common rotations, viz. 1. Peas, with dung, two rows near each other, and a wide interval. 2. Turnips in the intervals. 3. Drilled wheat between the turnips. 4. Turnips, with dung, in drills after the wheat. These four crops are put in, and removed within two years, the ground being in good heart.

2112. The next species is the *Seed-garden*, which forms one of the points of union between horticulture and agriculture. These gardens or small farms are not numerous, and confined chiefly to two or three counties near the metropolis. They consist of from five to twenty acres or upwards, in part cultivated by the plough; the occupier is not generally a bred gardener, but sometimes is so, and unites with the business of seed-grower that of market or nursery-gardener. The seeds he cultivates are generally limited to a few kinds; thus chervil, radish, and cress-seeds are grown chiefly in the neighbourhood of Saffron-Walden in Essex, cabbage-seeds at Battersea, onions at Deptford, peas in Kent, turnips in Norfolk, rape in Lincolnshire, mustard in the county of Durham, &c. The great art is to grow the seeds true to their kind, for which purpose one grower must not attempt too many varieties of the same species, but he may grow a number of different species, and of varieties of the same species, provided they do not come into flower at the same time. Such seeds as are raised in large quantities, as turnip, mustard, cress, maw or poppy-seed, peas, &c. are either sold privately by samples, to the London or other seedsmen, or exposed publicly in the seed market in Mark-lane, London, or in local country markets. But for the greater number of seeds, the practice is for the nurserymen about London to grow a sample of it in their own grounds as pure and perfect as possible, and then to send it to the seed-farmer to be sown and cultivated by him, and the seed ripened, cleaned, and sent to the nurserymen, at a fixed rate, by the cwt. or bushel.

Flower-seeds are generally grown by nurserymen themselves; many of the other sorts by market-gardeners, and many kinds are received from the head-gardeners of private gentlemen.

2113. *Grass Orchards, Vergérs Agréstes*, Fr.; form the next point of union between farming and gardening. There are a number of them in the cyder counties, and in the vale of Clyde, and Carse of Gowrie. A suitable soil and site are chosen, the surface, if not in pasture, is sown with grass-seed, and standard fruit-trees, chiefly apples and pears, and sometimes, as in Shropshire, plums and walnuts are planted in rows, and properly fenced. They receive little pruning, and generally receive no other care but that of gathering the fruit, which is either made into cyder; stored in cellars; or sent immediately to market. As the trees get old and covered with moss and missletoe, or infected with canker, shakes, or rottenness, they are scarified, headed down, and sometimes regrafted or rooted out and renewed, according to circumstances. See *The Orchardist*, by T. S. D. Bucknal, Esq., and *Hints to Proprietors of Orchards*, by W. Salisbury.

2114. *Ploughed Orchards* differ in nothing from the grass orchards but in being constantly or occasionally under aration. The trees stand in quincunx, and every year the direction of the furrows is changed: thus, the first year it may be ploughed east and west; the second, south-east and north-west; the third, south and north; and the fourth, south-west and north-east. The stem of each tree is thus left in the centre of a square or rhomboid of turf of four feet on the side. The ground is cropped as in common farming, or farm-gardening.

Market-gardens (2048.) The number of these is considerable; their situation is near large towns or sea-ports, and their extent from one to fifty acres or upwards; some near London extend to upwards of a hundred acres. The object of all is to produce culinary vegetables and fruit for public sale, either as called for at the garden or garden shop; as wanted by the green-grocer, or exposed in the public market. Some of these gardens are general, producing every description of culinary fruit and vegetable, hardy, exotic, and forced, in demand; of which, as examples, may be mentioned the Earls Court-garden, of upwards of sixty acres, and with extensive hot-houses, by Gunter; the Hoxton garden, nearly equally extensive, by Grange; and the Isleworth gardens, by J. Wilmot, M. Keens. Other gardens near the metropolis are devoted chiefly to particular crops: as that of Biggs, at Mortlake, to asparagus; some at Battersea, to cabbage and cauliflower; at the Neats houses, to celery; at Deptford, to asparagus and onions; Charlton and Plumstead, to peas, &c. In some gardens attention is chiefly paid to forcing early, and growing late crops; in others, as at Lambeth, by I. Andrews, exotic fruits, as pines and grapes, are chiefly grown. At a greater distance from town, articles of easy carriage, as gooseberries, strawberries, asparagus, tart-rhubarb, sea-cale, &c. are leading articles; and in small gardens in the immediate vicinity of the metropolis, nothing is sent to market; but salads, as water-cress, radishes, lettuce, parsley, herbs, and flowers, are the chief articles grown, and they are sold in small quantities on the spot. The market-gardeners near sea-ports direct their attention chiefly to the produce of cabbage, onions, turnips, and such vegetables as are in demand as ships' stores.

In most parts of the country it happens, that from bankruptcies, absence of families, and such like causes, the produce of a number of private gardens is sent to market. This is a good deal the case near London; but so much so round Liverpool, and Manchester, that scarcely a market-gardener is to be found near these towns. Indeed many of the citizens there who possess villas and gardens, cultivate them as much for the sake of the disposal of the produce as for their own enjoyment.

Market-gardeners on a small scale have generally been master or head-gardeners, who have acquired a capital from a number of years' servitude; those occupying more extensive concerns are generally the sons or successors of other market-gardeners, and possess considerable capital. An important point in the culture of these gardens is to supply abundance of manure and water in dry weather; these always produce luxuriant and succulent crops of leaves, though obviously injurious in respect to flavor. A proper rotation and change of surface are also important; and in smaller crops it is a material point to have the rudiments of one crop always ready to succeed another. Thus radishes, lettuces, and onions are sown on asparagus-beds; the radishes are soon drawn, and succeeded by the lettuces and onions, which are left only in places where they will not injure the asparagus; the lettuces come into use soon after the asparagus is cut, part of the onions are drawn young, and the rest left to bulb. In the alleys between the beds, cauliflowers are planted early in the season, and between these, at a later period, cucumbers, which, with their runners, cover the vacant parts both of the alleys and beds. Thus six crops are obtained in succession, and the ground is clear by October for landing up the beds.

Early cauliflowers are generally a profitable crop. The seeds are sown in August, pricked out, and planted under hand-glasses, six under each, in October. The glasses are placed in rows, ten feet apart, and at four feet distance from centre to centre in the row: thus an acre contains 1092 glasses. After the cauliflowers are planted, the ground is sown with lettuces and spinach; if the lettuce stands the winter, it is valuable, and grows fast when the soil is stirred round it in March. About this time, four of the six plants under each glass are removed, and planted in a warm situation, or in the sheltered alleys of the asparagus beds. About the beginning of May the cauliflowers are too large for the glasses, and are just coming into flower. As they are gathered and their roots removed, they are replaced by cucumber-plants, previously raised in hot-beds, and now containing two or more proper leaves. In July the middle of the intervals between the rows of glasses is planted with endive, and between each glass two cauliflower-plants are planted to come in late. Thus five crops are raised, all valuable ones, if the ground was previously in good heart, and was kept frequently well stirred, and quite free from weeds. The following are common rotations: 1. radishes, carrots, savoys or cabbages, or colworts; 2. early turnips, autumn cabbage; 3. spring turnips, French beans, savoys, or peas and spinach, and leeks or brocoli.

In sowing broad-cast crops it is found of advantage to sow several sorts of seeds together, because some of them may fail or be destroyed by insects after they come up: if all come up and thrive, then such sorts as are least valuable may be treated as weeds. Thus onions, radishes, lettuce, and carrots, are often sown together; sometimes the carrots are wed out, and the best crop is the onions; at other times the onions partially fail, and are drawn for salading or transplanting, and the lettuce is the main crop. Radishes are often sown with turnips, as a sacrifice to the fly, while the turnips escape.

In general all transplanted crops, and as many sown ones as possible, are drilled; and for bulky crops, as cabbages, peas, beans, &c. it is an approved practice to sow or plant two rows near to each other, and then leave a wide interval, in which a dwarf early crop, or crops of short duration, as spinach, lettuce, &c. is sown. By the time the main crop is at its full size, the inter-crop is removed; the ground is then dry, and another crop, as cabbages or turnips, introduced, which is ready in its turn to succeed as the main crop. In this way, no part of a market-garden is ever left naked or cropless, at least during summer, and though these intervening crops are often injured when young by the shade of the main crops, yet, if the ground be in high order, they soon recover when freely exposed to the air, and the ground is stirred. If the land, however, is not in good heart, it is a better system to adopt a rotation, and stir the whole ground well between each crop, because here, the soil being poorer, a greater volume is required to supply the same nourishment: quantity is substituted for quality.

With respect to the comparative market value of crops, they must, on the general average, be nearly on a par; if one crop is at any time dearer than another, it is in consequence of being more precarious or expensive to raise; if one article is very dear at one time, it is immediately overgrown, and becomes proportionally cheap. To grow something of every thing is safe for those who have extensive concerns; select things for those who devote their whole attention to small spots; and things long of coming to perfection, as tart-rhubarb, sea-cale, asparagus, &c. to those who have capital. It is never advisable to propagate a dear article very extensively, as every body is likely to be doing the same thing; it is better even to adopt a contrary practice.

A good deal of the profit of market-gardening depends on studying the state of the market; in gathering crops sparingly when things are low, and in sending liberal supplies at times, where, from weather or other causes, they are, or are likely to be high. This requires both judgment and capital, for the needy grower must sell at any price.

2115. *Orchard Gardens.* These are distinguished from the parterre or field-orchards, in being cultivated with the spade, and cropped like a market-garden; indeed, they are so much allied to market-gardens, as hardly to require any separate discussion. In general, several kinds of fruit-trees are cultivated together, as tree-fruits, shrub-fruits, and herbaceous-fruits; but some spots, from the soil, and probably superior culture, are noted for particular kinds of fruit, as Twickenham and Roslin, for strawberries; Maidstone, for filberts and cherries; Pershore for currants, &c. An account of the Islewoth mode of growing strawberries has been given in the Horticultural Transactions by M. Keens, an eminent grower of fruits and culinary vegetables. The filberts are planted in rows alternately with rows of cherry-trees; and, as temporary crops, a row of gooseberries, currants, or raspberries, are planted in each interval. Currants are grown extensively round Pershore, and the fruit sold to the manufacturers of British wines. They are also grown in Kent and Essex in rows eight feet asunder, and four feet from tree to tree. Early in spring the ground is dug, and sown with spinach; to that succeeds potatoes, and to those cabbages, which last are gathered as coleworts before winter; four crops, including the fruit, are obtained in one season.

2116. *Herb and Physic Gardens.* These are of limited number and extent, and generally occupied along with market or seed gardens. There are one or two for peppermint and a few other herbs, near Edinburgh, and the rest are in the vicinity of the metropolis, and chiefly at Mitcham in Surry. Peppermint is a principal crop, which requires a moist, soft soil, and to be taken up and replanted every three or four years. Lavender is grown to a considerable extent on lean soil, as is camomile, wormwood, rosemary, thyme, &c. Liquorice and rhubarb require a deep, free soil; roses, which are grown in large quantities for their flowers, require a rich soil; white lillies and colchicum, grown for their bulbs, require a new soil.

In one or two gardens near the metropolis, many species of herbs are grown to gratify the demand of certain classes of medical men, of self-doctors, and of quacks and irregular practitioners. Formerly there were many gardens of this sort; apothecaries generally grew a great part of their own herbs, and collected the rest in the fields; and hence the reason why so many of them formerly were eminent as botanists; but at present the only remarkable herb-garden is that of Messrs. Dicksons and Anderson at Croydon. These herbalists and seedmen, have constantly on sale, at their long established and respectable shop in Covent-garden, upwards of 500 species, including all the variety mentioned by Culpepper and other herbalists of the 17th century. There are still one or two herb-shops which collect their simples in a wild state; but land is now so generally cultivated, that even if there were a demand for native herbs, this mode would not be very successful.

It may be mentioned as a curious fact, that in Weston's time, (say about 1750,) winter savory, camomile, pennyroyal, peppermint, &c. were grown in the common fields near London, where cattle were turned out all the winter; the scent of these herbs being so disagreeable to these animals as to cause them to avoid them. *Tracts*, &c. 71.

All herbs should be gathered dry, and in sunshine after dry weather; they should be dried in the shade, and when perfectly dried, pressed close by a press or weights, and enclosed in paper. The packets should then be deposited in a dry place, and when opened for use always carefully shut afterwards. The practice of hanging up herbs in loose bundles, tends to dry them too much and dissipate their flavor.

2117. *Market Flower-Gardens.* These are devoted to the culture of flowers for sale when in blossom; either cut as nosegays, or in pots. They are chiefly to be found in the neighbourhood of the metropolis, where a sort of division of objects exists among them. Some gardens are noted for their roses; others, as that of D. Carter at Fulham, for growing the narcissus tribe; Colville in the King's-road, for geraniums; Henderson at Paddington, for cheap heaths; the Bedford nursery for mignionette; and Smith at Dalston, for forced flowers of all sorts. These gardens are not large; generally from one to a dozen of acres, and they are occupied by gardeners who have been brought up to this department of their profession. The standard articles of cultivation are roses, especially the moss rose for nosegays; the monthly rose is also much grown in pots for spring and autumn sale. The sweetbriar is in demand for its odor; honeysuckles, lilacs, mezereons, rhododendrons, azaleas, spiræas, double and scarlet-blossomed thorns, jasmines, laburnums, rose acacias, are in great repute, especially when forced. All sorts of evergreens, as pines, firs, laurels, cypresses, arborvitæs, hollys, yew, and above all, lauristinus, and box, are much in demand for decorating balconies, flat roofs, areas, courts, lobbies, &c. Potted fruit-trees in bearing have generally a ready sale, and especially the grape and peach.

The common flowers for nosegays are, Snow-drops, anemonies, narcissi, hyacinths, ranunculuses, tulips, lilliums, auriculas, polyanthuses, carnations, pinks, sweet williams, sweet peas, wallflowers, many other border-flowers, and most of the biennial and annual kinds.

The flowers prolonged in duration by being placed under glass before frost approaches, being in pots, are, Mignionette, stocks of all the sorts, nasturtiums, veronicas, violets, gentians, monthly roses, lauristinus, clematis, dahlia, and chrythemum.

The forced flowers are chiefly, the pink tribe, violets, wallflowers, tenweek-stocks, common stocks, hyacinths, crocuses, narcissis, tulips, tuberoses, irises, rose campions, sweet pease, lupins, roses, lilacs, sweetbriars, mezereons, &c.

The exotics in most common demand are, Myrtles, geraniums, hydrangeas, heaths, camellias, Chinese roses, heliotropes, fuchsias, &c.

The flowering plants generally kept in pots are, Auriculas, polyanthuses, pinks, carnations, violets, fox-gloves, veronicas, dahlias, chrysanthemums, phloxes, and saxifragas of sorts, most of the bulbs and many of the annuals and biennials.

The flowers blown in water-glasses are, the hyacinth and narcissus chiefly, and also the crocus, tulip, amaryllis, colchicum, iris, &c.

Perhaps more pots of mignionette are sold in and near the metropolis than of any other potted plant whatever; fifty years ago it was hardly known. Next to mignionette may be named stocks, pinks, sweet-pease and wall-flowers, among the hardy plants; hyacinths, among the bulbs; and geraniums and myrtles, among the exotics. Some years ago heaths and camellias were chiefly in repute; these being found difficult to keep in rooms, the public taste has changed, and the flower-grower varies his products accordingly. All these, and other sorts of plants in pots, are also lent out by the market-florist, to decorate private or public rooms on extraordinary occasions, but especially for those midnight assemblages called routs. This is the most lucrative part of the grower's business, who generally receives half the value of the plants lent out, as many of them, and generally those of most value, are so injured by the heat as never to recover.

2118. *Florist's Gardens* are devoted to the culture of florists or select flowers for the sale of the plants and roots. There are not many exclusively devoted to this branch, excepting near Manchester and the metropolis. Those near Manchester, Paisley, and most other provincial towns are generally on a small scale, and cultivated by men who have auxiliary resources of livelihood; but near London are some extensive concerns of this sort, particularly those of Messrs. Milliken and Curtis of Walworth, Davy of the King's-road, Bailey of Clapton, &c.; the first is celebrated for tulips and most bulbs, the second for pinks and carnations, the last for auriculas. This is one of the most delicate and difficult branches of gardening, and is only successfully pursued by such as devote their exclusive attention to it. The great difficulty is to preserve fine varieties, and keep them from degenerating or sporting: many gardeners, excellent propagators and cultivators of hot-house and green-house plants find it a very difficult task to grow a fine auricula or carnation; and their flowers would cut but a poor figure at the florist's shows, either near London or in the country. Much depends on the soil, which requires to be rich and well mellowed by time.

This is perhaps the most precarious branch of commercial gardening as a means of subsistence, since the purchasers are not so much the wealthy mercantile class who possess villas, or the independent country gentlemen, in whose gardens fine florist's flowers are seldom seen, as the tradesman and middling class. The income of these being temporary, that is, depending in a great measure on personal exertion, and the current demand for their products is, of course, easily affected by political changes, which make little difference to the man whose income arises from a fixed capital.

2119. *Nursery Gardens.* (2044.) In these are propagated and reared all sorts of trees and shrubs, and all other herbaceous plants in general demand: the culture of florist's flowers is often combined to a certain extent, and the dealing in seeds imported, bulbous roots, and garden-implements and machines, is generally considered a part of the business. Hence the designation of nurseryman, seedsman, and florist, formerly, and still, to a certain degree, common on their sign-boards. Of this class of commercial gardens, there is one or more in most counties of Britain, and a few in Ireland; but the greater number, and by far the most important, are in the vicinity of the metropolis. Their extent near town is limited; some contain only an acre or two, but others occupy forty or fifty acres; in the country where land is cheap, some are of double or treble that extent. In general, they have been commenced by head-gardeners, who had acquired a little capital, and continued by their sons or successors. In country nurseries, the commoner hardy fruit-trees, and tree and hedge-plants are the chief products: near Edinburgh and the metropolis some embrace every article of nursery produce, as the Hammersmith nursery, unrivalled in the world; others deal chiefly in fruit-trees; green-house plants; or American plants, and some almost limit themselves to particular species, as the camellia erica, geranium, &c. The Scotch nurseries, and especially those of the northern districts, as that of Messrs. Gibbs at Inverness, are famous for the raising of forest-tree seedlings, which they send in large quantities to all parts of the three kingdoms.

To enter on the subject of nursery-culture, would embrace almost every part of gardening; since no department requires a more general knowledge, or so much attention and practical adroitness. The essential part of the business is the art of propagation; which, in some cases, as in multiplying heaths, and other Cape and Botany-bay plants by cuttings, and in raising even the pine and fir-tribe from seed, requires very delicate and accurate manipulation, and constant subsequent care and attention. Even grafting, budding, and layering, require to be carefully, skilfully, and expeditiously performed, and the future progress of the scion, bud, or shoot, carefully watched. Next to propagating, rearing requires attention, and especially transplanting and pruning; on the former depends the state of the roots, and of course the fitness of the plant for removal; and on the latter, very often, the future figure of the tree.

In the nursery business, as in every thing else, the most skilful and vigilant theorist can seldom make his practice conform to his knowledge. Thus, many customers, from ignorance, indolence, or unforeseen circumstances, defer ordering what they want from their nurserymen till the last moment, which consequently prevents him from applying the requisite details of culture to his stock of plants and trees in the proper season. Thus the heading down of fruit-trees is often delayed, in deference to late purchasers, till the buds begin to push; and to cut them at that time, particularly vines, apricots, and cherries, would endanger their existence, and, at all events, enfeeble their shoots. In this case it is necessary to wait till they have made shoots of a few inches, when they may be headed down not with much regard to shoots which have appeared, but more as they would have been cut in the proper season when nothing appeared but buds. The plant in a healthy, vigorous state, when so headed down to apparently dead or dormant eyes, will soon push, and regain, in a great degree, the lost time; and, indeed, it may always be considered safe to rub off all shoots, not in desirable situations, from healthy trees, provided it be done early in the season. Trees which are not in full health, whether recently transplanted or not, should, in general, be left with their tops on, the leaves on which will prepare nourishment to strengthen their roots, and they can be headed down the following season.

Some persons, after the drawing season, fill up the blanks in the lines of fruit-trees, with stocks to be budded the same season. This may do in new and excellent soils, and where there is little demand for fruit-trees; but, in general, the best way is to fill up all blanks that cannot be filled up with the tree kind in the proper season, with culinary vegetables, either for the kitchen or for seed, or with flowers to produce seed.

The following are leading objects of nursery-management:

1. *Correctness* in the names given to plants and seeds of every description, and particularly to fruit-trees. To facilitate this, as *to seeds and roots,* their names should be painted on the various boxes, sacks, and chests in which they are kept; and as to fruit-trees, they should be designated by numbers painted on wooden, or better on cast-iron, tallys. Stools and stock-plants of every description, not very generally known, and, if possible, the whole of those planted along the borders, whether known or not, should have their systematic and English names painted on similar tallys; and smaller herbaceous plants in pots, and all exotics in pots, excepting such as come under the head of fruit-trees or plants, as vines, pines, &c. should be named on small wooden tallys, written with a black-lead pencil on white-lead newly rubbed on. Seton's number-stick (619.) is by far the best for temporary numbers to fruit-trees, or for numbering sown seeds or small plants. Some employ leaden, iron, or copper tallys, painted, but these are too conspicuous, and require too much labour in the preparation for a nursery.

It appears to us, that, to prevent the chance of substituting one sort of fruit-tree for another, either by accident or design, the following mode might be adopted.

Let a catalogue of fruit-trees be printed by the nurseryman, and let it contain against each name, the number placed against the plant in the nursery; then every autumn before the drawing season commences, let a person with steel types of the numerals, and a marking-iron with the initials of the nurseryman, go through the rows of fruit-trees, and beginning at No. 1., say of apples, put type 1. in a proper socket prepared in the marking-iron, and mark each tree fit to move, a few inches above the graft; let him next do the same with No. 2., having changed the type; and so on with the apples and all other fruit-trees, not excepting the peach. This would not supersede the use of parchment labels to plants sold, but it would afford both to the nurseryman and the public who purchased his catalogue and his trees, a certain means of detecting error, as, should the label drop off in the hurry of carrying the trees to the packing-court, or in repacking when arriving at their final destination, the number on the bark and the published catalogue could readily be referred to. If performed with a small, sharp instrument, this practice could do no harm to the tree.

2. *Punctuality, Accuracy,* and *Dispatch* in executing all orders.

3. Rather *procuring* or *omitting* an article than sending off a bad one, unless under peculiar circumstances, to be explained to the party.

4. *Careful packing,* and such as suits the sort of articles, the season, the distance, or the climate to which they are to be sent, mode of carriage, &c.

5. Keeping an *exact account* of men's time, and being particular in mustering them every morning before the hours of commencing work, and again at the hours of rest and refreshment. This may be greatly facilitated by causing them all to enter and go out at the same gate, which ought to be that at the counting-house; and a bell or horn should call them to or from work.

6. Keeping a *vigilant* eye to the men whilst at work, especially with strangers, till you have proved to them that you know what they can do by day or hour, by fair labor.

7. Having one principal *foreman* or partner for the whole, and sub-foreman for the exotic, American, herbaceous, general nursery, and seed departments.

8. Having a proper person employed as *a traveller;* or yourself or partner taking that department.

9. Acting on all occasions with the utmost *impartiality* between gentlemen and their gardeners, leaning rather to the latter, in all doubtful cases, as the weaker party, according to the common consent and practice of all mankind.

10. Paying all workmen, and, at all events, your foremen, such *wages* for their labor as may not tempt them either to idleness or pilfering themselves, or to countenance these practices in others.

11. Publishing a printed *catalogue* on a scientific principle, of every article you have, or intend to have, for sale, with the names, synonyms, some description of the fruits, and reference to a figure of the plant or fruit in some generally known work; and placing, as above observed, (1.) the same number opposite the names of your fruit-trees in the catalogue, as is actually placed against them on cast-iron tallys in the nursery, and annually in autumn, before the drawing season, impressed on all of them fit for sale, with a marking-iron and types.

12. Attending at all times and seasons, and in every part of the nursery to *frugality,* (avoiding meanness,) and neatness, keeping every where a vigilant eye, and always being beforehand rather than behind, with the different operations of cultivation. Much of neatness depends on the master's insisting that every workman shall clean up and finish as completely as practicable, every operation as he goes along. Having taken up a tree or a plant, he ought never to forget to level up the hole; having pruned one, he ought at the same time to pick up the shoots, or if in a course of pruning, he should have a boy or woman going after him to do so, or, at all events, they ought to be picked up the same day. A corresponding attention to order and neatness is requisite

in every other operation; and this attention once become a habit, will be found a saving of labor, and a source of profit as well as of pleasure.

2120. The *Management of the Seed Department* is comparatively simple. The chief difficulty for seedsmen who are beginners, and at a distance from the metropolis, is the ordering the proper quantities of each seed from the growers or wholesale dealers. The guides to this are, the proportions of the different crops usually grown in private gardens and the wants of the class who are likely to become purchasers. The same difficulty occurs in beginning almost every business, and is only to be overcome by experience. The different periods to which different seeds retain their vegetative powers require to be known by seedsmen, as well that they may not furnish lifeless seeds to their customers, as that they may not throw away as useless such as are possessed of the vital principle. Though few seeds are kept by respectable seedsmen above a year, yet in cases where a partial failure has taken place in the seed crop, most sorts will grow the second year after that in which they have ripened. Some, however, will keep from two to five, or ten or more years; and others for an unknown length of time. The following are the latest periods at which the seeds most generally in demand may be expected to grow.

Cabbage Tribe. Four years.

Leguminous Culinary Vegetables. One year.

Esculent Roots. Beet, ten years. Turnip, four years. Carrot, one year. Parsnip, one year. Radish, two years. Salsify, two years. Skirret, four years. Scorzonera, two years.

Spinaceous Plants. Spinach, four years. White beet, ten years. Orache, one year. Purslane, two years. Herb Patience, one year.

Alliaceous Plants. Two years.

Asparaginous Plants. Asparagus, four years. Sea-kale, three years. Artichoke, three years. Chardoon, two years. Rampion, two years. Alisanders, and the Thistles, two years.

Acetarious Plants, in general two years. Lettuce, three years. Endive, four years. Burnet, six years. Mustard, four years. Tarragon, four years. Sorrel, seven years; and Celery, ten years.

Potherbs, and garnishing Plants; in general two years; but Parsley will grow at six years. Dill and Fennel, five years. Chervil, six years. Marygold, three years; and Borage, four years.

Sweet-Herbs, generally two years; but Rue and Rosemary, three years; and Hyssop, six years.

Plants used in Tarts, &c. generally two years; but the Rhubarb only one year; and Gourd, Pompion, &c. ten years.

Herbaceous Fruits. The Cucumber and Melon, ten or more years. Love-Apple, Capsicum Tribe, and Egg-Plant, two years.

Annual and Biennial Flower Seeds, generally two years; but some grow with difficulty the second year: they are seldom kept by seedsmen longer than one year.

Perennial Flower Seeds, the same.

Tree Seeds. Stones, two years; and some, as the haw, three; but they are in general of very doubtful success the second year. Acorns will scarcely grow the second year; Elm, Poplar, and Willow Seeds, not at all.

All seeds ought to be kept dry, and the air as much as possible excluded; but those liable to be attacked by insects, as the pea, bean, turnip, radish, &c. should be occasionally exposed to air and friction, by being passed through a winnowing machine. The more rare seeds should be kept in their pods till the season for using. Seeds received from foreign countries should, in general, be sown as soon as possible after their arrival. In packing seeds for the home demand, no particular process is requisite; but in sending seeds to America or the East Indies, the sorts which soon lose their vitality should be enveloped in clay, tallow, or wax, or put up in bottles rendered air and water tight.

2121. *Bulbous Roots,* with the exception of the anemone and ranunculus, can only be kept out of ground a few months with propriety, though some are often found in the seed-shops as late as May. When thoroughly dry they may be kept in bags or boxes, and the more delicate sorts wrapt up in papers separately. Ranunculus and anemone roots retain their vegetative powers two, and sometimes three years.

The greater part of culinary, flower, and indigenous tree-seeds sold in the shops, are procured from the English seed-growers and collectors; but a part also are obtained from other countries; as of onion-seed from Genoa; anise, basil, &c. from the south of France; carrot, onion, and a variety of seeds, when the English crop fails, from Holland.

The hardier bulbs, as crocus, daffodil, &c. are for the most part grown in England; the other hardy sorts are obtained from Guernsey, as the Guernsey-lily; the Cape of Good Hope, as ixia, gladiolus, &c.; or from South America, as the tuberose.

The seeds of tender exotic trees and shrubs are obtained from the seed-collectors at the Cape, New Holland, and other foreign settlements; and of others from North America.

2122. An important part of a nurseryman's duty and care, in which he may render essential services to horticulture, is, *the recommendation of head-gardeners* to private gentlemen. He ought to select such as are well qualified for what they undertake, and consider himself as in some degree responsible for the conduct of the person recommended. In addition to this, the nurseryman, in the yearly tour he generally makes among his country customers to receive payments and take orders, should observe whether the person recommended has acted according to his expectations, and should exhort, reprove, or approve, accordingly. The nurseryman, while on this tour, by seeing a number of gardens and gardeners, must, by comparison, be well able to judge of their merits; and by judiciously dealing out approbation or blame, might do much good. The good gardener, who had become slovenly, from not seeing other gardens, or the indifference of his employer, might thus be recalled to his duty, and the art not suffered to be disgraced by his practice. This is also the time for gentlemen to state to nurserymen the faults they have to their gardeners, so as they may tend by their advice to correct them. The nurseryman who has recommended a gardener, is the only person who can act as a mediator between this gardener and his employer; and we repeat, that by the judicious interference of well-informed and experienced nurserymen, much good might be done; gardens kept in better order, and gardeners improved and retained, instead of being removed from their situations without being properly informed of their errors, and a proper opportunity afforded them of amendment.

Sect. III. *Public Gardens.*

There are very few gardens of this class in Britain; and we can only refer to the enclosed areas of the public squares and parks of the metropolis and principal cities, to the botanic-gardens of the universities and other public bodies, and to the gardens of the two horticultural societies.

2123. The *Public Squares* are generally kept in order by jobbing gardeners at a certain rate by the year. The principal part of their business consists in keeping the grass short, by mowing once a fortnight in summer, and rather seldomer in spring and autumn; in keeping the gravel clean, and in keeping up a display of flowers in the dug groups.

2124. The *Public Parks* and other equestrian promenades are mostly managed by officers appointed by government; being once formed, and the trees grown up, they require little annual expence. The Mary-le-bonne or Regent's Park is in part let as a nursery-ground, and, instead of a rent, the occupier is bound to plant a certain number of trees the first year of his lease, to nurse up these, and leave a certain number of them on each acre at the end of his lease. A considerable part of this park is also, as already mentioned, let to private persons for the purpose of erecting villas, which, though it will controul the rambles of the pedestrian, will give and maintain a woody appearance, without any expence to the public.

2125. The *Botanic Gardens* of the universities are under the general direction of the professor of botany, and managed by a head-gardener or curator: those, founded by subscribers, or a society, as the gardens of Liverpool, Hull, Glasgow, and Dublin, are under the direction of a committee, and similarly managed. The duties common to curators are the keeping up and increasing the collection of plants; those who manage university-gardens, have, in addition, to furnish specimens of certain plants in sufficient numbers for the use of the professor and students. In some cases, the curator is required to instruct students; and in others, he is permitted to do this, and to take pupils or apprentices for his own emolument. Most gardens exchange, and some, as that of Liverpool, sell plants and seeds.

On the *Cultivation of Botanic Gardens* we shall offer only a few general hints. Instead of the principle of *rotation*, is here substituted that of *a renewal*, partial or wholly, of the soil. On shallow soils it is to be effected by removal of the whole, or a proportion of the old soil, and the introduction, and thorough mixture of a proportionate quantity of good virgin loam, or of virgin-peat, bog, or sand, according to the plat or border to be renewed. In rock-works, and bogs, American grounds, and in most of what may be called *particular habitats*, there is no other way; but in the plats which contain the general arrangements, deep trenching may partially or wholly supply its place.

Manure cannot altogether be dispensed with in botanic gardens, particularly for some or most of the vegetables which will be included under the culinary, agricultural, and flower-garden departments; but, in general, decayed leaves is the best manure for all other plants and trees, not in a state of monstrosity or otherwise changed by cultivation.

Sheltering and *Shading* are parts of culture which demand very considerable attention in botanic gardens, especially in warm climates. Delicate plants which require a moist atmosphere, as some alpines and Americans, require to be closely covered with a hand-glass, and this again partially with a wicker-case during the whole summer, even if under the shade of a wall or hedge.

A good deal of skill is often requisite in sowing, and causing to vegetate, seeds which have been brought from a distance. Sowing in very fine earth in pots, covering them with a bell, and placing them in the shade and in moist heat, is the most likely mode to succeed, whatever climate the seeds may have been sent from. To this, some add previous steeping of the seed in pure water, and in water impregnated with oxyginated muriatic acid. Others water with water impregnated with this acid or with its gas; some charge the earth of the pot with the gas, and others invert a bell-glass over it, containing an atmosphere partly or wholly composed of the gas. (See *Hill* in *Hort. Trans.* i. 233.) All these modes, and others suggested by vegetable chemistry, may be tried; but where the vital principle is not extinct, the first mode will generally be found sufficient.

Numerous annual and biennial seeds require to be sown every year, independently of seeds of new sorts from foreign countries. For collections of these in beds or in a general arrangement, the mode of sowing in rows across the bed, is obviously the best; and several rows radiating from a polygonal tally in the centre, is the most economical, as admitting of the greatest number of sorts in the least space.

2126. With respect to *management*, there are various duties belonging to the office of curator of a public botanic-garden which are peculiar to the situation; some of which we shall briefly enumerate.

Gathering and drying specimens to *keep up the herbarium*, and to exchange or give away; frequently inspecting the herbarium to guard against damp and moths; collecting and *preserving seeds* of every kind for the purposes of exchange.

Collecting wild Plants, and seeking for new species in proper situations; in unfrequented haunts for herbaceous plants; in haunts much frequented by birds, for trees; in bays, and sheltered creeks, and shores, for aquatics; in rocky shores for marine plants; among the tops of snow-clad mountains in winter, for mosses; in old forests in winter for lichens, and in spring for fungi, and so on.

Acclimating Plants, by raising them from seeds, one generation after another, till the final progeny will endure the open air throughout the year. Dr. Walker (*Essays*) states how the passiflora cærulea was acclimated in Scotland, merely by time, without propagation from seed. Sir Joseph Banks, (*Hort. Tr.* i. 21.) by sowing the seeds of succeeding generations of the *zizania aquatica* from 1791 to 1804, "proved that an annual plant scarce able to endure the ungenial summers of England, became, in fourteen generations, as strong and as vigorous as our indigenous plants are, and as perfect in all its parts as in our native climate." Next to the ordinary duties of a botanic curator, this appears to us, much the most important of the services he can render to the horticulture and agriculture of his country.

Distributing Seeds, Cuttings, and Plants of all Sorts, among all who are likely to keep them, and set a due value on them, but to none else. The illiberality of the administrators of some gardens, in this respect, has been much and deservedly blamed. The surest mode of preserving a plant in the country is, to render it as common as possible; and the easiest mode of effecting this is, to distribute a few specimens among the nurserymen. From an opposite conduct, many of the plants introduced at Kew, and described in the Hortus Kewensis, are not to be found in the Kew garden; and, thus, never having been distributed, are lost to the country. The policy of this garden, for a number of years past, is considered as highly reprehensible: being supported by the public, it ought to have been devoted to its service.

To encourage a desire of botanical knowledge, by *giving the name and history of plants* to all eager enquirers; to induce a taste for botany and the vegetable kingdom, by pointing out striking peculiarities of plants to superficial observers, in order to attract their attention; trying to point out things which may assimilate with the taste or foible of the person addressed; recollecting that sexual matters, and matters bordering on the marvellous, are the most generally attractive to volatile or vacant minds; in this way becoming all things to all men, in order, by all means, to gain some.

Disseminating and dispersing Seeds and Plants of scarce natives, or of foreign sorts not yet naturalised, by placing them in their proper soils and habitats. Thus, when the aquatic plants are reduced, throw the parts taken from rare ones, into an adjoining ditch, lake, canal or river; scatter the seeds, and plant the roots of wood-plants in plantations; arenarious plants on sandy soils or shores, and so on.

Curator Anderson of the Chelsea garden scatters all his spare seeds on Battersea, Clapham, and Wandsworth commons, and throws his spare aquatics into the Thames. The consequence is, that though only a few years practised, some rather scarce plants seem already naturalized in these places.

J. Dickson, one of the vice-presidents of the Horticultural Society, and an enthusiastic botanist, has naturalized that beautiful plant, the *fresh-water soldier*, in the ponds about Croydon; as we have done the same plant, and several others, in the Serpentine canal in Hyde-park.

R. A. Salisbury, one of the first botanists of the age, and equally eminent as a horticulturist, thinking he could naturalize in our sandy shores the *Pancratium maritimum*, planted a bulb in the Isle of Wight, among *Chelidonium corniculatum*, and *Eryngium maritimum*, with which he saw it growing wild below Montpelier (*Hort. Trans.* i. 341.); "and when at school, in the neighbourhood of Halifax, in 1769, *he* was flogged in the Whitsuntide holidays, for helping to propagate the *Narcissus triandrus*, and for running out of bounds to know the name of it at North Bierly."

2127. Every botanic garden should print for exchange, distribution, or sale, a *cata-*

logue of its contents. Very complete gardens, such as those of Kew, Cambridge, and Liverpool, find it answer to publish printed catalogues, with a view to a remuneration by sale; but the legitimate object of a botanic-garden catalogue is, to exchange it with that of other botanic-gardens, foreign and domestic; in order, that by comparison of riches, exchanges may be made for mutual advantage. For this purpose, it seems desirable, that every thriving establishment, should print or prepare a catalogue once a year, or once every two or three years. To facilitate this, it might be printed by the lithographic process, from a list written in a small-hand, on *prepared paper*. By printing only the botanic names, each sheet would contain nearly four thousand names, and consequently three sheets, all the plants, native or introduced into Britain. This might be produced stitched together, all expences included, for a trifle; and as the present law respecting letters stands, might be franked in separate sheets. Thus a cheap communication between British botanic-gardens might be formed, and through our foreign ambassadors, these catalogues might be distributed all over the world.

Where it is not convenient to form a catalogue of printed names, one may be formed of figures. Thus the possessed or desired plants might be indicated by putting down the numbers placed against the names of the plants in some generally circulated botanical-catalogue. If, in the excellent catalogue of Sweet, the genera had been numbered as in the synopsis of Persoon, it would have been the best; in the mean time, Persoon's work, as it is in the hands of most botanists, foreign and domestic, may be referred to; and as an example of the brevity of this kind of catalogue or reference, let us suppose one curator wishes to write to another for Varronia, crenata, lineata, bullata, and globosa; all he has to do is to write for *Per.* (*Persoon*), 371 (the number of the genus,) *and* 1 *to* 4, (the numbers of the species desired,) and similarly as to all the plants described in Persoon's synopsis. Ten thousand plants would in this way be represented by about 11500 figures.

2128. The *Gardens of the Horticultural Societies*, being at present in a state of embryo, do not admit of description; and we shall not here obtrude any speculative remarks on the subject of their design or management. Their object and character ought not to interfere with the botanic-garden on the one hand, nor the promenade-garden on the other.

CHAP. III.

Topographical Survey of the British Isles in respect to Gardening.

The British isles, as we have already observed, (183.), are, in their present state, naturally and politically, more favorable to the practice of horticulture in all its branches than any other country; in no country is so great a proportion of the surface covered with gardens, including, under this term, the parks or landscape-gardens, which surround gentlemen's seats. The beauty and magnificence of these parks, and the villas, mansions, castles, and palaces, of which they are the appendages, far surpass what is to be met with in any other part of the world.

The palaces and scenery of Italy are more interesting to artists and classical antiquaries, from the particular associations necessarily connected with their pursuits; but the views of an accomplished and well-regulated mind will extend to other kinds of excellence, as well as those of picturesque or classic beauty; and a man that knows to what extent civilization and refinement are carried in different parts of the world, will look into the interior of these casinos and palaces, their gardens and farms; and inquire to what extent they would contribute in their propriety, salubrity, furniture, produce, and management, to the gratification of the wants of an Englishman in his present state of refinement. In these particulars he will find them so very deficient, as to admit of no sort of comparison with those of Britain.

The following notices of the state of gardening in each of the different counties of the United Kingdom, are necessarily imperfect to a certain extent; from defective information some things are omitted, and erroneous statements may exist as to others. In the selection of the names of the principal country residences, some are undoubtedly admitted which may not have that claim, in comparison to others which are excluded; and others, though they once had that claim, may now have it no longer, from neglect, change of ownership, or even destruction as a country seat. Most of the descriptive hints, added after the names of country residences, refer to the state they were in some years ago, some as far back as 1805; and the changes in the names of the possessors that may have taken place since that time must no doubt be the cause of various errors, though we have spared no pains to avoid them. The descriptive epithets, added to the names of places in the southern kingdom, are taken generally from the *Beauties of England and Wales*, (London, 26 vols. 8vo. published from 1801 to 1815); those of Scotland from the beauties of that country, (5 vols. 8vo. Edin. published from 1802 to 1809); and those of Ireland from *The Traveller's Guide*, (1 vol. 8vo. Dublin, 1819.) We have visited all the counties of Britain ourselves in 1804, 5, and 6, and since been professionally engaged in several of them; and we have also made a general tour of Ireland in 1811. When any remarks occur which are not found in the books referred to, they may be considered as the result of our own observation at these periods or since. From the limited space that we can devote to this part of the work, these remarks are necessarily very few; we have omitted stating any thing as to the indigenous plants; and said very little as to the natural woods or artificial plantations of each county. All the seats which are of established celebrity, and are what are called show places, are distinguished by a cross (×): of most of these places accounts have been published in the local guides, sold in country towns.

Sect. I. *Gardens and Country Residences of England.*

The surface is estimated at 32,150,000 acres, almost every where cultivated, and no where incapable of cultivation; in most places varied; gently and beautifully in some districts, and abruptly and on a grander scale in others. The most hilly and mountainous districts are those of the north, and the most level those of the east. The most humid climates are those of the western and northern counties, as Lancashire and Cheshire; and the most dry those of the east and south, as Norfolk and Sussex. The richest soil, and those in which gardening, as an art of culture, and as a trade, has been carried to the greatest perfection, are those round the metropolis; there, within the circuit of ten miles, it is estimated (*Lyson's Environs of London*, published 1792 to 1796), 500 acres are employed in raising culinary vegetables; 800 acres covered with fruit-trees and shrubs; 300 acres in medicinal herbs; 500 as nursery and florists' gardens; besides not fewer than 1200 acres employed by farming gardeners in growing potatoes for the market, and 1200 occupied with turnips, cabbages, parsnips, and white-beet for milch cows.

Gardening, as an art of design and taste, may be considered as nearly equally advanced in almost all the counties. Some of the most highly kept gardens and country residences are in Middlesex and Surrey; of the most extensive and magnificent in Oxfordshire, Yorkshire, Nottinghamshire, and Devonshire. The best examples of cottager's and farmer's gardens are in Essex, Kent, Norfolk, and Lancashire; the seed-gardens are chiefly in Essex and Kent; orchards in Herefordshire, Warwickshire, and Devonshire; and market-gardens and nurseries are distributed according to the extent and population of the different counties. These counties are forty in number, and we shall take them in the order of the circuits made by the judges, being that in which their names are most generally associated in our memories, and that also in which they are not unaptly classed in regard to beauty and character.

2129. MIDDLESEX, the north side of a vale watered by the Thames, and containing 179,200 acres, of which one part is clayey and another marshy, but the greater part productive. As containing the metropolis, it may be considered the richest county in the United Kingdom as to culinary and flower-gardening. The depôt or market, where chiefly these productions are exposed for sale, is Covent-garden, an open square, laid out with fixed temporary wooden shops and stalls. The vegetables and commoner fruits and flowers are brought in by carts and waggons three days in the week, Monday, Wednesday, and Saturday, so as to arrive in the market between three and five o'clock; they are then sold by regular salesmen to the retailers of the market, or to green-grocers, fruiterers, and stall-keepers from different parts of the town. In general the terms are adjusted, and the market cleared of the vehicles and horses by ten o'clock or earlier in the summer, no more remaining in the market than what is found by the different tenants to be sufficient for the local consumption.

The more valuable fruits and flowers, such as forced strawberries, peaches, grapes, and pines, and forced roses, hyacinths, and nosegays, during winter, are generally sold by private contract to the fruit-shops in the market, or to others distributed in different parts of the town. The principal fruit-shop is that of Grange in Piccadilly, who is the king's fruiterer; the principal flower-shop that of Smith in Covent-garden market.

Besides the central market of Covent-garden, there are others in different parts of the town, as the Fleet, Newgate, Borough, &c. which receive very considerable supplies of the leading kinds of vegetables direct from the country; but the forced productions, and the more expensive fruits, are generally brought to Covent-garden, when not disposed of to the shops by private contract.

2130. The following TABLE exhibits a comparative View of the *Average Prices of Vegetable productions*, by Retail, in Covent-garden Market, throughout the Year.

	January.	*February.*	*March.*	*April.*	*May.*	*June.*	*July.*	*August.*	*September.*	*October.*	*November.*	*December.*
Cabbage	- - -	- - -	2s. per dozen	2s. per dozen	1s. 6d. per dozen	1s. per dozen	1s. per dozen	- - -	- - -	- - -	- - -	Sm. ones 6d. p. doz.
Cauliflower	- - -	- - -	- - -	- - -	16s. per dozen	5s. per dozen	3s. per dozen	2s. per dozen	1s. 6d. per dozen	1s. per dozen	4s. 6d. per dozen	5s. per dozen
Broccoli	1s. per bunch	1s. 6d. per bunch	2s. per bunch	2s. 6d. per bunch	3s. per bunch	- - -	- - -	- - -	6d. per bunch	9d. per bunch	1s. per bunch	1s. 6d. per bunch
Pease	- - -	- - -	- - -	- - -	- - -	3l. per half sieve to 1l. 10s.—5s.	1st. 8s., 2s., 1s. 6d. per half sieve	2s. per half sieve	2s. per half sieve	- - -	- - -	- - -
Beans	- - -	- - -	- - -	- - -	- - -	6s. per half sieve	3s. per half sieve	1s. per half sieve	6d. per half sieve	- - -	- - -	- - -
Kidney-beans	6s. per 100	6s. per 100	6s. per 100	6s. per 100	5s. per 100	3s. per 100	3s. per 100	10s. per half sieve	4s. per half sieve	5s. per half sieve	- - -	6s. per 100
Potatoes	- - -	- - -	10s. per lb.	6s. per lb.	6s. per lb.	4s. per lb.	2s. per lb.	6d. per lb.	3d. per lb.	2d. per lb.	1d. per lb.	4d. per lb.
Turnips	3d. per bunch	3d. per bunch	3d. per bunch	4d. per bunch	New, 3s. per bunch	1s. per bunch	6d. per bunch	4d. per bunch	3d. per bunch	3d. per bunch	2d. per bunch	2d. per bunch
Carrots	6d. per bunch	6d. per bunch	6d. per bunch	8d. per bunch	New, 2s. per bunch	1s. 6d. per bunch	1s. per bunch	9d. per bunch	4d. per bunch.	4d. per bunch	4d. per bunch	4d. per bunch
Radishes	2s. per punnet	2s. per punnet	2s. per punnet	2s. per punnet	1s. p. doz. bunches	1s. per doz. bunch.	1s. per doz. bunch.	6d. per doz. bunch.	- - -	- - -	1s. per punnet	1s. per punnet
Spinach	4s. per half sieve	4s. per half sieve	4s. per half sieve	3s. per half sieve	1s. per half sieve	6d. per half sieve	6d. per half sieve	6d. per half sieve	1s. per half sieve	6d. per half sieve	6d. per half sieve	1s. per half sieve
Onions	2s. per half sieve	2s. per half sieve	2s. per half sieve	3s. per half sieve	4s. per half sieve	9s. per half sieve	1s. 2d. per bunch	8d. per bunch	2d. per bunch	1s. per half sieve	1s. per half sieve	1s. 6d. p. half sieve
Asparagus	1l. 1s. per 100	1l. 1s. per 100	15s. per 100	15s. per 100	10s. per 100	8s. per 100	8s. per 100	- - -	- - -	- - -	- - -	1l. 1s. per 100
Sea-kale	4s. per punnet	4s. per punnet	4s. per punnet	3s. per punnet	2s. per punnet	2s. per punnet	- - -	- - -	- - -	- - -	- - -	4s. per punnet
Artichoke	- - -	- - -	- - -	- - -	- - -	24s. per dozen	18s. per dozen	8s. per dozen	4s. per dozen	4s. per dozen	4s. per dozen	- - -
Lettuce	2s. per score	- - -	- - -	1s. per score	7s. per score	4s. per score	2s. per score	2s. per score	2s. per score	1s. per score	4s. per score	2s. per score
Small salads	6d. per punnet	6d. per punnet	6d. per punnet	6d. per punnet	6d. per punnet	6d. per punnet	4s. per punnet	4s. per punnet	4o. per punnet	4s. per punnet	4s. per punnet	4s. per punnet
Rhubarb-stalks	- - -	- - -	3s. per bundle	2s. 6d. per bundle	1s. 6d. per bundle	1s. per bundle	1s. per bundle	- - -	- - -	- - -	- - -	- - -
Love-apple	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	2s. 6d. per dozen	1s. 6d. per dozen	1s. 6d. per dozen	- - -
Capsicum	- - -	- - -	- - -	- - -	- - -	Green 7s. per 100 Ripe 2s. per doz.	Green 7s. per 100 Ripe 2s per doz.	Greenl 5s. per 100 Ripe 2s. 6. per doz.	Green 3s per 100 Ripe 1. 6d. per doz.	Green 5s. per 100 Ripe 1s. 6d. per doz.	- - - Ripe 1s. 6d. per doz.	- - - Ripe 1s. 6d. per doz.
Mushrooms	2s. per pottle	2s. per pottle	2s. per pottle	2s. per pottle	2s. per pottle	2s. per pottle	3s. per pottle	2s. per pottle	1s. per pottle	1s. per pottle	1s. 6d. per pottle	1s. 6d. per pottle
Truffles	4s. per lb.	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	4s. per lb.	3s. per lb.	5s. 6d. per lb.
Morels	- - -	- - -	- - -	- - -	5s. a dish	5s. a dish	5s. a dish	- - -	- - -	- - -	- - -	- - -
Cucumbers	21s. per brace	21s. per brace	12s. per brace	10s. 6d. per brace	6s. per brace	4s. per brace	1s. 6d. per brace	1s. per brace	1s. per brace	- - -	- - -	- - -
Melons	- - -	- - -	- - -	- - -	- - -	From 5s. to 20s. ea.	From 5s. to 15s. ea.	5s. each	3s. each	3s. each	- - -	- - -
Pine-apples	12s. per lb.	12s. per lb.	12s. per lb.	12s. per lb.	12s. per lb.	12s. per lb.	10s. per lb.	10s. per lb.	10s. per lb.	10s. per lb.	10s. per lb.	10s. per lb.
Grapes	- - -	- - -	- - -	- - -	36s. per lb.	30s. per lb.	15s. per lb.	8s. per lb.	5s. per lb.	5s. per lb.	5s. per lb.	- - -
Peaches	- - -	- - -	- - -	- - -	- - -	- - -	42s. per dozen	21s. per dozen	10s. per dozen	4s. per dozen	4s. per dozen	- - -
Figs	- - -	- - -	- - -	- - -	- - -	- - -	- - -	18s. per dozen	10s. per dozen	5s. per dozen	- - -	- - -
Cherries	- - -	- - -	- - -	30s. per lb.	20s. per lb.	8s. per lb.	6s. per lb.	2s. 6d. per lb.	2s. 6d. per lb.	- - -	- - -	- - -
Strawberries	- - -	- - -	- - -	- - -	3s. per dozen	1s. per dozen	4s. per pottle	2s. per pottle	- - -	- - -	- - -	- - -
Apples	40s. to 18s. pr. bus.	40s. to 18s. p. bus.	40s. to 48s p. bush.	- - -	- - -	- - -	- - -	18s. to 10s. p. bush.	4s. per bushel	4s. per bushel	30s. to 15s. p. bush.	30s. to 15s. p. bush.
Pears	50s. per half sieve	50s. per half sieve	50s. per half sieve	- - -	- - -	- - -	- - -	10s. to 5. p. ha. sieve	4s. per half sieve	20s. per half sieve	20s. per half sieve	20s. per half sieve
Plums	- - -	- - -	- - -	- - -	- - -	- - -	5s. per punnet	5s. per punnet	20s. per bushel	12s. per punnet	- - -	- - -
Gooseberries	- - -	- - -	- - -	- - -	- - -	10s. per half sieve	6s. per half sieve	Ripe 6s. p. ha. sieve	Ripe 6s. p. ha. sieve	- - -	- - -	- - -
Red currants	- - -	- - -	- - -	- - -	- - -	10s. per half sieve	10s. per half sieve	4s. per half sieve	2s. per half sieve	- - -	- - -	- - -
Black currants	- - -	- - -	- - -	- - -	- - -	10s. per half sieve	8s. per half sieve	5s. per half sieve	4s. per half sieve	- - -	- - -	- - -
Raspberries	- - -	- - -	- - -	- - -	- - -	3s. per pottle	2s. per pottle	1s. 6d. per pottle	6d. per pottle	4d. per pottle	- - -	- - -
Cranberries	2s. per quart	2s. per quart	2s. per quart	2s. per quart	2s. per quart	2s. per quart	2s. per quart	2s. per quart	2s. per quart	2s. per quart	4s. per quart	4s. per quart
Bilberries	- - -	- - -	- - -	- - -	- - -	- - -	2d. per pint	- - -	- - -	- - -	- - -	- - -
Sloes	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	6d. per quart	6d. per quart	6d. per quart
Elder-berries	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	8s. per bushel	10s. per bushel	12s. per bushel	- - -
Quinces	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	2s. 6d. per dozen	2s. 6d. per dozen	- - -
Medlars	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	1s. 6d. per dozen	1s. 6d. per dozen	1s. 6d. per dozen	1s. 6d. per dozen
Walnuts	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -
Services	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	5s. per dozen	2s 6d. per dozen	2s. 6d. per dozen	2s. 6d. per dozen
Filberts	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	2s. per lb.	1s. 6d. per lb.	1s. 6d. per lb.	1s. 6d. per lb.
Chestnuts	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	2s. 6d. per 100	2s. 6d, per 100	2s. 6d. per 100
Mulberries	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	2s. per gallon	1s. 6d. per gallon	1s. 6d. per gallon	- - -
Oranges	1s. 6d. to 4s. p. doz.	1s. 6d. to 4s. p, doz.	1s. 6d. to 4s. p. doz.	1s. 6d. to 4s. p. doz.	1s. 6d. to 4s. p. doz.	5s. per dozen	5s. per dozen	5s. per dozen	- - -	- - -	- - -	2s. per dozen
Lemons	2s. per dozen	2s. per dozen	2s. per dozen	2s. per dozen	3s. per dozen	3s. per dozen	3s. per dozen	3s. per dozen	3s. per dozen	3s. per dozen	3s. per dozen	3s. per dozen
Apricots	- - -	- - -	- - -	- - -	- - -	- - -	10s. per dozen	5s. per dozen	5s. per dozen	5s. per dozen	- - -	- - -
Nectarines	- - -	- - -	- - -	- - -	- - -	18s. per dozen	12s. per dozen	8s. per dozen	6s. per dozen	4s. per dozen	- - -	- - -
Pomegranate	12s. per dozen	- - -	- - -	- - -	- - -	- - -	- - -	- - -	3s. per dozen	3s. per dozen	3s. per dozen	3s. per dozen
Apples, baking	18s. per bushel	18s. per bushel	18s. per bushel	22s. per bushel	- - -	- - -	- - -	10s. per bushel	3s. per bushel	12s. per bushel	16s. per bushel	16s. per bushel
Pears, baking	2s. 6d. per dozen	2s. 6d. per dozen	2s. 6d. per dozen	- - -	- - -	- - -	- - -	- - -	- - -	- - -	1s. 6d. per dozen	1s. 6d. per dozen

2131. Besides this culinary market there is another called the *Seed Market*, held twice a week, on Mondays and Fridays, in a large roofed space in Mark-lane. Here the growers or holders of garden-seeds, and of such agricultural seeds, as are commonly sold by nurserymen, as clover, rye-grass, &c. attend and transact business by sample. The purchasers are the London retailers; or the wholesale dealers for their country customers; nothing is there sold by retail.

The produce of the *Nursery-Gardens* is sold on the spot; as is also that of the florist's gardens; the herb-growers sell their productions to the wholesale druggists and manufacturing chemists by sample.

Public Promenades. — The principal public promenades of the Metropolis are the verdant areas of the squares, especially Finsbury, Russel, Grosvenor, and Berkeley squares; and the public equestrian, and also walking promenades in this county, are the parks of St. James, the Hyde, and Mary-le-bonne.

Botanic Gardens. — The only public botanic garden is that of Chelsea, containing between three and four acres. The origin of the Chelsea garden is involved in obscurity; the first notice of it in the books of the Apothecaries' Society is in 1674, when it was proposed to wall it round; and two years afterwards, in 1676, they agreed to purchase the plants growing in Mrs. Gape's gardens at Westminster; which garden, it is thought, may have been the one mentioned in Evelyn's Diary for 1658, as "the medical garden at Westminster, well stored with plants, under Morgan, a skilful botanist." Piggott is the name of the first curator, noticed in 1676. Watts, mentioned both by Ray and Evelyn, was an apothecary by profession, but undertook the care of the garden in 1680, at 50*l. per annum.* Miller was appointed in 1722, at the time Sir Hans Sloane, when applied to for a renewal of the lease of the garden, granted it to the Society in perpetuity at a rental of 5*l. per annum*, and on condition that specimens of fifty new plants should annually be furnished to the Royal Society till the number amounted to two thousand. Miller resigned his situation as curator two years before his death in 1770, and was succeeded by Forsyth, who went to be royal gardener in Kensington in 1784, and was succeeded by Fairbairn, who died in the garden in 1814. His situation is now filled by Wm. Anderson, who has greatly enriched the garden, and contributed materially to restore its high character. It may be noticed as a warning to gardeners, and indeed to all of us, that the two first curators, Watts and Miller, are said to have relaxed from their activity and got careless; and that Fairbairn neglected the garden for a number of years together. No proper catalogue of this garden has ever been published; with the exception of one, of the medical plants, by Miller and Rand, in 1730, and another of the same kind in 1739.

Farmers' Gardens. — The principal of these are in the parishes of Chelsea, Hammersmith, and Fulham, to the west; and at Hoxton, Kingsland, Hackney, &c. to the east of the Metropolis. George Matyear of Fulham, Samuel Hutchins of Earl's Court, Kensington, Cock and Dancer of Chiswick, and Brown and Reid of Hoxton and Kingsland, have the most extensive ploughed gardens; the smallest exceeding a hundred acres. Southfield Farm, near Parson's Green, in Fulham, has been occupied jointly as a market-garden and a nursery for upwards of two centuries, and the whole of that time till the beginning of the present century, in the family of Rench. In this garden were produced the first pine strawberry, and the first auricula, by the father of the late Mr. Rench, who also instituted the first annual exhibition of flowers. He died at the age of ninety-nine years, having had thirty-three children. The late Mr. Rench, mentioned by P. Collinson, as famous for forest trees, introduced the moss-rose; planted the elm-trees now growing in the Bird-cage Walk, St. James's Park, from trees reared in his own nursery; married two wives, and had thirty-five children, and died in 1783, in the same room in which he was born, at the age of a hundred and one years. The grounds are now occupied as a market-garden by Mr. Fitch, who married one of the daughters.

Vegetable Gardens, and *Garden Orchards*, abound in the same parishes. The principal are those of Grange of Heston, and Gunter of Earl's Court, each of which contains between sixty and seventy acres, extensive forcing-houses, and pineries, and walls for fruit-trees. The open garden is regularly planted with standard fruit-trees, and is more devoted to the production of fruits than of culinary vegetables. The garden of Wilmot at Isleworth is of the same character, and nearly equally extensive; and next is that of Michel Kerns of the same place. The gardens of Brentford and Twickenham are famous for strawberries; in those of the last parish there are about four hundred acres covered with this fruit. Almost the whole of the parish of Fulham is occupied in fruit-trees and vegetables. The gardens of the Neat-houses in Chelsea have long been famous for celery and cauliflower; water-cresses are grown in irrigated trenches at Bayswater and in the parish of Isleworth.

Market Flower Gardens. — For forced flowers and shrubs, the principal garden is that of Smith of Dalston; for geraniums and green-house plants in general, Colville in the King's-Road; and for hardy flowers, D. Carter's of Fulham. Some of the nurserymen deal extensively in forced flowers, as Jenkins of Mary-le-bonne, Henderson of the Edgeware-Road, &c.

Florists' Gardens. — Of these the principal in Middlesex is that of Davy in the King's-Road; then Bailey at Clapton, and also of the King's-Road; Moore in the King's-Road, and some at Brentford and Hounslow.

2132. *Nurseries.* — The principal British nurseries are in this county; and as almost all the country nurseries are supplied with their more rare articles from them, we shall particularize the names of a few:

The Vineyard at Hammersmith, is unquestionably the first nursery in Britain, or rather the world. At the beginning of the last century it was a vineyard, and produced annually a considerable quantity of Burgundy wine. A thatched house was built in the grounds; the upper part occupied as a dwelling-house, and for selling the wine; and underneath were the wine-cellars. The ground was taken by Messrs. Lee and Kennedy, the fathers of the present, or late occupiers of that name, and continued by their sons, who dissolved partnership in 1818, and the concern is now the sole property of James Lee.

This nursery owes its celebrity, in a great measure, to the late Mr. Lee's knowledge in botany, and to his publishing the Introduction to that science at a time when its principles were not generally diffused. Mr. Lee was patronized by a great many of the nobility and gentry, for his general knowledge in natural history, and for his sound sense and strong understanding. The nursery is now carried on by his son to greater extent in every department than any other nursery in Europe. Mr. Lee has four sons, whom he intends to bring up to the business in four separate departments: the *seed business*, the *counting-house*, *exotics in houses*, and *fruit-trees*, *forest-trees*, and *hardy plants*.

Besides an extensive correspondence, and a vigilant attention to procure every new plant as soon as introduced by others, a great many plants have been introduced to the country directly by this establishment. Among the collectors they sent out for this purpose, may be mentioned a person collecting oaks and other plants in America; another, for eight years, at the Cape of Good Hope, in partnership with the Empress Josephine, collecting ericas, bulbs, and other plants; and a man in South America.

The whole concern, from its first establishment to the present moment, has been conducted with singular spirit and skill; no expense spared to procure new plants from abroad, and preserve and propagate them when received. The green-houses are extensive, and a house two hundred feet long has lately been erected for fruiting the different sorts of grapes, and another for figs. The proprietor has grounds for the commoner descriptions of stock in different parts of the country: as at Bedfont for stocks for fruit-trees, and for cherries; at Hounslow and Bagshot for stocks, and also for seedling fruit-trees, and other commoner articles, &c.

The Fulham Nursery was established by Christopher Gray, about the beginning of the last century. Catesby, Collinson, Miller, Dr. Garden, and other eminent botanists, and travellers contributed many rare plants, and great part of Bishop Compton's collection was purchased by them from the Bishop's successor. Some fine old exotics are still existing in this nursery, as the Quercus suber, Celtis occidentalis, Ailanthus glandulosa, Diospyrus virginiana, &c. The first magnolia grandiflora was planted here; the original tree, the parent of most of the older trees of this kind in the country, died some years ago; the dead trunk, which is still preserved, measured four feet ten inches in circumference; its branches extended twenty feet; it was as many feet high, and its fragrance perfumed the whole neighbourhood. This nursery passed successively from Gray to Burchall, and from him to Messrs. Whitley, Brames, and Milne, the present occupiers.

The Brompton Park Nursery — was founded by Messrs. Cooke, Lucre, London, and Field, in 1681. In 1694, all the partners having died or sold out but London, he took in Henry Wise, who had been an apprentice to Rose, the royal gardener, as London had also been. At that time the grounds exceeded 100 acres in extent. This nursery passed successively from London and Wise to Swinhoe, Smith, and Co. — in 1756 to Jeffries and Co. — in 1788 to Gray, Wear, and Co. — in 1810 to Gray and Sons, in whose occupation it is at present. The grounds are now reduced to thirty acres, and the establishment has unavoidably fallen off in reputation. In the time of London and Wise it was spoken of in terms of the highest approbation by Evelyn. In his preface to the translation of Quintiney's Complete Gardener (published 1701) he says, "the proprietors, Mr. George London, chief gardener to their Majesties, and his associate, Mr. Henry Wise, are recommended for their assiduity and industry; they have not made gain the only mark of their pains, but with extraordinary and rare industry, endeavoured to improve themselves in the mysteries of their profession; from the great advantages and now long experience they have had, in being employed in most of the celebrated gardens and plantations which this nation abounds in, besides what they have learned abroad, where horticulture is in high reputation." He adds "the grounds and gardens of noblemen and persons of quality, which they have planted *ab origine*, and which are still under their care and attention, justify what I have said in their behalf."

Bowack, who wrote an account of the parish of Kensington in 1705, says, that some affirm that if the stock of these nurseries were valued at one penny per plant the amount would exceed 40,000*l*.

The Kensington Nursery — was established by Robert Furber in the beginning of the last century, and was of note for fruit-trees in Miller's time; it has passed successively from this family to Grimwoods, and to Messrs. Malcolms, the present spirited and judicious possessors.

The Brentford Nursery. — Messrs. Ronalds and Son, has been established upwards of a century. It is chiefly devoted to the culture of fruit-trees.

The Brompton Agricultural Nursery, — Messrs. Gibbs and Co. was originally part of the Brompton Park nursery; but was established chiefly for a display of the grasses and plants used in agriculture, during the present century.

The Hackney Botanic Nursery — was established by Conrad Loddiges, a German gardener, about the middle of the last century. It is particularly devoted to the propagation of rare plants, and contains the best general collection of green-house and hot-house exotics of any commercial garden. In palms, tree ferns, and scitamineæ, they particularly excel, and of the first tribe, possess upwards of eighty species. For the better display of these plants they have lately erected the largest hot-house in the world; it being 80 feet long, 60 feet wide, and 40 feet high. It is heated by steam, as are all the others, extending to upwards of 1000 feet, forming three uninterrupted sides of a parallelogram. In the area are the pits and frames. Two houses are devoted to the camellia; one is roofed with copper sashes, by Timmins of Birmingham; the other is a curvilinear roofed house, formed of our bar (*fig.* 576.); it is 120 feet long, 23 feet wide, and 18 feet high.

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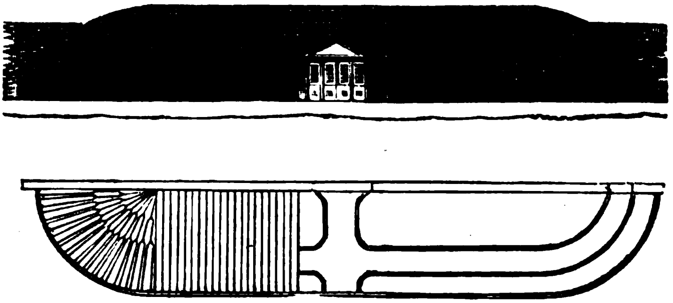

The Kingsland Nursery — was in part in the occupation of Fairchild, and also of Cowel, in the beginning of the last century. The present possessors are Messrs. Bassingtons.

The Ball's-pond Nursery — Messrs. Barr, Brooks, and Co. has been established upwards of half a century, and is carried on with much spirit.

The Mile-End Nursery — was established by James Gordon, gardener to Dr. Sherrard, at Eltham, and passed successively to Gordon, Dermer, Thompson, and Co.; Gordon, Forsyth, and Co.; and Thompson and Co. by whom it is at present kept up in a very respectable style.

The Mary-le-bonne Nursery. — Thomas Jenkins, has been established within the present century; it is of considerable extent; contains extensive hot-houses for forcing flowers, for green-house plants, and pits for pine-apples. It also contains a subscription botanic garden.

Other Nurseries. — Of these there are, perhaps, a hundred in this county, that might be deservedly mentioned. That of Fraser and Co. in the King's-road, noted for American herbaceous plants; of Harrison and Co. Old Brompton, for its antiquity; Schaler and Co. King's-road, as famous for roses; Joseph Knight for a general collection of exotics and hardy flowers, and for excellent management; that of Kirk and Son for its antiquity, the grounds being in part surrounded by the walls of Cromwell's Garden; Hendersons, in the Edgeware-road, for pine-apples; Forsyth, (one of the principal London seedsmen) at Mile-end; Ross, at Kingsland, &c.

2133. *Private Gardens* come next in order.

Street Gardens, (*fig.* 577.) — are necessarily numerous in the outlets of the metropolis; many of them in the New-road, Hammersmith-road, and in the parishes of Chelsea, Fulham, and Kensington, are very neatly kept.

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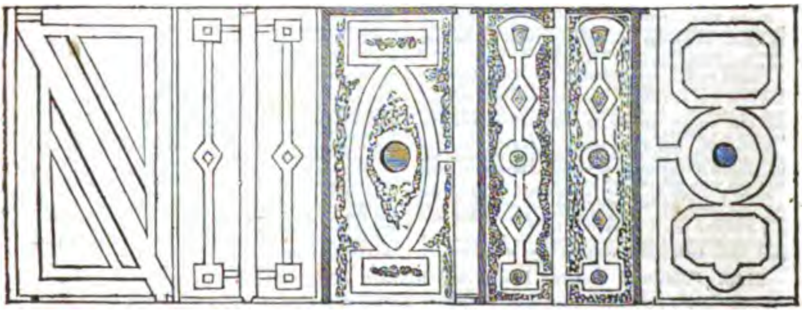


The Cottage Gardens of laborers, — near town, are not remarkable for management, but in the western and eastern extremities of the county they are better.

The Cottage Gardens of artificers, — are often very neatly kept; particularly those of the Spitalfields weavers, and other operatives who have a taste for flowers.

Farmers' Gardens; — as many of the farmers near the metropolis are retired or speculative London tradesmen, they have often very neat gardens. Those to the west of London may be referred to as examples.

Suburban and Citizens' Villas — are in considerable number, of various degrees of extent; but generally neatly kept.

2134. *Villas* are numerous in every part of the country; a few may be enumerated:

Arnos Vale, — near Southgate; J. Walker, Esq. A noble mansion, chiefly by Sir R. Taylor: the grounds comprise woods watered by the New River; the flower-garden is rich, and there is an extensive range of hot-houses containing an abundant collection of exotics.

Culland's Grove, — near Southgate; Sir W. Curtis. A substantial villa, and good kitchen-gardens, with hot-houses, on which no expense is spared.

Canons, — near Edgeware: Sir Thomas Plumer. A dull flat of rich pasture, intersected by rows of elms, and surrounded by a brick wall.

This place is remarkable as having been the site of the improvements of the celebrated Duke of Chandos, who rose from the rank of a private gentleman. James Brydges, Esq. married into the family of Lake, then proprietors of Canons. Having made his fortune as a paymaster in the German war, and acquired his title, he built the magnificent mansion of Canons about 1712. It stood nearly in the centre of the park, at the end of a spacious avenue, being placed diagonally so as to shew two sides of the building, which, at a distance, gave the appearance of a front of prodigious extent. Vertue describes it as "a noble square pile, all of stone; the four sides almost alike, with statues on the front; within was a small square of brick, not handsome, the out-offices of brick and stone, very convenient and well disposed," &c. The architect was James, of Greenwich, and the whole expense of the building and furniture is said to have amounted to 200,000*l.* Dr. Alexander Blackwell, author of a treatise on agriculture, who afterwards went to Sweden, where he died, and whose widow published figures of plants, was employed to superintend the works out of doors. Lysons thinks it is probable he laid out the pleasure-grounds; but it is not unlikely that the architect, James, who transla'ed *Le Blond's* Gardening, disposed of the grounds as well as of the house. The Duke's manner of living corresponded with the magnificence of his mansion, and fell little short of the state of a sovereign prince. Canons and the Duke were satirised by Pope, under the character of Timon and his villa, in 1731. Pope at first denied it, and afterwards wrote an exculpatory letter to the Duke, who answered it with great magnanimity, as by a man who accepted his excuse without believing his professions. There is a print of Hogarth's, in which he represents Pope whitewashing the Earl of Burlington's house, and bespattering the Duke of Chandos's carriage as it passes by.

When the Duke died, the mansion, being thought to require an establishment too expensive for the income of his successor, after fruitless attempts to dispose of it entire, was pulled down, and the materials sold by auction in 1747. The grand staircase, of which each step was a single block of marble above twenty-five feet in length, is in Lord Chesterfield's house in May Fair; the equestrian statue of Geo. I., in the centre of *Leicester-square*; the park was purchased by an upholsterer (Hallet), who built the house now existing, and successively occupied by himself, by O'Kelly, and the present proprietor. Two poems were written on Canons; one, by S. Humphrys, in 1728, the other by Gildon.

Cranford Lodge, — near Norwood; Countess of Berkeley. Remarkable for its pheasants, which, in the late earl's time, were everywhere as abundant, and seeking their food on the green sward with all the confidence and serenity of domestic fowls.

Delaford Park, — near Uxbridge; C. Clowes, Esq. A handsome mansion; and grounds finely undulated, well wooded, and watered by the river Colne.

Durham Park, — near South Mims; J. Trotter, Esq. A good house, well wooded grounds, and a productive kitchen-garden.

Ealing Grove, — near Ealing; C. Wyatt, Esq. A substantial and commodious house, and forty acres of ground arranged with much judgment.

Earl's Court Villa — at Earl's Court; John Baynes, Esq. Was the villa of the late celebrated surgeon, John Hunter. Here he had a curious menagerie.

Flambards, — near Harrow; Lord Northwick. The house being in the village, from its elevation commands astonishingly fine views; the grounds are disposed in good taste.

Fordhook, — near Ealing; Charles Duval, Esq. A good house, once the residence of Fielding; the grounds economically and tastefully disposed.

Forty Hall, — near Enfield; J. Myers, Esq. The house originally by Jones, but altered; the grounds extensive, undulating, abounding in lofty elm and ash trees, and adorned with some fine pieces of water.

The Grove, — near Stanmore; C. Poole, Esq. The grounds are remarkable for containing an island and tomb, in imitation of the *Isle de Peupliers* at Ermenonville, and of Rousseau's tomb, formerly there; but now in the pantheon of Paris.

× *Gunnersbury*, — near Ealing; A. Copeland, Esq. A desirable villa, with seventy acres of ground, adorned by two fine sheets of water, and numerous cedars, supposed to have been planted by Kent, who laid out the grounds shortly after 1740. There are extensive forcing-houses and plant-stoves.

Hendon Place, — near Hendon; J. Carbonell, Esq. A handsome, stately mansion, and grounds rendered attractive by various picturesque undulations, watered by the river Brent. Among the trees are some fine cedars, and one of remarkably large growth.

Kempton Park, — near Sudbury; Mrs. Fish. Great improvements were made here a few years ago by the late Mr. Fish, both on building, excavating for pieces of water, and in planting. At his death, however, the hot-houses and other articles were sold by public auction, and what remains is neglected.

Marble Hill, — near Twickenham; C. A. Fulk, Esq. The grounds were laid out by Pope, at the time the house was the property of the Countess of Suffolk. They contain much venerable wood, and a dilapidated grotto.

Marble Hill Cottage, — near Twickenham; T. Brent, Esq An embellished dwelling; fitted, up with great delicacy of taste by the late Lady Diana Beauclerk, and standing on a spot of peculiar beauty, close to the Thames.

Rosslyn House, — Hampstead; General Sir M. Disney. A good house, commanding extensive views of London and Surry over the Regent's Park: the extent of the grounds considerable for the situation.

South Lodge, — near Enfield Chace; N. Gandry, Esq. Celebrated as having been the residence of the great Earl of Chatham, who expended a considerable sum in laying out the grounds; which, according to G. Mason, he did much in the manner recommended by U. Price. The place is now much neglected. The Temple of Pan, which stands in the pleasure-grounds, is described by Whateley in "Observations." It was afterwards the residence of Mr. Sharp, the friend of Collinson in 1764, who had a good collection, and whose gardener, Watts, (who worked under Miller, and is now an old man and nursery gardener at Acton,) propagated the mistletoe on most sorts of trees, resinous as well as non-resinous.

× *Southgate Grove*, — near Southgate; W. Gray, Esq. A beautiful Ionic building by Nash, to which an elegant conservatory is attached. The lawn declines from the house, and then rises in an opposite bank, finely clothed with oaks: the walks were laid out by H. Repton. On the whole this is one of the most romantic and beautiful villas in Middlesex: it bears a striking resemblance to that of Blaize Castle near Bristol.

Spring Grove, — near Hounslow; Lady Banks. Chiefly remarkable as having been the residence of the late eminent President of the Royal Society, and patron of all natural science. There is an excellent kitchen garden; and pines and mushrooms grown to great perfection by J. Oldacre.

† *Strawberry Hill*, — near Twickenham; Countess of Waldegrave. The house, a composition of the late Lord Orford's, in the Gothic style, from time to time, and great part being wood covered with plaister, it is going fast to decay: the grounds are of very limited extent, and much less interesting than has generally been imagined; without the Thames they would be dull.

Twickenham Villas. — These are numerous; that of Baroness Howe, is in the garden of Pope, and not far from the site of his house. Pope purchased his villa, and removed there in the year 1715, and continued improving it till his death in 1744. It was then sold to Sir W. Stanhope, who added wings, and enlarged the gardens. It then passed to Wellbore Ellis, Esq. afterwards Lord Mendip, who married his daughter; next to Viscount Clifden, who sold it to Sir John Briscoe, Bart., and after his death it was purchased by Baroness Howe, in 1807, who levelled the villa to the ground, and built a new house about 100 yards from its site. The weeping-willow, planted by Pope, perished in 1801.

The villa of George Pocock, Esq. was the residence of Mr. Secretary Johnstone from 1720. Mackey, in 1724, says he had the best collection of fruit of any gentleman in England; that he had slopes for his vines, from which he made some hogsheads of wine a year, and that Dr. Bradley reckoned him among the first gardeners in the kingdom.

Twickenham Park was once the property of Lord Chancellor Bacon, who esteemed it "a fit residence for persons to study in." About 1740, this seat was the property of M. Vernon, a merchant of Aleppo, who brought the weeping-willow from the Euphrates, and planted it here. Peter Collinson says he saw it growing there in 1743, and that from that tree originated all the weeping-willows in Britain.— *Lambert* in *Linn. Trans.* Lysons observes, that Twickenham has so long been the favourite retreat of the scholar, the poet, and the statesman, that almost every house has its tale to be told.

Twyford House, — near Wilsden; —— Willan, Esq. A commodious Gothic residence, the effect of which is much admired, by Atkinson; the attached lands agreeably ornamented with wood; a small portion dedicated exclusively to pleasure-grounds, and the rest managed as a hay farm.

Whitton Place, — near Hounslow; lately the residence of Sir William Chambers, was built by Archibald Duke of Argyle, celebrated in the early part of the last century for the introduction of exotic trees. Many of the plants and trees were moved to Kew in 1762; but a number of the cedars sown here in 1725, still remain, and constitute the finest assemblage of that tree in the country. The house, after the death of the Duke, became, by purchase, the residence of Sir William Chambers the architect. The grounds were divided, and an elegant villa built on a part of them by the father of the present proprietor, George Gosling, Esq. A lofty tower; the old green-house now formed into a dwelling-house; and the fine pieces of water and venerable pines, firs, and cedars still remain.

Wembly Manor House, — near Kilburn; J. Gray, Esq. A neat house, most agreeably situated in a grass farm, ornamented from the designs of H. Repton.

Wyke-house, — near Brentford; E. Ellis, Esq. Remarkable for its good and well-managed kitchen garden.

2135. *Villas with demesne Lands and Mansion Residences* are not very numerous.

Bentley Priory, — near Stanmore; Marquis of Abercorn. An irregular brick edifice of no architectural pretensions, but occupying an elevated site, and commanding extensive prospects.

Boston-House, — near Brentford; Colonel Clitherow. The grounds umbrageous and ornamental, and noted for large cedars.

× *Caenwood*, — Hampstead; Earl of Mansfield. An elegant building, by Adams and George Saunders, and some additions by Atkinson; with fifty acres of pleasure-grounds, beautifully disposed, containing some fine old wood, and undergrowths of rhododendrons and other American plants; there is a fine terrace walk, flower garden, and excellent kitchen garden, home farm, and dairy.

× *Chiswick-House*, — near Chiswick; Duke of Devonshire. An elegant Corinthian edifice, by the Earl of Burlington and Kent, with two wings by Wyatt. The gardens were originally laid out by Lord Burlington, in the Italian style, with a redundancy of sculptural embellishments, but have since been modernised. They now contain a large flower-garden, a range of hot-houses 300 feet in length, and a group of aviaries for hardy birds: there is also a large kitchen garden.

Stanmore-House, — near Stanmore; G. H. Drummond, Esq. The house and grounds originally by Holland; the grounds, since improved by Repton, contain some fine views.

× *Sion-Hill*, — near Brentford; Duke of Marlborough. The grounds disposed with great taste, but, with the house, of limited extent.

Trent-Place, — near Enfield; J. Cumming, Esq. A spacious brick structure on a fine swell in the midst of a park of 500 acres, more varied by irregularities, and of a bolder character than is usual in Middlesex.

Wrotham-Place, — near South Mims; G. Byng, Esq. A spacious architectural pile, by Ware, on a commanding eminence: the park is rather deficient in wood.

2136. The *first-rate Residences* of this county are chiefly in London, but there are a few in the country.

× *Holland-House*, — near Kensington; Lord Holland. A magnificent Elizabethean mansion, with a demesne of 300 acres, of which 63 are in pleasure-ground, and remarkable for a flower-garden, beautifully laid out and managed. Here the ruins of a stable become a fine object; for the stalls, having been arched with masonry, remain and resemble a ruined aqueduct. In this garden the dahlia was first successfully cultivated in England.

× *Sion-House.* — near Brentford; Duke of Northumberland. Once the property of the Duke of Somerset, whose physician, Dr. Turner, author of "The Herbal," mentions a botanic garden formed here. The house, a magnificent quadrangular structure of stone, improved by Adams, and more recently by Hardwick. The grounds are flat; but abound in fine trees, and the pleasure-grounds with many venerable cedars, and other exotics. They were laid out by Brown, and are under the care of M. Hoy, F.L.S.

2137. *Royal Gardens.* Of these there are four, Carlton Gardens, Hampton Court, Kensington, and Pimlico.

Carlton Palace Gardens — were originally laid out by Kent, for Lord Carlton; and afterwards by Brown and Holland, for the present king when prince of Wales. They are secluded, but not much enriched with flowers and shrubs, or in high keeping. Attached to the palace is a conservatory; a copy of the skeleton of Henry VII.'s chapel in Westminster Abbey; but though handsome as a piece of architecture, it is of little use as a plant habitation, being in fact intended more as a lounge and resource for an extra room on great occasions.

× *Hampton Court,* — the most capacious, and perhaps the most magnificent, of all the royal palaces: principally built by Cardinal Wolsey; but enlarged by Henry VIII., and in part rebuilt by William and Mary. It consisted originally of five, but now only of three quadrangles, and several minor courts; the style impure Grecian. Its situation is upon the north bank of the Thames: it is embraced by forty-four acres laid out in the Dutch taste in the time of William and Mary, by London and Wise. The ground belonging to it as park, is of considerable extent, and is distinguished by the different divisions of Bushy Old Park, New Park, Middle or Hare Warren, and Hampton Court. The gardens contain a labyrinth, one of the most perfect, as to preservation, in England: the privy garden is ornamented with terrace-walks, and near it is a grapery, seventy feet by fourteen, occupied by a Hamburgh vine planted in 1769, which has been known to produce in one year 2200lbs. of grapes. Its roots are said to have found their way to a drain leading from the offices to the river, from which it is supposed to derive moisture and nourishment. There is a kitchen-garden of twelve acres, with nine pits, and other hot-houses heated by steam, and managed by W. Padley, the royal gardener.

× *Kensington.* — The palace a large brick building, badly placed, in relation to the surrounding gardens, being lower than the greater part of their surface. The gardens are three miles and a half in circumference, and contain grass and gravel, open and shaded walks, with a circular basin and river. The finest point of view is on entering from the Uxbridge road. The kitchen-garden was formerly famous as exhibiting the effects of the late W. Forsyth's mode of managing fruit-trees; at present the forcing department is remarkable for its hot-houses, in which the pine is better cultivated than in any of the royal gardens. The original extent of the gardens was only thirty-six acres. Queen Anne added thirty acres, which were laid out by her gardener, Wise. Queen Caroline added nearly 300 acres from Hyde Park, which were laid out by Bridgeman. Being royal gardens, several poems have been published to celebrate them; one by Tickell, in his works; another in 1722; and a third in the pastoral kalendar in 1763.

Pimlico, or Buckingham-House Gardens — were enlarged and laid out soon after the middle of the last century, by Robinson, brother to Ramsay Robertson, the king's farmer. They occupy a triangular spot of a few acres, and have scarcely any other beauties to recommend them than those of seclusion and verdure.

2138. SURREY. A surface of 519,040 acres, generally beautifully varied in surface; the soil in a great part gravelly or sandy; poor in many places; but from the salubrity of the air this county is particularly adapted for villas and other residences. That part of the metropolis which is within the county, contains a garden-market for the commoner fruits and vegetables, but it is not extensive. There are several respectable seed-shops, and the greatest seed-factors reside here; in the suburbs and suburban villages, are some good market-gardens, the principal herb-gardens in the kingdom, and some seed-gardens: juniper-berries and cranberries used to be gathered on the commons on Box Hill and Leith Hill, and sold in the metropolis. There are a few nurseries: the county abounds in villas, and contains some mansion residences. There are no public gardens in the county, but the promenade of Greenwich Park, in Kent, adjoins the metropolis. In Stevenson's survey of the county, it is stated, that 3500 acres are employed as farmers' market-gardens. The greatest gardening author this county has produced is Evelyn, of Wootton House, and the most celebrated gardens those of the Carews, at Beddington.

Farmers' Gardens. — Of these there are a considerable number in the low part of the county, adjoining the Thames. Turnips are grown in abundance and in great perfection, for the cow-feeders.

Market Gardens. — There are some highly cultivated and of very considerable extent on the banks of the Thames, especially at Barnes, Mortlake, and Camberwell. The two former places are famous for asparagus, and Battersea for cabbages. There are generally about eighty acres under asparagus in the parish of Mortlake: the greatest grower is Biggs, who has had forty acres under this crop at one time. There are some good gardens near Chertsey, and here the Chertsey or great Surrey carrot is better grown than any where else, and the London seedsmen are supplied from the growers with its seeds. The hardy fruits are less generally grown for the market in Surrey than in Middlesex and Kent; but there is one celebrated grower of exotic and forced fruits, Isaac Andrews at Lambeth, famous for his pine apples, and being annually among the first who send early grapes and cherries to market. His hot-houses, like those of Gunter and Grange in Middlesex, are all heated by steam.

Herb and Physic Gardens. — These are chiefly in the parish of Mitcham, where the soil is poor and gravelly. The oldest establishment of this description is that of Potter and Moore, who formerly grew most of the articles in the vegetable materia medica then in vogue. They now grow chiefly roses, lavender, chamomile, the mints, opium poppy (*Papaver somniferum*), balm, blessed-thistle, borage, clary, hyssop, sage, scurvy-grass, angelica, thyme, fennel, pot marygold, &c. Messrs. Dickson and Anderson, of Covent Garden, seedsmen and herbalists, have a garden at Croydon for a general collection of such herbs, as are only in demand in small quantities.

Market Flower Gardens. — There are several of them near the metropolis, but none eminently deserving description.

Florists' Gardens. — The principal of these is that of Messrs. Milliken and Curtis, at Walworth, who have the first collection of hardy bulbs grown in this country. It was founded by the late — Maddock, author of the "Florist's Directory," about the middle of the last century. There are also one or two other very respectable gardens of this description.

Nursery Gardens. — Before London was so much extended on this side, there were some old and extensive nurseries, such as those of the Drivers, Malcolms, North, &c.; but the grounds which occupied these gardens, are now generally built on, and the existing nurseries are of less note though highly respectable. Of these may be mentioned that of Ronaldson at Tooting, noted for the best collection of ericæ in the vicinity of the metropolis; Chandler at Vauxhall, noted for camelias; Phillips at Lambeth, for fruit trees; and Buchanan's at Camberwell, for a general collection.

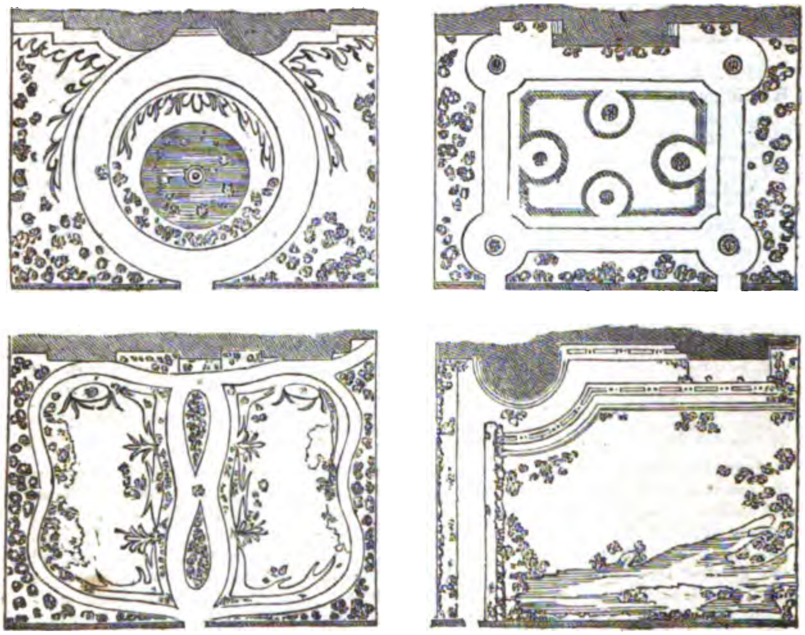
Near Bagshot are a number of nurseries, devoted chiefly to the growth of stocks for fruit-trees, with which they supply the trade in London, and elsewhere. Among these may be mentioned Donald at Woking, Cobbett at Horsehill, Hammond, and others, at Ripley and Trimley; Lee, of the Vineyard, has also extensive nurseries in this quarter, for raising the commoner articles.

Botanic Gardens. — That of Tradescant at Lambeth, and a medical garden by Morgan, mentioned by Evelyn, the lease of which was bought by the Apothecaries' Company in 1676, may be noticed as belonging to the garden antiquities of the county. Curtis, the botanist, had formerly a subscription botanical garden at Lambeth Marsh; which was afterwards removed to Queen's Elm, Brompton. Benjamin Robertson formed a valuable botanic garden, at a great expence, at Stockwell; he died in 1800, and bequeathed the whole of his estates for the purpose of establishing it as a public botanic garden; but his will was set aside.

2139. *Private Gardens*, as already observed, are very numerous, and generally well managed, compared with those of most other counties. Cottage gardens are neat, and often ornamental, and the farmer's gardens are generally well attended to, this class of cultivators being here, as round most large towns, in great part retired tradesmen.

Suburban Villas — (*fig.* 578) are certainly more numerous, and better laid out than any where else. They border the different great roads for some miles from town, and render them delightful to the passing traveller.

578



2140. *Villas.* We have selected a few; but the number that merit attention is more than double those here named.

Addington Place, — near Croydon; Archbishop of Canterbury. A good house in the centre of a park, much varied and well planted: the house lately enlarged and improved.

Aldbury Place, — near Blackheath; S. Thornton, Esq. An elegant Ionic mansion, greatly altered and improved by the present proprietor. The park, a beautiful piece of ground, of 250 acres, finely wooded, especially with old Spanish chestnuts. There are some small pieces of water in the park, and a basin and fountain in the garden. This place was noted in Evelyn's time (107.) for the subterraneous passage of 160 yards in length, made nearly through a hill, but a rock at the south end prevented the design from being completed.

Botley, — near Chertsey; Sir J. Mawbey. An elegant stone mansion, in a park well stocked with timber, and adorned with a fine piece of artificial water, with a bath at one end of it.

Burwood Park, — near Walton; Sir J. Frederick. An elegant house, in a park of 300 acres, valued here because not intersected by a single footpath.

Bysshe Court, — near Godstone; J. M. Ewart, Esq. Worthy of notice on account of the kitchen garden, which is surrounded by a moat, the area enclosed being that on which the former mansion stood.

× *Deepdene*, — near Dorking; T. Hope, Esq. A man of great taste in all the fine arts, and eminently so in architecture and gardening. His essay on gardening, and work on household furniture, are highly esteemed. This Italian villa was built by the Duke of Norfolk, but improved and decorated with sculptures and a Tuscan tower, by the present proprietor. The grounds are not extensive, but are highly romantic, and intersected with walks in various directions, which, with admirable liberality, are at all times open to the public.

Egham Park, — near Egham; —— Parry, Esq. A neat house, in a well-wooded park of sixty acres, lying on the south-west side of Cooper's-Hill; a conservatory and colonnade added to the house, and the kitchen-garden much improved by the present proprietor.

Ember Court, — near Thames Ditton; Colonel Taylor. A stuccoed house, and a park of late years greatly enlarged and improved.

Grove-hill, — near Camberwell; the late J. C. Lettsom, M.D. A plain mansion; the gardens laid out with great taste and beauty, and rich in exotics. There are also various ornamental buildings, and the whole is in the highest state of preservation!

Kingswood Lodge, — near Egham; —— Flounder, Esq. A substantial stuccoed house; the grounds modernized by us in 1805, for Gideon Bickerdyke, Esq. the proprietor at that time. They are chiefly remarkable for their commanding prospects, and as forming a part of Cooper's Hill, celebrated by Denham.

Monk's Grove, — near Chertsey; Lord Montford. Remarkable only for its kitchen-garden, sunk in the side of St. Anne's Hill, at a great expence.

Morden Park, — near Morden; G. Ridge, Esq. A handsome quadrangular house, on a rising ground, agreeably diversified with extensive plantations of shrubs and flowers, and embellished by two sheets of water.

× *Norbury Park*, — near Mickleham; W. Locke, Esq. A simple but grand mansion, in an elevated commanding situation, "well fitted to reign over the domain in which it is placed." The park is extensive, and the wood in judicious masses branching away from the house in opposite directions. It contains many walnut-trees, the nuts of which in some years are said to fetch 600*l.*, and in other seasons scarcely a bushel is produced.

× *Pain's Hill*, — near Cobham; Lord Carhampton. One of the most beautiful and meritorious places in England. The extent is 213 acres, great part taken from a barren heath; but the surface being naturally varied, and the river Mole bordering the estate, laid a foundation for every improvement. By a simple contrivance the water was raised so as to supply a large and beautifully varied lake, and the buildings and woods were judiciously adapted to the grounds. A vineyard was planted on the south-side of a gravelly hill, from which wines were made for several years. The woods were planted so as of themselves to produce variety, by adopting the manner of grouping the natural orders; thus, in one part the pine and fir tribe prevailed, in another aquatics, and so on. This place was celebrated by Whateley, Walpole, and all writers, and much admired by the public, to whom it was open, till it fell into the possession of the present proprietor.

Petersham Lodge, — near Kew; Sir W. Manners. The house a design of the Earl of Burlington; the grounds spacious and beautiful, and adjoining Richmond Park.

Polesdon, — near Leatherhead; ——— ———. The grounds remarkable for a fine terrace walk 900 feet in length.

The Priory, — near Ryegate; Lord Somers. A modern house, with 76 acres of pleasure grounds, very well laid out.

Puttenham Priory, — near Godalming; Admiral Cormick. A neat Corinthian house in a judiciously arranged area of fifty-four acres.

× *Richmond Hill*, — Richmond. Among the many fine villas here, we may notice that of the Marquis of Queensbury, as affording an example of grounds on both sides of a public road judiciously connected by a subterraneous communication.

Roehampton Grove, — Roehampton; W. Gosling, Esq. An elegant modern structure, by Wyatt, with a highly polished lawn and shrubberies, and a fine piece of water, supplied by pipes from a conduit on Putney Common. There are above a dozen other structures equally deserving attention at Roehampton.

That of Lord Viscount Fitzwilliam was the house of Sir Matthew Decker, maternal grandfather of his Lordship, a wealthy Dutch merchant, who first brought pine apples to perfection at this place. Mackay, in his tour through England, about the year 1724, says, that there was in the garden the longest, the largest, and the highest hedge of holly that he ever saw. In the house, was the picture of a pine-apple gathered there in 1720, on account of a visit of Geo. I. for whose reception Sir Matthew built a room on purpose. He died in 1749. The hedge no longer exists. Lord Fitzwilliam died ——, and the picture is now in the Fitzwilliam museum at Cambridge.

Rooke's Nest, — near Ryegate; H. Turner, Esq. An old mansion, recently enlarged and beautified, standing in a delightful park, with fine old woods; a large lake, and good kitchen-gardens and hot-houses.

The Rookery, — near Dorking; —— Fuller, Esq. Purchased in 1759, by Daniel Malthus, Esq. author of the translation of Girardin *Sur les Paysages*, &c. from Abraham Tucker, Esq. of Beechworth Castle, the celebrated author of "The Light of Nature pursued." Mr. Malthus took advantage of its beauties of hill, dale, wood, and water, converted it into an elegant seat, and sold it in 1768.

Sherwood Lodge, — near Battersea; J. Wolfe, Esq. The house has received an elegant addition in the Gothic style; the grounds of limited extent, but in high keeping.

Shrub Hill, — near Dorking; Lord Leslie. A commodious and pleasant villa.

Streatham Park, — near Streatham; A. Atkins, Esq. The grounds contain 100 acres, surrounded by a shrubbery and gravel walk, forming a circuit of two miles; the kitchen-gardens remarkably extensive, and inclosed by a wall fourteen feet high.

St. Ann's Hill, — near Chertsey; Mrs. Fox. The gardens and pleasure-grounds of moderate extent, but laid out with much taste by the late eminent statesman, whose widow now resides here.

Tilburster Hill, — near Godstone; Alexander Mac Leay, Esq. F.R.S. L.S. &c. The house on the south side of a green hill finely bosomed with trees, and looking across a rich vale, to finely wooded hills beyond. The gardens and pleasure-grounds small, but rich in American plants.

West Beechworth, — near Dorking; H. Peters, Esq. An old mansion, the grounds greatly enlarged and improved by the present owner; the old park remarkable for its noble timber; especially chestnuts, elms, and limes.

Woburn Farm, — near Chertsey; Sir J. St. Aubin. A brick house; the grounds flat, but agreeably varied by a piece of water; but chiefly remarkable from having been first planned and laid out by the late P. Southcote, Esq., the inventor of the *Ferme Ornée*. To such a character they have now scarcely any pretensions.

2141. The *Mansions* with *Demesnes*, in *Surrey*, are few compared with the number of villas.

Ashted Park, — near Ryegate; Hon. F. G. Howard. An elegant mansion, with magnificent stables, in a park of 140 acres, inclosed with a brick wall.

Beddington, — near Croydon; W. Gee, Esq. Celebrated in the sixteenth century for its gardens, and for the first orange trees grown in England (107.) The attention paid by Sir Francis Carew to other plants as well as orange trees, is proved by his shewing to Queen Elizabeth, who used frequently to visit him, a cherry-tree with ripe fruit, kept back a month beyond the usual time. Over the whole tree he strained a canvas, which was occasionally wetted; by this means the cherries grew large, and continued pale; when assured of the Queen's coming he removed the canvas, and a few sunny days brought them to their color. Platt's *Garden of Eden*, 165. The present mansion was erected about 1709; the park contains some fine old elms, is not varied nor very extensive.

J. Gibson, in an account of the gardens near London, written in 1691, says the orangery at Beddington was above 200 feet in length; that most of the trees were thirteen feet high, and that the gardener had the year before gathered at least 10,000 oranges. The heir of the Carew family was then in his minority, and the estate was let to the Duke of Norfolk. At present Richard Carew, Esq. is in possession of the estate, and the manor-house is in the occupation of William Gee, Esq. his younger brother.

× *Claremont*, — near Esher; Prince Leopold of Saxe Coburg. The park was chiefly planted by Kent, for Pelham Earl of Clare, and afterwards Duke of Newcastle, who built the prospect tower and called it Clare (clear) -mount. After the Duke's death, it was purchased by Lord Clive, who, when setting out on his last voyage, gave directions to Brown to build a house, without limiting him to expense. He performed the task to the satisfaction of his employer, at a charge somewhat above 100,000*l*. It is a beautiful Corinthian building of freestone, an oblong square open on all sides, the offices under ground, and connected with the stables by a subterraneous communication. The situation is well chosen, the execution good, and the internal arrangement unexceptionable. Brown had often altered houses, but this house, and that of Crome, are the only instances of his having erected new ones. The grounds want water, and are rather deficient in distant prospect; but in other respects they are singularly and beautifully varied, and planted with the greatest taste. In the late Princess Charlotte's time, government built a green-house on an eminence in a very bad style; it is composed of large pained windows and fan lights like an assemblage of shop fronts. A good collection of plants is scattered among the hot-houses of the kitchen-garden, which stand in need of renovation and reformation.

Clandon Place, — near Guildford; Earl of Onslow. A noble mansion, by Leoni, built in 1731, the stables more recently by Brown, who also laid out the grounds, and transformed a chalk-pit into a rich scene of picturesque beauty.

Cobham Park, — Cobham; H. C. Combe, Esq. A substantial mansion, and ground of considerable beauty; the kitchen-garden well seen to; and the hot-houses in good condition.

Eastwick-house, — near Leatherhead; J. Laurel, Esq. A brick house, improved in design, and stuccoed by the present proprietor, standing in a park of 400 acres.

× *Ewood*, — near Merstham; Duke of Norfolk. A house built by the late duke for an occasional residence. It stands in a park of 600 acres, on the brow of an eminence, commanding extensive views of the home grounds, which contain a piece of water of sixty acres, and over the beautiful wooded heights of Dorking, and the adjacent country.

Gatton Park, — near Ryegate; Sir M. Wood. A handsome house in a park of considerable extent, much varied in surface, and containing several detached pieces of water.

Marsden Park, — near Godstone; J. Hatsel, Esq. A good house, delightfully situated in a valley, and mentioned by Evelyn (107.) as being a noted improvement.

Moor Park, — near Farnham; —— Simpson, Esq. A large white house of simple architecture, in a park not very extensive, but abounding in scenes beautifully romantic. This was formerly the residence of Sir William Temple, who died here, and was so attached to this retirement, that by his own directions his heart was buried in a silver box under the sun dial in his garden, opposite to a window from which he used to contemplate the landscape.

Nonsuch Park, — near Cheam; S. Farmer, Esq. A part of what was the park of the royal palace of Nonsuch, on which a handsome Gothic mansion, by Wyatt, has been erected by the present proprietor.

The Oaks, — near Mitcham; Earl of Derby. Originally an alehouse, but greatly enlarged and improved by the present proprietor as a hunting seat; the park surrounded by a hill of two miles, and spotted with numerous clumps.

× *Oatlands*, — near Walton; Duke of York. A demesne of 3000 acres, almost entirely park, with a house by Holland; a fine terrace-walk; a serpentine lake, by Wright, which has often been mistaken for a part of the Thames; and a much admired grotto.

× *Okeham Park*, — near Guildford; Lord King. The grounds have been lately much improved, the piece of water enlarged, and the whole adapted to the modern taste.

Pepper Harrow, — near Haslemere; Lord Middleton. A good mansion, on the banks of the Wey, sheltered on the north and east by rising grounds, covered with plantations; with an elegant conservatory at the west end of the house, and a kitchen-garden of three acres, containing a good range of hot-houses.

× *Wimbledon-house*, — Wimbledon; Earl Spencer. A mansion by W. Holland, in a park of 1200 acres, agreeably diversified in surface, containing fine distant views, and tastefully laid out by Brown, who formed a sheet of water, which covers a surface of 50 acres. The manor-house of Wimbledon was formerly one of the first in the kingdom. A survey of it was taken in 1649, and a copy of part of it is inserted in the 10th volume of Archæologia. The house was painted in fresco externally, like the palace of Nonsuch: in the gardens was an orangery, containing forty-two trees, in boxes, valued at 10*l*. each, lemons, citrons, pomegranates, figs: in the mazes, wildernesses, knots, allies, were a great variety of trees and shrubs, a bay tree, and an *Irish arbutus*. There was a *musk milion* ground "at the end of the kitchen-garden, trenched, manured, and very well ordered for the growth of *musk milions*." The house was pulled down, rebuilt, burnt down, and rebuilt again in 1786.

Wootton-house, — near Dorking; Hon. and Rev. J. Evelyn Boscawen. A seat of the Evelyn's since the time of Elizabeth. It is a low spreading building of no pretensions, surrounded by hills, cloathed with copse-woods; but open to the south, and containing some good pasture-ground round the house.

2142. *Royal Residences.*

Kew, — near Brentford; the private property of the king, was established by the Princess Dowager of Wales, in 1760, and has become universally celebrated, chiefly from the number of seeds or plants sent there from foreign countries, and the excellent description of them published in the Hortus Kewensis. A catalogue of the plants was first published by Dr. Hill in 1768, in one volume; that by the late W. Aiton in 1789, in three volumes, 8vo. The present catalogue, completed in 1812, extends to three volumes. Sir W. Chambers published a description of the house and gardens in 1763, with upwards of forty plates, and they have also been the subject of two poems, one by G. Ritso in 1763, and the other by Henry Jones, author of the tragedy of the Earl of Essex, in 1767.

From the first establishment of the garden, a number of collectors have been sent abroad, and maintained there for the purpose of sending home plants and seeds. This has added a great many names to the catalogue, because every plant is introduced there which has once been in the garden; but, unfortunately, from want of that liberality in giving away or exchanging plants which ought to, and does characterise almost every institution of this description, many of the plants which have been introduced are lost, and no where to be found but in the catalogue. We have only to instance the natural order of proteaceæ.

A palace in the Gothic style was built by Geo. III. on the banks of the Thames. The design is by Wyatt, and rather crowded; the situation more beautiful than wholesome. It has never been completed.

Richmond Park, — near Richmond. The palace long since taken down; the park 2253 acres, surrounded by eight miles of brick wall. It is well wooded, and contains some large pieces of water. A part of what is called the Old Park is occupied by his present majesty as a dairy; the remainder constitutes the royal gardens, which were first laid out by Bridgeman in avenues, and afterwards opened and improved by Brown. They have the advantage of being situated on the banks of the Thames, and exhibit some beautiful views. Queen Caroline, who was very partial to this spot, had here a dairy and menagerie. Several ornamental and grotesque buildings were dispersed about the gardens; one of which, called Merlin's Cave, contained several figures in wax; another, called the Hermitage, was adorned with busts of Sir Isaac Newton, Locke, and other literary characters. A description of these gardens was published in 1735.

2143. SUSSEX. A surface of 935,040 acres, gently varied, the soil generally rich, great part bordering on the sea, consists of low undulating hills, or what may be called hilly plains, known by the name of Downs (from *Duno*, Sax. a hill). The northern parts, towards Essex and Kent, abound in natural woods, or remains of woods called wealds. This county is not remarkable for its gardening; on the coast, however, and especially about Worthing, the fig thrives better in the open air than it does any where else in England. It is grown to great perfection in the gardens of the Duke of Norfolk, at Arundel, and in some commercial gardens near Worthing. These trees, and also the fig-orchard, of nearly an acre, at Tarring, near Worthing, occupied by Loud, and containing 100 standard trees, have already been referred to (1493.) Market-gardens, in the neighbourhood of Lewes and Worthing, are rather on the increase, for the purpose of supplying the latter village and Brighton, both rapidly increasing, with culinary vegetables. The garden-market at Brighton is at present supplied with all its more valuable articles from London, excepting peaches, grapes, and figs, which, in the autumn, are imported from France. The severity of the sea-breeze renders this part of the coast peculiarly unfavorable to gardening.

The principal nursery in Sussex is that of Chichester, by Silverlock, distinguished as the inventor of a hollow wall (*fig.* 146.), which promises to be of real utility both in gardening and cottage-building. There are also nurseries at Horsham, Lewes, and other places, but they are of no great note. At Brighton there is a florist, who grows chiefly auriculas and geraniums. Furze-seeds are collected for the seedsmen from the wealds, and some tree-seeds from the woods of the Duke of Richmond and Lord Sheffield.

The cottage-gardens near the coast are neatly managed, and productive; as are some of the farmers' gardens. There are a few villas near the marine towns; but the principal country seats are mansions with demesnes.

Ashburnham Abbey, — near Beachy Head; Earl Ashburnham. A spacious modern edifice, in the midst of an extensive park, containing much fine timber, and a large sheet of water.

× *Bayham Abbey*, — near Tunbridge Wells; Marquis of Cambden. A small habitation in the Gothic style, badly placed; but the demesne extensive, and affording a fine situation for building, for which a magnificent design has been given by H. Repton (*Observ. on Landscape Gardening*). Near the present building the interior of an old church and cloisters have been laid out as a flower-garden, which is much admired.

× *Buckhurst Park*, — near Lewes; Lord Whitworth. Both house and grounds have been greatly improved by this nobleman and his lady, the Duchess of Dorset.

Cannon-house, — near Westdean; Lord Selsey. A small place, too near a church-yard; and a small brook, which is dry in summer; the effect of both, however, much diminished by judicious planting.

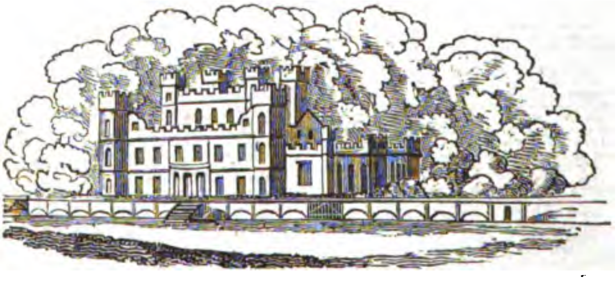
Eridge Castle, — near Tunbridge Wells; Earl Abergavenny. An irregular castellated edifice, embattled and flanked with round towers, but without any imitation of ancient architecture in the doors, windows, or other details. It stands on a bold eminence, in a park of 2000 acres, well wooded and watered.

Glynde, — near Tunbridge Wells; Lord Hampden. A noble pile, of Elizabethean architecture, with a terrace commanding a fine view of the surrounding country. The grounds much improved by the late Dr. Trevor, but at present rather neglected.

Heathfield Park, — near Winchelsea; F. Newberry, Esq. The park, environed with holly, able to keep in any game in Evelyn's time: some of these hollies still exist, and many have been cut down for their timber.

Michael Grove, — near Clapham; Sir J. Snelly. A spacious Gothic mansion (*fig.* 579), of cream-colored brick, and in the most florid taste of that style of architecture: the arrangement, both internal and external harmonious and scientific. The grounds, by Repton, contain some fine marine views.

579



Parham, — near Arundel; Sir C. Bishop. A singular old Elizabethean house, not much altered either exteriorly or within; the park abounding in stately groups of oaks.

× *Sheffield Place*, — near Lewes; Lord Sheffield. The mansion stands low, in a park of between 5 and 600 acres, long famous for its large oak-trees, and more recently so for other plantations, and for the care and judgment for which these are managed in every part of the demesne. There is 100 acres of pleasure-ground, and above 1400 acres managed as a home farm, and for experiments in culture, and breeding, for which Lord Sheffield has been long celebrated.

Stanmer, — near Lewes; Earl of Chichester. A plain stone edifice, forming three sides of a square, in a park much diversified by nature and planted with judgment.

Stanstead-house, — near Chichester; L. Way, Esq. One of the most delightful situations in the kingdom: the house, an elegant Ionic pile, with wings, an observatory, and cupolas; the park 650 acres, finely varied and wooded.

West Grinstead Park, — near West Grinstead; William Burrel, Esq. A handsome stone mansion: the grounds lately much improved, and some hot-houses added to the kitchen-garden.

Up Park, — near Eastbourn; Sir H. Fentherstone. A magnificent house, and well-wooded park; the timber trees in 1743, valued at 19,000*l*.

2144. The following are *first-rate Residences*.

× *Arundel Castle*, — at Arundel; Duke of Norfolk. A magnificent castellated structure, partly very old, and partly re-erecting on a more sumptuous style. It is founded on a circular knoll, effected partly by nature and partly by art: the adjoining grounds flat towards the sea, but the rest of the park varied and well wooded. The kitchen gardens are good, and noted for their old and prolific standard fig-trees.

× *Goodwood*, — near East Lavant; Duke of Richmond. A magnificent house in the Grecian style, chiefly by Wyatt; the walls built of small flints collected on the South Downs. The stables and offices form a handsome quadrangular building near the house, and are inferior to few if any in the kingdom, and the dog-kennel exceeds in magnificence and convenience, even to luxury, every structure of the kind ever raised for such tenants. The park includes 2000 acres; behind the house is a fine grove of cedars, mentioned by Collinson, and every where abundance of old timber; and it contains a beautiful summer-house; on the pleasure-grounds is a tennis-court; and on a hill beyond the park, a race-course.

× *Petworth-house*, — at Egremont; Earl of Egremont. A magnificent mansion, fronted with free-stone, and surrounded by statues; in the front an artificial lake formed at an expence of not less than 30,000*l*., the water collected from numerous small springs in surrounding hills and conducted thither in pipes. The park is 12 miles round. It was formerly little better than morass and waste, but has lately been drained and well stocked with every variety of British oxen, and also those of the Calmucks and of Astracan; there is also a breed from the East Indies; the Scottish bisson, and the shawl goat of Thibet. His lordship farms extensively, and has used every exertion to encourage the breeding of oxen as beasts of labor rather than horses. The gardens and hot-houses are on a scale of design and management suitable to every other part of this truly noble demesne.

2145. *Royal Residence.*

× *The Pavilion, or Palace* — at Brighton, is in a mixed style of Chinese, Gothic, and Moresque architecture, in which the former greatly prevails. Exteriorly it forms a singular and beautiful whole; but is badly arranged within, and, excepting the dining-room, the others are low or of disagreeable forms and proportions; or, like the music-room, over-labored in attempting to keep up the Chinese character. The grounds contain only a few acres, in which are a magnificent pile of stables, formed round a circular court, covered by a dome partly glazed. The garden scenery is tasteless, stocked with the meanest flowers, and shows no exertions for approbation.

2146. KENT. A surface of 935,600 acres, considerably diversified by ridges of chalky eminences in some places; low marshy grounds on the Thames and Medway; open downs near Dover; and an inland, flat, and woody part towards Sussex, called the Weald; a Saxon word signifying wood, or the woody part of a country. It is one of the oldest cultivated counties in England; and, from some laws peculiar to it, landed property is much divided, and there are a great many small proprietors who reside on, and cultivate their own estates. Hence the garden-like appearance which prevails in great part of this tract, and particularly about Maidstone, and on the road from London to Canterbury. The cottage and tradesmen's gardens on this tract are remarkably neat, perhaps more so than any where in the world, unless in some parts of Holland. It is also very productive in vegetables and fruits for the market, and in seeds of different kinds for seedsmen: it contains some beautiful villas, and one or two fine old mansion residences, and one public, formerly a royal park. Philip Miller appears to have been born in this county, near the metropolis, but where is uncertain. The most celebrated gardens in former times were those of Knowle, and of Dr. Sherrard at Eltham.

Greenwich Park, — near Greenwich, originally belonging to Greenwich palace, but that being formed into an Hospital in the reign of William III., it is now disjoined. It contains 188 acres, walled round by James I., and planted with elms and Spanish chestnuts in intersecting rows and avenues by *Le Notre,* in Charles II.'s time. The *coup d'œil* of the Metropolis from this park is as interesting a thing of the kind as exists.

Farmers' and *Market Gardens,* — abound along the Thames for the supply of the shipping. Immense quantities of green peas are grown round Dartford, both in farm-market gardens and in common farmed lands for the London market. At Sittingbourne, and in the isle of Shepey, peas and beans are grown; and at Greenwich and Deptford great quantities of asparagus, sea-kale, and onions, cauliflowers, &c. Edmonds at Deptford is the greatest grower of asparagus, and sometimes has 70 or 80 acres under this crop.

Orchards. — These are chiefly about Lewisham, Maidstone, and along the banks of the Medway; the principal fruits of the county are the cherry and the filbert, but most of the others are also grown from the walnut to the strawberry. The latter fruit is brought to great perfection at Fordwick, a village near Canterbury, belonging to Earl Cowper.

Seed Gardens. — Great quantities of seeds are grown for the seedsmen; canary, radish, kidney-beans, and formerly turnip in the Isle of Thanet; toker or Sandwich beans at Sandwich, and also kidney-beans. Various seeds are also grown round Maidstone, and much canary-seed in the hundred of Herne. The Kentish perennial rye-grass is collected through the county, and shipped for the seedsmen at Feversham. About twenty acres in the parish of Deptford are generally devoted to the growth of onions for seed, the Deptford variety being in great repute.

Of *Florists' Market Gardens* — there are two at Greenwich; and there are also some *Florists' Gardens* there.

Nurseries — are not unfrequent, though the county is already fully planted, and most of the orchardists raise their own trees. The principal is that of John Willmott and Co. of Lewisham. It was founded by Mr. John Russel, about the middle of the 18th century, who raised himself by his skill and industry to a state of affluence rare among nurserymen; and, after keeping his carriage, and living many years like a gentleman, died in 1794, aged 63, leaving property to the amount of 20,000*l.* The nursery is now carried on by his son-in-law with increased spirit; the grounds contain 150 acres; 70 hands are employed, and about 3000*l.* a-year paid for labor.

The New Cross Nursery, — near Deptford, W. Cormack and Sons, is extensive, and has long enjoyed a respectable reputation.

Cottage Gardens. — Besides being neater, as already mentioned, these gardens are stocked with finer kinds of vegetables, as kidney-beans, early potatoes, lettuces, &c. than in most counties; and they abound more in flowers.

Private Gardens of Farmers — are also superior to those in most counties; fruit is here a necessary of life; every where cultivated, and all that is not consumed at home finds a ready market at Maidstone or London; or is purchased by the fruit-hawkers and agents which travel through the county.

Suburban Villas. — A few of these line the roads near the Thames, and especially about Deptford and Greenwich, and there are a number round Blackheath, among villas of a larger description. A few also exist round every town in the county, and all are highly kept.

2147. *Villas.* Of these only a few can be here ennumerated.

Belvidere, — near Plumsted; Lord Eardley. A spacious brick edifice on an elevation, rapidly declining towards the north, with fine views over the Thames into Essex; the grounds, though small, agreeably diversified, and well wooded.

× *Blendon-hall,* — near Bexley; J. Smith, Esq. A good house, and the grounds agreeable, with some natural oak woods and a piece of artificial water. The present owner has greatly improved them, from the designs of H. Repton.

Charlton-house, — near Charlton; Lady Wilson. A good specimen of the style of James I.; the grounds occupy 70 acres, include some beautiful scenery, and fine old trees, especially cypresses.

Danson Hill, — near Benley; J. Johnstone, Esq. A handsome mansion, by Sir Robert Taylor; and grounds containing fine woods, and a spacious sheet of water, laid out by Brown.

Eden Farm, — near Beckenham; Lord Auckland. An elevated healthy situation, surrounded by fine beech-trees.

East-Cliff Lodge, — near Ramsgate; Lord Keith. The house a good specimen of modern Gothic; the grounds, which contain thirteen acres, remarkable for a curious subterraneous passage 500 yards in length.

Godmersham Place, — near Canterbury; —— Knight, Esq. A handsome mansion, backed by extensive woods.

Hayes Place, — near Beckingham; P. Dehaney, Esq. The mansion erected by the late Earl of Chatham; who, as G. Mason informs us, took much delight in improving the grounds.

Hathfield, — near Ashford; Earl Thanet. A square edifice of Portland stone; the grounds skirted by the Stour, and much improved by the present Earl, who dedicates great part of his time to agricultural pursuits.

Hill Park, — near Westerham; J. H. Barrow, Esq. The grounds beautifully varied by nature, tastefully planted, and containing a curious artificial cascade in front of the house.

Holwood-house, — near Beckenham; the favorite retreat of the late prime minister Pitt. A small house, but the grounds extensive and beautifully laid out by H. Repton.

Lee, — near Ickham; T. B. Bridges, Esq. A Gothic mansion by James Wyatt, Esq. praised by Lord Walpole; the park displaying some fine thriving trees over undulating grounds.

Quarry Hill, — near Tunbridge; J. Burton, Esq. an eminent London builder. A castellated mansion by the roadside, built of the stone and flints of the country, with an extensive park, abounding in undulations and wood.

Wooton Court, — near Dover; Rev. E. T. Brydges. A white house on a bold hill, nobly crowned with woods; the grounds much varied with hill and valley.

Woodlands, — near Blackheath; J. J. Angerstein, Esq. An elegant mansion of Portland stone, in a commanding situation; the grounds agreeably varied, and the gardens remarkable for the quantity of glass they contain. There is a very large conservatory and numerous vineries, the invention and execution of Mr. D. Stewart, when this gentleman's gardener; also an excellent collection of exotics.

2148. *Demesne* and *first-rate Residences.*

× *Chevening,* — near Seven Oaks; Earl Stanhope. A good mansion by Inigo Jones, with grounds flat and rich, but not much varied by plantation. The present Earl is much attached both to horticulture and agriculture.

Cobham-hall, — near Cobham; Earl Darnley. A house in the form of a Roman H, the centre partly by Inigo Jones; the park of 1800 acres, nearly seven miles in circumference, beautifully diversified, abundantly wooded; with remarkably fine oaks, and a noble avenue of lime trees. On an elevated site is a large magnificent mausoleum, which cost 9000*l.*

Foot's Cray Place, — near Footscray; — Harris, Esq. The mansion of free-stone, copied from a design by Palladio, erected near Venice; the park well planted, and embellished with a canal, formed from the Cray river, which flows through the grounds.

Knowle Park, — near Seven Oaks; Duchess of Dorset. A magnificent Elizabethean palace, the most modern part of which is dated 1605; it covers five acres. The park is between five and six miles in circumference, varied in surface, and clothed with venerable oaks, beeches, ashes, and elms. The pleasure-grounds, for the greater part, remain in their original taste, and contain some fine old limes, cedars, and other trees. Extensive conservatories, modern rosaries, and flower-gardens, with other improvements, have been added by the present proprietor, who is much attached to gardening.

Mote, — near Maidstone; Earl Romney. Formerly a castellated mansion, surrounded with a moat; now a splendid structure on a knoll, commanding, fine views, "but having too much the air of a citizen's villa." The park is extensive, timbered with large trees; with a broad sheet of water, and a handsome bridge.

Mount Morris, — near Monks Horton; the late Lord Rokeby. A large square brick house by Gibbs, and a well wooded park of 1000 acres, greatly improved in its pasture by the owner, who took great delight in farming

† *Penshurst,* — near Tunbridge; J. S. Sydney, Esq. An extensive castellated pile of the 13th and 14th centuries; the park now reduced to 400 acres, but containing many fine old lime, oak, chestnut, and beech trees.

Summer Hill, — near Tunbridge, W. Woodgate, Esq. A celebrated and beautiful seat, granted by Queen Elizabeth to the Earl of Leicester. The mansion erected in James I.'s time; the grounds richly wooded and highly picturesque.

2149. ESSEX. A surface of 1,240,000 acres, of which one part, bordering on the Thames, is marshy, and chiefly under pasture; another part southwards is occupied with the remains of Hainault and Epping forests; and the remainder in the middle of the county, and towards Cambridge is a mixed tract of arable lands, on which, besides corn, the coriander, caraway, and hazel, are grown. The rest abounds in pasture and gentlemen's seats. There is a good market at Colchester for vegetables, and in the corn markets there, and other places, samples of the commoner garden seeds are generally exposed for sale.

Farmers' Market Gardens. — These are extensive in most parts of the county. About Ilford, Barking, and Plaistow, immense quantities of early potatoes are grown for the London market.

Market Gardens. — The principal of these are near the metropolis, and at Chelmsford and Colchester; the latter town and Eveley, and Purfleet, supply the first early peas from the east side of the metropolis. Few of the market gardens in this county, in Kent, or indeed any where, excepting those of Middlesex and Surry, have much glass.

Seed Gardens. — The London seedsmen receive more of their stock from this county than from any other. In the low district on the Thames, great quantities of rape-seed are grown; brown and white mustard are grown in most places; small garden seeds of almost all sorts round Coggeshall, Colchester, and in the Isle of Mersey; carrot seeds at Wethersfield; coriander, caraway, and mawe seed (*Papaver somniferum*, var. with blue seeds,) round Coggeshall; from the Marquis of Buckingham's woods at Gosfield Hall, near Braintree, most sorts of fir seeds which are sowed in England are procured, and hornbeam seeds from Epping Forest.

Physic Gardens. — There are none of these worth mentioning, unless one or two near Saffron Walden, in which the saffron is still cultivated for the apothecaries; but this article being procured so much cheaper from abroad, its culture in England is nearly given up.

Florists' and Nursery Gardens. — There are few of any consequence.

Cottage Gardens, Farmers' Private Gardens, and *Suburban Villas,*—(*fig.* 580.), abound and are in general very neatly kept: formerly the tradesmen of Chelmsford and Colchester, were much attached to the culture of florists' flowers, and they still continue to be so in a considerable degree.

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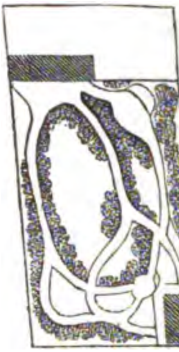

2150. Of *Villas* there are a considerable number, from which we select only a few.

Coopersale, — near Thoydon Gernon; — Archer, Esq. A spacious edifice, surrounded by lawns and pleasure-grounds.

Debden-hall, — near Thaxtud; Mrs. Chiswell. A handsome stone mansion, designed by — Holland, surrounded by thriving pleasure-grounds.

Eastbury-house, — near Barking; — Sterry, Esq. A spacious brick edifice, with octangular towers and chimnies; the grounds rather confined.

Fitz-Walters, — near Brentwood; T. Wright, Esq. An octangular house, with chimnies in the centre; the grounds of limited extent.

Greenstead-hall, — near Greenstead; C. Ord, Esq. A neat house and good garden.

Hallingbury Place, — near Stansted; J. Houbloun, Esq. A desirable and pleasant residence, lately much improved.

Hare-street Cottage, — in Hare-street; the late H. Repton, Esq. Remarkable as having been the residence of this justly celebrated artist.

Langles, — near Great Waltham: J. J. Tuffnel, Esq. A handsome house, on a pleasant eminence, and the park and grounds well laid out.

Liston-hall, — near Boxley; — Campbell, Esq. A handsome modern building, with piazzas, encompassed by a small park and garden.

Marsden Park, — near Miserden; — Sandys, Esq. The house is ancient; the park seven miles in circumference, and early equalled for birch woods, picturesque, sequestered, and romantic scenes.

Twinstead-hall, — near Twinstead; J. Marriot, Esq. A spacious handsome building, surrounded by pleasant gardens, over which is a bridge to the adjoining meadows.

2151. *Mansion* and *Demesne Residences.*

Audley End, — near Saffron Walden; Lord Baybrooke. A magnificent Elizabethean structure, of which, according to Lord Walpole, John Thorpe and Bernard Janson were the architects. The model was procured from Italy, and cost 500l., and the expence of erection was 190,000l. The park is finely wooded, and some improvements, it is believed, were made from the designs of H. Repton.

× *Claybery-hall,* — near Woodford; J. Hatch, Esq. A neat house, and greatly improved scenery; the park contains some fine timber.

Colne Park, — near Little Colne; P. Hills, Esq. A handsome mansion of white brick, surrounded with woods and plantations, among which is an Ionic column, erected by J. Soane, Esq. architect, in 1791.

Copford-hall, — near Colchester; J. H. Harrison, Esq. A handsome house and pleasant grounds, containing several pieces of water.

Copped-hall, — near Epping; J. Conyers, Esq. One of the greatest ornaments of the county. The house, of white brick, has been much improved by Mr. Wyatt; the park is extensive, irregular, and well wooded, and the distant prospects grand.

Easton Lodge, — near Dunmow; Lord Maynard. An Elizabethean mansion in an elevated situation, surrounded by a spacious park, with water and shrubberies.

Foulkbourne-hall, — near Witham; J. Bullock, Esq. A stately old mansion, and in the grounds one of the largest cedar trees in the kingdom.

Felix-hall, — near Kelvedon; C. C. Weston, Esq. A neat modern building, and the grounds laid out with much judgment.

× *Gosfield-hall,* — near Gosfield; Marquis of Buckingham. A mansion of the domestic architecture prevalent in Henry VII.'s reign. The grounds are of limited extent.

Hare-hall, — near Romford; J. A. Wallenger, Esq. An elegant mansion of Portland stone, with wings joined by colonnades; the pleasure-grounds are well laid out by Mr. Wood, a local landscape gardener.

Higham Hills, — near Woodford; J. Harman, Esq. The house is on a high ridge, to the west of which is a fine park, bordering on Epping Forest, and containing a fine piece of water and many exotic trees.

Hill-hall, — near Theydon Mount; Sir W. Smith. A handsome quadrangular building on an eminence, with fine prospects over a well wooded park.

Ingatestone-hall, — near Ingatestone; Lord Petre. An irregular pile in a low situation, noted for its fish-ponds.

Langford-hall, — near Langford; N. Westcombe, Esq. A modern white house, in a finely wooded park.

Mistey-hall, — near Manningtree; F. H. Rigby, Esq. The house has lately been much improved, and some plantations and pleasure-grounds laid out with taste.

Navestack-hall, — near Navestock; Earl Waldegrave. A plain brick building, pleasantly situated amongst gardens and pleasure-grounds.

Shortgrove, — near Audley; —— Smith, Esq. A handsome mansion on an eminence, with the river Granta at the foot of a lawn in front, from which the house is supplied by water from a machine designed by the celebrated mechanician, Dr. Desaguliers. The plantations and pleasure-ground are thriving and beautiful.

Thorndon-hall, — near Brentwood; Lord Petre. The mansion, from a design by Paine, in the Corinthian style. The park and grounds well stocked with wood, and many of the trees of great rarity and value, having been planted by a former Lord Petre, mentioned by Ellis, in a letter to Linnæus, as one of the greatest encouragers of botany of his time, and in short the Maecenus of the age.

Valentines, — near Wanstead; C. Cameron, Esq. A venerable mansion and grounds; the hot-house remarkable for a vine of the black Hamburgh kind, planted in 1758, and nearly as large and prolific as that at Hampton-Court.

Wanstead-house, — near Wanstead; Wellesley Long Pole, Esq. A large and magnificent structure, the principal front 260 feet. The park is very extensive, and abounds in old avenues, water, &c., laid out by London and Wise. The present proprietor has made great improvements; erected extensive hot-houses in the kitchen garden, and formed one of the largest American gardens in the kingdom, from designs by Lewis Kennedy, Esq.

Weald-hall, — near Brook Street; C. Towers, Esq. A handsome building in a large park, with rich gardens and plantations, and distinguished by an embattled prospect tower.

Whitley, — near Badbrook; T. Walford, Esq. An elegant residence with fine plantations, extensive pleasure-grounds, rich in exotic trees, and containing some well-constructed ornamental buildings and a fine collection of English plants.

2152. HERTFORDSHIRE. A surface of 302,080 acres, the north part forming part of a chalky ridge which extends across the kingdom in this direction, the rest agreeably varied. The soil is generally loamy or clayey, or a chalky subsoil: there are many private gardens in the county of almost all descriptions; a number of small nurseries and market-gardens, and some florists' market-gardens. The gardens at Moor-Park and Cassiobury were formerly the most celebrated in the county. The villas are less numerous than the demesne residences.

Beechwood Park, — near Market Street; Sir J. Sebright. A handsome mansion, in a delightful well-wooded park, abounding in stately beech trees. There is a farm of 700 acres, cultivated in the first style by the proprietor, who is distinguished both as a grower of corn, and a breeder of domestic animals.

Brocket Hall, — near Welwyn; Lord Melbourne. A handsome dwelling, from the designs of Mr. Paine; the park and grounds beautiful, and much enriched by the river Lea, which is here formed into a handsome sheet of water. The park farm is scientifically cultivated, chiefly by the direction of Lady Melbourne.

Brickenden Bury, — near Hertford; —— Morgan, Esq. The park is large and well furnished with wood and water.

Broxburn Bury, — near Broxbourn: J. Bosanquet, Esq. The house is spacious, and with the park, has lately been much improved.

Cockenhatch, — near Royston; Lady Wills. A singular, but not unhandsome mansion, in a pleasant park.

Colney House, — near London Colney; G. Anderson, Esq. A handsome and regular mansion with wings; the offices connected by an underground passage, and completely enveloped in evergreens. The park contains some fine oak and elm trees; the pleasure-grounds are extensive; the kitchen garden well stocked with the best sorts of fruit-trees; and there is a large green-house full of choice plants.

Gobions, — near North Mims; J. Hunter, Esq. In Henry VII.'s time the seat of Sir John Moore, father to the illustrious Sir Thomas More. The gardens were then, and in the succeeding reign, celebrated for their splendour in the ancient taste.

× *Gorhambury House*, — near St. Albans; Earl Verulam. A Corinthian house of brick stuccoed, by Sir Robert Taylor; and a park of 600 acres, well stocked with fine timber, particularly beech.

The Grove, — near Watford; Earl of Clarendon. An irregular brick structure in a park three miles in circumference, through which the river Gade flows in a divided stream. There is a farm of 600 acres assiduously cultivated by his lordship, who pays the greatest attention to every branch of farming.

Hamels, — near Sacombe; G. Mellish, Esq. The grounds laid out with much taste.

Hemsted Bury, — near Hemel Hempsted; —— Hilton, Esq. A neat house and pleasant grounds in a mixed style between the geometric and the modern manner.

× *Panshanger*, — near Hertford; Earl Cowper. A fine situation, the house lately improved, and the grounds pleasant. The park contains a remarkably large oak.

Theobald's Park, — near Cheshunt; Sir G. B. Prescot. A residence of 300 acres, with a handsome mansion erected on what was formerly a palace and park of James I. who, having got possession of the park, by exchange, from the Earl of Salisbury, enlarged and surrounded it with a wall ten miles in circumference. When Cromwell's survey was taken in 1650, it contained 2508 acres, diversified with avenues and other masses of trees. The gardens were large, and ornamented with labyrinths, canals, and fountains The great garden contained several acres, and there was besides a pheasant, privy, and laundry garden. In the former were nine knots, artificially and exquisitely made, one of them in imitation of the king's-arms.

Tring Park, — near Tring; Sir D. Smith. The house is large and convenient, and the park consists of between 300 and 400 acres, beautifully varied both with undulations of surface and fine trees.

Watton Woodhall, — near Watton; S. Smith, Esq. A spacious and elegant mansion, occupying one of the finest situations in the county, built by Sir Thomas Rumbold, and the kitchen garden formed by Malcolm. The park is large, diversified by hill and dale, and watered by several small streams, which flow into the river Beane, in its course through the grounds; it contains fine oaks, many of which are of great magnitude. The kitchen-garden is excellent, and well managed.

Wormleybury, — near Wormley; Sir A. Hume. A good house and pleasant grounds, but chiefly remarkable for it horticultural productions, Sir Abraham having introduced various new plants from China and India.

2153. The following may be considered as *first-rate Residences*.

× *Cashiobury*, — near Watford; Earl of Essex. A spacious Elizabethean mansion; and a park between three and four miles in circumference abounding in rich scenery and noble timber, originally-planted by *Le Notre*. The pleasure-grounds are extensive, and contain a beautiful flower-garden in the Chinese style. The kitchen-garden is well cultivated, and also the home-farm. The Earl of Essex, in Evelyn's time, was a great encourager of gardening, as is the present Earl.

× *Hatfield House*, — near Hatfield; Marquis Salisbury. A magnificent Elizabethean mansion, in a finely diversified park watered by the river Lea, and containing some of the finest oak, ash, elm, and other trees in the county. There were originally two parks, one for red and the other for fallow deer; and in one of them was a vineyard which was in existence at the time Charles I. was a prisoner in Hatfield. In 1795, a piece of ground of 17 acres in extent, was set apart for agricultural experiments, which are conducted with great science and assiduity by the Marchioness.

× *Moor-Park House*, — near Rickmansworth; —— Williams, Esq. A magnificent Corinthian mansion, by Giacomo Leoni, and the grounds laid out under the direction of the celebrated Lucy Countess of Bedford, and afterwards modernized by Brown, when the estate was in the possession of Lord Anson. The park is finely diversified with oak, ash, elm, and lime trees, so old as to be much decayed at their tops. This celebrated seat has been praised by Bacon and Sir W. Temple: and one of its possessors B. H. Styles, Esq. was unfairly satirized by Pope, for removing a hill from the north front at an expence of 5000*l*.

2154. BUCKINGHAMSHIRE. A surface of 318,400 acres, hilly, and abounding in some places in natural, beech woods the soil rich, and on chalk. It does not abound in gardens or residences, but contains one long celebrated — Stow. The seedsmen procure many of their tree seeds from the natural woods of the county; as beech mast, from Amersham and High Wycomb, and also horn-beam, holly, haws, and juniper. Some of the nurserymen procure their stocks for standard-roses from the same woods, and from copsewoods at their periodical fellings, or when they are to be rooted out.

Bulstrode, — near Beaconsfield: the Duke of Somerset. The house is in no respect remarkable; the park contains 5000 acres, abounding in old oak and beeches. The gardens were formerly kept in good order, and also the farm.

Chalfont House, — near Chalfont, St. Giles; in 1800, Thomas Hibbert, Esq. The grounds were laid out by the former possessor with much taste and judgment; and are finely ornamented with wood, and adorned with a pleasant piece of water. The gardens, in Mr. Hibbert's time, were richly stocked with tender exotics, especially heaths, and other Cape plants.

Cliefden, — near Wooburn (Bedf.); a seat founded by George Villiers, second Duke of Buckingham, in the reign of Charles II. Burnt down in 1795. The grounds are finely varied by woods, which descend on the side of a steep hill to the Thames, and are celebrated by Pope in his "Moral Essays."

Fawley Court, — near Fingest; Strickland Freeman, Esq. The mansion is handsome and spacious, with four fronts: it was built in 1684, from a design of Sir Christopher Wren. The grounds round the house are rather flat; but the distant scenery is hilly, well-wooded, and the windings of the Thames are seen along a beautiful vale.

× *Hall Barn*, — near Beaconsfield; Edmund Waller, Esq. descendant of the poet, by whom the grounds were laid out in the ancient style, verging into a sort of wildness at the extremities of the walks. The ground near the banqueting-house has been moved and remodelled by the poet at very considerable cost, and the place, on the whole, must have deserved the encomiums that were made on it when in its perfection, and in high keeping; at present it is rather neglected.

Hedsor Lodge, — near Wooburn; Lord Frederick Boston. The house is modern and elegant; the grounds are distinguished for their high sloping hills, deep vallies, and the wild luxuriance of the woods, which, combining with the bold swells or abrupt depressions of the surface, produce some very beautiful and picturesque scenery. The view from the brow of the hill, with the village church; the winding Thames, and the distant hills clothed with beech-wood, is very fine. 1800.

Latimers, — near Chesham; Lord George Cavendish. A small place of no great note, but here introduced, because referred to by G. Mason as having been laid out by Brown.

Shardeloes, — near Amersham; T. D. T. Drake, Esq. The house is a respectable modern edifice, from a design by M. Adams, It is situated on the brow of a hill, overlooking a broad sheet of water, planned by Bridgeman. The park is much varied in surface, and richly clothed with beech woods.

Stoke Park, — near Stoke Pogies; John Penn, Esq. The house was built in 1789, from the designs of James Wyatt, Esq.; and the grounds, laid out by H. Repton, are beautiful, though of limited extent.

Wooburn Farm, — near Wooburn; Earl Wharton (1770). This place was laid out as a *ferme ornée*, and was celebrated in the time of Whately, who gives a full description of it. It is now entirely obliterated, and the grounds let as a common farm.

× *Wycombe Abbey*, — near Wycombe; Lord Carrington. The house situated in a bottom, has lately been much improved in the Gothic style by Mr. Wyatt. The grounds contain a curious artificial cascade, executed by J. Lane, a stone-mason, who executed the cascade at Bowood, in Wiltshire, and is celebrated for his talent in this way. The park contains 200 acres, well wooded and watered, and bounded on the south by high hills.

× *Wycombe Park*, — near Wycombe; Sir J. D. King, Bart. The house is small, by W. Ware, in the Grecian style and elegant. The grounds form part of a vale, bordered by a stream, and are deservedly much admired for their wood and water. They were laid out by Brown, and received some improvements from H. Repton.

2155. The following are *first-rate Residences*.

× *Ashridge Park*, — near Hempsted; Earl of Bridgewater. The ancient abbey, lately pulled down, and a magnificent Gothic mansion, erected from the designs of J. Wyatt in 1815. The park is five miles in circumference, pleasingly varied with hill and dale, and furnished with some very fine oak and beech trees. The gardens are extensive; the culinary department is under the care of T. Torbron from Kew, an excellent gardener; and the flower-garden contains several acres, full of variety, and laid out from the designs of H. Repton, Esq. in 1814. The farm is managed by a Northumbrian bailiff.

× *Stow*, — near Buckingham; Marquis of Buckingham. The chief ornament of the county, and celebrated for nearly a century for its gardens. When beheld at a distance, this place appears like a vast grove, interspersed with columns, obelisks, and towers, which apparently emerge from a luxuriant mass of foliage. The gardens obtained their celebrity from the alterations effected by Lord Cobham in the early part of the last century. The first artist employed was Bridgeman, whose drawings are still in possession of the Marquis. Stowe was the most eminent place in the ancient style, and set the fashion of employing numerous statues and architectural ornaments. Kent was called in probably about 1755 or 1760: he abolished several formalities; and among other improvements substituted the sunk fence for the high wall. A stranger, in passing through the grounds, is astonished at the number, the beauty, and the magnificence of the buildings; and the house, with its extended front, elevated site, and extensive prospects, is a truly grand object. The gardens of every kind are kept in high order, especially the flower-gardens, lawns, and shrubberies, near the house. The buildings and other objects are too numerous to be even enumerated here; a copious account of them, accompanied by plates, will be found in *Seeley's Description of Stow*.

2156. BEDFORDSHIRE. A surface of 260,000 acres, not much varied; the soil sandy in many places, and a strong clay in others. It contains a few mansions, and the princely residence of the Duke of Bedford; and the village of Sandy, on the borders of the county, has long been famous for growing pickling cucumbers, which are sent to the London market, and sold by the bushel.

Ampthill Park, — Ampthill; Earl of Upper Ossory. The mansion, a superb edifice, built in the Grecian style; the park contains 2000 acres, extensive and flat, but furnishes some pleasant prospects; it has a fine water view, and many ancient oaks.

Luton Hoo, — near Luton; Marquis of Bute. The house is large, and contains one good front by Adams; the library is 146 feet in length, and inferior only to that of Blenheim. The park is extensive, well wooded, and watered by the river Lea, which expands into a lake, varied by islands at the base of the eminence on which the house is situated. The gardens of the farm were formerly kept in high order, but are now (1821) much neglected.

Wrest, — near Selsey; Baroness Lucas (1800). An ancient seat, the grounds of which were submitted to Brown, who formed here a noble serpentine river, their principal ornament, and has occasioned this place being called the Stow of Bedfordshire. They abound with architectural ornaments, and contain many fine large trees.

× *Woburn Abbey*, — near Woburn; Duke of Bedford. A first rate residence. The abbey or palace is in the Ionic style, very extensive, and was much improved in the end of the last century, from the designs of Mr. Holland. From the Duke's apartments a covered way leads to a green-house, 140 feet in length; and from the end of the green-house a piazza of nearly a quarter of a mile leads along the margin of a flower-garden to the dairy, a handsome Chinese building, ornamented with stained glass. The park is very extensive, varied in surface, and abundantly clothed with trees; but it wants one feature of essential importance, water. This might be given, but it would be at considerable expence. At present there are several small pieces or lakes; but they have no effect in a general point of view, though some of them are pleasingly picturesque as recluse scenes. One of them, contrived to fall in the way of the approach, is crossed by a via duct (*fig.* 581.) designed by Repton. There are many fine old cedars, silver firs, and pines, in one part of the park, which were planted under the direction of Miller; and there is a very tall beech with an erect stem, which has been noticed by Pontey. The gardens are extensive, and abundant in every thing; and the farm has long been celebrated for the annual meeting of agriculturists, called sheep-shearings, to which it gave rise, and at which all the eminent agriculturists of the country, and many foreigners, are annually present. The late Duke Francis, it has been truly observed, did as an individual what is generally done by society; he rewarded invention; fostered ingenuity; and gave a fair trial to every new agricultural scheme. The present duke has not the same taste as his late brother, but still keeps up the annual meetings, and cultivates the park farm.

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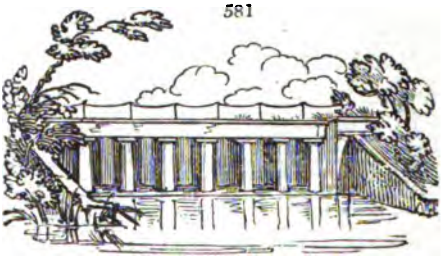


2157. HUNTINGDONSHIRE. A dull, flat, humid, unhealthy surface, of 240,000 acres.

† *Hinchinbroke House*, — near Huntingdon; Earl of Sandwich. A large irregular building, built of stone and brick by the Cromwells, in the time of Elizabeth; the park flat, and not extensive.

2158. CAMBRIDGESHIRE. A surface of 500,000 acres; little varied, but fertile and healthy. It is not remarkable as a gardening county; but it contains a good botanic garden at Cambridge, and one or two extensive seats. The seedsmen receive a good deal of clover-seed from Royston, and of white and yellow mustard from the Isle of Ely. Clark is the principal nurseryman at Cambridge.

Public Promenades. — There are a few shady walks belonging to some of the colleges open to the public in general, and some private gardens; but none of them of any note.

The *Cambridge Botanic Garden* — was established in 1763 by Dr. Walker, Vice-master of Trinity College, who purchased nearly five acres about 1761 for that purpose, and gave it in trust to the Chancellor, Masters, and Scholars of the University, for the purpose of a public botanic garden. Mr. Thomas Martyn, the titular Professor of Botany, was appointed reader on plants, and Mr. Charles Miller, son to Mr. Philip Miller, (who had assisted Dr. Walker in choosing the ground,) was made first curator. To him succeeded Donn, who died in 1817, and was succeeded by Mr. A. Biggs, the present curator. This garden has obtained considerable celebrity entirely through the exertions of Mr. Donn, who, in a short time, formed a very extensive collection, and published the *Hortus Cantabrigiensis*.

Madingley, — near Long Stanton; Admiral Sir Charles Hinde Cotton, Bart. The house is in the Elizabethean Gothic, and resembles that much-admired example of this style, Holland-house. The grounds are umbrageous and picturesque.

Chippenham Park, — near Newmarket; John Thorp, Esq. A magnificent mansion; it was erected from a design of Inigo Jones, about the end of the seventeenth century, and the grounds laid out in the geometric style. The present proprietor has increased the property, and made very great improvements on the grounds. There is a beautiful sheet of water near three quarters of a mile in length, the joint work of the late Mr. Eames and Mr. Lapidge. The hot-houses form a range of nearly 500 feet. In the plantations upwards of a million of trees have been planted.

× *Wimpole*, — near Gamlingay; Earl Hardwicke. The most splendid private residence in Cambridgeshire. The mansion is a large brick structure; the park is extensive, but rather flat; the river Cam flows through it, and there are three lakes. The whole has been greatly improved, and the farming establishment is eminently distinguished, and ranks with those of Woburn and Holkham.

2159. SUFFOLK. A surface of 102,240 acres, generally level, the soil sandy towards the sea, but clayey inwards. It is an old county, and contains some venerable seats and woods. Great quantities of peas are grown for the Loudon market at Woodbridge, and especially the pearl pea; Leostoff is famous for carrots; a good deal of clover, and some turnip-seed, is furnished from the different parts of the county; and there are good nurseries at Bury, Ipswich, and Barton Mills.

Bury Botanic Garden — was established in 1819, by W. Hudson, of Chapel House, formerly of the War-office, a great lover of plants. Its extent is between two and three acres, and the collection of hardy plants is already considerable. The expences are defrayed by annual subscribers at two guineas each. It is in contemplation also to establish a botanic garden at Ipswich.

Ampton Hall, — near Bury; Lord Calthorpe; and Livermere, N. L. Acton, Esq. adjoining. The owners have made a noble river through both parks at their joint expense, by which means they have ornamented their estates to a degree otherwise impossible. In Mr. Lee's grounds the river terminates in a *scoop*, or painted perspective, in the Dutch style; a thing rarely to be met with in England. The Rev. M. Young, author of the Agricultural Survey of the County, has given a description of this river, and says, "the scoop has an excellent effect."

Elvedon Hall, — near Elvedon; Earl Albemarle. A demesne of 4000 acres: a few years ago, of barren sand, but now planted and improved; the agriculture conducted with great skill and assiduity by the proprietor, who ranks high as a farmer and breeder.

× *Euston Hall*, — near Thetford; Duke of Grafton. A commodious red brick mansion, with little decoration, surrounded by immense trees, and watered by the Ouse. The park contains 1450 acres, and an elegant temple designed for a banqueting-house, by Kent, and erected in 1746. The late Duke was an able and successful agriculturist, and kept upwards of 3200 acres in his own hands.

Flixton Hall, — near Breccles; A. Adam, Esq. A noble structure, near the river Waveney, in Inigo Jones's Gothic, built in 1615, but in excellent preservation. The grounds contained originally some fine old woods, and have lately been enlarged and embellished with extensive plantations.

Finborough Hall, — near Stow-market; R. Pettiward, Esq. An elegant building of Woolpit brick, from a design by Mr. F. Sandys. The park, of 200 acres, gently slopes from the mansion, into a circular valley, through which runs a stream; there is a fine winding walk to the church, and beautiful groups of straggling thickets of trees.

Henham, — near Henham; Lord Rous. An elegant modern mansion, and an extensive park and pleasure-grounds, kept in excellent order.

Helmingham Hall, — near Helmingham; Earl Dysart. A house built in the time of Henry VIII., surrounded by a moat, which, as well as the basin in the park, is frequented by great numbers of wild fowl. The park comprehends 400 acres, and contains some of the finest old oaks in this part of the kingdom. The church is close to the park, and near it a picturesque cottage, inhabited by a person, whose business it is to take care of the vaults and splendid monuments of the Tolemache family, who possessed the estate in the reign of Edward I.

Heveringham Hall, — near Huntingfield; Lord Huntingfield. One of the finest seats in the county; the house a modern erection from the designs of Sir Robert Taylor, and finished by Mr. Wyatt; the front 200 feet long, and adorned with Corinthian columns. It is situated on an eminence in an extensive park, which abounds in fine plantations, and is diversified by a noble piece of water near the house. The whole of this extensive property has been improved by plantations, which, in a few years, will give a new character to this part of the country.

Ickworth Park, — near Bury; Earl Bristol. An unfinished mansion, on a grand scale, from a design sent from Italy; the park eleven miles in circumference, and containing 1800 acres.

Livermere, — near Fakenham; N. L. Acton. An elegant seat of white brick; the grounds flat, but adorned with a fine piece of water, and well wooded.

Redgrave Hall, — near Redgrave; .... A spacious mansion of Woolpit brick, with Ionic columns; the park charmingly wooded, and adorned with a fine piece of water in front of the house.

Rendlesham House, — near Rendlesham; Lord Rendlesham. A princely residence: the mansion of great extent, modern, but in the Elizabethean style. The park and pleasure-grounds extensive, and highly kept. The former abounds in old wood, though rather deficient in undulations of surface.

Rushbrook Hall, — near Pakenham; R. Rushbrook, Esq. A noble spacious mansion with wings, forming three sides of a square; the park very extensive and well wooded, both with timber trees, and undergrowths, furze, hollies, &c. for game.

Sudborne Hall, — near Orford; Marquis of Hertford. A sporting residence of the Marquis; the hall a plain quadrangular building, covered with composition; the park abounding in copse and other covers for game, with cultivated patches sown with corn and buck-wheat for the same purpose.

Woolverton Hall, — near Woolverton; C. Berners, Esq. A house of the cream-coloured brick of Woolpit, with an Ionic portico, placed on the banks of the Orwell; the stables detached and rendered ornamental. The park is neatly laid out, and contains a handsome monumental obelisk of free-stone.

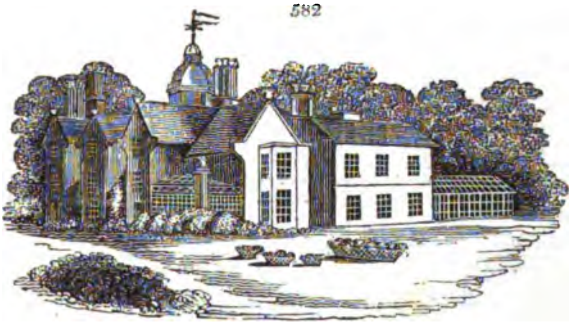
2160. NORFOLK. A surface of 1,694,400 acres; every where flat, fenny towards Lincolnshire; sandy in most places; and the rest a strong clay. It contains some good residences. At Norwich florists' flowers were first introduced into England by the refugee manufacturers from Flanders, about the middle of the sixteenth century. The principal nurseryman in the county is G. Lindley, of Catton. The London seedsmen receive mustard-seed from Wisbeach, and some turnip and clover-seed from other quarters.

Blickling Hall, — near Aylsham; Right Hon. W. A. Harbord. An interesting ancient mansion, surrounded with a moat, completed in 1628: the gardens, at that time, containing an elegant wilderness and lake. The park consists of 1000 acres, abounds in old trees, and the lake extends, in a crescent shape, for a mile, and its greatest breadth is 400 yards.

Felbrigg, — near Cromer; —— Windham, Esq. A house partly of the time of Henry VIII. but subsequently enlarged; the park abounding in old woods, and greatly improved by the late possessor, whose taste in such matters is evinced in his letter to Mr. Repton.

Gillingham Hall, — near Yarmouth; Lord Beresford. A neat venerable Gothic house (*fig.* 582.), with some fine old trees, a handsome piece of water, and ivied ruins of an old church.

582



× *Gunton Hall*, — near Cromer; Lord Suffield. The park remarkable for its very extensive plantations.

Hanworth, — near Cromer; R. L. Doughty, Esq. An excellent modern house, situated in a small but very pleasant park, well wooded, and laid out with great taste.

Hillington Park, — near Sechey; Sir M. B. Folkes. A residence lately much improved, and the gardens, hot-walls, and hot-houses, rendered very complete.

Kimberley Hall, — near Downham; Lord Woodhouse. A convenient house, in an extensive and beautiful park, richly ornamented with wood and water.

× *Rainham*, — near Wells; Marquis Townshend. A comfortable house, built in 1630, by Inigo Jones; the grounds extensive, naturally suited for improvement, but not much improved.

Walsingham House, — near Walsingham; H. L. Warner, Esq. A commodious house, and grounds which have been under a course of improvement for several years, and are now highly beautiful. A rivulet is swelled to a lake, and a judicious use made of the ruins of a priory which formerly existed here.

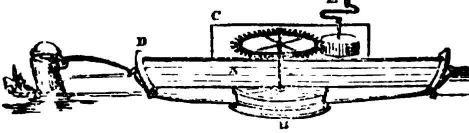
Wolterton Hall, — near Aylsham; Lady Waldegravé. An elegant modern mansion, built by Ripley the architect, under the directien of Horace Walpole, in 1730. The park is large and well ornamented with wood and water.

2161. The following are *first-rate* Residences:

× *Holkham Hall*, — near Wells; T. W. Coke, Esq. One of the best mansions in England, in point of comfort and arrangement. The park extensive, flat, and sandy; but varied by trees and farming processes continually going on, and containing a piece of water for which Repton contrived a boat (*fig.* 583.) so constructed, that by means of a cylinder and rope (B), and machinery enclosed in a box (C), and connected with the rope (D), the boat may be moved from one side of the water to the other, according as the handle (E) is turned to the right or left.

× *Houghton Hall*, — near Wells; Earl Cholmondeley. A noble free-stone structure, with two fronts, wings with cupolas, and one of the best dining-rooms for proportions and conveniences in England. The park is extensive, but dull and flat: it contains some fine old beech trees.

583



2162. OXFORDSHIRE. A surface of 454,000 acres, considerably varied by ridges, approaching, in some places, to the character of hills; the climate cold, and the soil in most parts thin, on a stony subsoil. It contains the magnificent residence of Blenheim; some others of great extent, and a botanic-garden at Oxford. There are no commercial gardens in the county worth mentioning.

Public Promenades and College-Gardens. — The promenades of Magdalen College are umbrageous and varied, considering that they are merely walks round meadows on raised mounds, bordered by hedges and hedge-row trees. The public avenues are magnificent, and as well adapted for display as the others are for retired exercise or conversation. There are private gardens to most of the colleges; their form is generally square or oblong, surrounded by a broad walk and intersected by others; that of Christchurch is famous for its fig-trees, planted in 1648; that of Trinity for its verdant sculptures; and that of St. John's College, for being laid out by Brown, in the modern style, in 1773.

The *Botanic Garden of Oxford*, was founded by Henry Earl of Danby, in 1632; it contains five acres, a greenhouse and stove, and a gardeners' house. The first curator was Bobart from Brunswick, in whose time, and in that of his son, who succeeded him in 1679, it was more worthy of notice than it has been since. Its present curator is William Baxter, A. L. S. and F. H. S.

Badgmoor, — near Henley; J. Grote, Esq. Forty acres of pleasure-ground and a house; in the former a summer-house, from which fine views are obtained through vistas formed by shrubs, the holly and other dark greens being placed in the fore-ground.

Coombe Lodge, — near Henley; S. Gardiner, Esq. A flat place, rendered interesting by every thing that art could effect by planting.

Grove Cottage, — near Stokenchurch; R. Davis, Esq. Truly an elegant cottage dwelling; neat, commodious, simple, and harmonized with the rural scenery around.

× *Middleton Stowey* — near Bicester; Earl Jersey. An extensive unvaried residence; but greatly improved both as to the house and grounds by the present possessor.

Mongewell, — at Mongewell; Bishop of Durham. The mansion unfavourably placed, but the attached grounds extensive, and arranged with much taste.

× *Nuneham-Courtenay*, — near Oxford; Earl Harcourt. A Grecian house, in part by Brown; the grounds laid out by this artist, and the flower-garden, which has been much admired, in part by him, and in part by Mason the poet. The park contains 1500 acres, and a beautifully varied drive is conducted through it.

Sherbourne Castle, — near Wattlington; Earl Macclesfield. Surrounded by a broad and deep moat, and approached by three drawbridges, the chief entrance guarded by a portcullis. The park contains sixty acres, but is flat and uninteresting; the pleasure-grounds have been lately improved; a flower garden laid out in a chaste taste; an extensive conservatory of stone and cast iron erected: and also a pavilion for the reception of flowers in the more genial summer months.

Thame Park, — near Thame; Miss Wykham. Two hundred acres of very rich pasture-land, skirted with wood, but rather flat, originally laid out by Brown, and the pleasure-grounds, now improving, contain a good conservatory.

× *Wormsley*, — near Stoken Church; John Fane, Esq. The house on a very elevated site, the grounds of little merit or beauty, but the proprietor an excellent farmer and breeder.

Wroxton, — near Banbury; Earl Guildford. A building in the abbey style, of considerable antiquity; and what renders the place particularly interesting, the geometric style of gardening is kept up in every improvement introduced in the pleasure-grounds.

2163. The following are *first-rate* Residences.

× *Blenheim*, at Woodstock; Duke of Marlborough. The most princely private residence in Britain, or in Europe, too universally celebrated to require any eulogium. The palace and bridge by Vanburgh; the grounds by London and Wise, and subsequently by Brown. The finest view is on entering from the Woodstock gate, but the scenery is every where grand and magnificent. The pleasure-ground walks are extensive and varied; and there is a drive of eleven miles round the park. Part of the latter is cultivated as a farm. The lake is the largest piece of artificial water in England: the diameter of the centre arch of the bridge is 101 feet. There is little of horticulture either in the kitchen or flower-garden; the latter was an oval, with a basin of water in a centre; and radiating walks, after the plan of that of Madame de Pompadour at Versailles. Unhappily (as we think) it has lately been destroyed, and an aviary erected on its site.

× *Ditchley*, — near Woodstock; Lord Dillon. A good house, by Gibbs; the grounds very extensive, and intersected by an avenue of five miles, in the centre of which the house is placed, and at the opposite extremities are seen in a clear day, the palace of Blenheim and Heythrope House. The natural copses on the estate are intersected by narrow alleys in all directions, clipped on the sides to facilitate the shooting of game.

× *Heythorpe*, — near Enstone; Earl of Shrewsbury. A superb mansion in the Italian style, approached by a magnificent avenue, formed by square platoons of elm trees. The grounds chiefly in the ancient taste, with curious artificial cascades. There are also extensive hot-houses.

2164. BERKSHIRE. A surface of 476,160 acres, finely varied by low hills and vales, the air healthy, and the soil good, and well cultivated. It contains nmerous villas and mansions. The neighbourhood of Reading is noted for the white skinned, or Reading onion, the bulbs of which are grown in quantities for the London market, and the seeds for the seedsmen. Cabbage-seeds are also grown in quantities there: and there is a good nursery occupied by Swallow.

Beaumont Lodge, — near Windsor: Henry Griffiths, Esq. The house is in the Gothic style by Mr. Elwyn, architect of Windsor: the park contains one hundred acres, sloping to the Thames, and finely varied by wood.

× *Benham House*, — near Speen: Earl Craven. The house is in the Ionic style, with an elegant portico; the grounds agreeably varied and richly-wooded, and contain a handsome sheet of water, supplied by the river Kennet.

Caversham, — near Reading; C. Marsac, Esq.: is in Oxfordshire, though so near the capital of Berkshire. It is an old place, celebrated in "Observations on Modern Gardening," for the beauty of the approach, which is between two hills, with the scattered trees descending their steep sides, and approaching and retiring from the road in beautiful variation. The house is plain, elegant, large, situated on an eminence, and forming a conspicuous object from the surrounding country. The park is not extensive, but is much varied, so as to appear more considerable than the amount of its contents would indicate. The garden scenery is agreeable; but the horticulture not remarkable. The whole was laid out by Lord Cadogan, with the assistance of Brown.

Chelsey Farm, — near Wallingford; in 1800 the property of Lord Kensington, and formerly reputed to be the largest and most compact farm in England. Rent 1000*l*. per annum. Before the desolation of monasteries, it belonged to the Abbot of Reading, who had a seat here. The great barn in which his tythes were deposited is yet standing, and measures 101 yards in length, and eighteen in breadth. The side walls are only eight feet high, but the roof rises to a great height, and is supported by seventeen pillars, each four yards in circumference.

Coleshill House, — near Coleshill; Viscount Folkstone. The house is a perfect and unaltered specimen of the taste of Inigo Jones, from whose design it was erected in 1650. The park is not large, but is very agreeable.

Donnington Grove, — near Speen: William Brammel, Esq. The house is a handsome modern building. The park well wooded, and enriched by views to Donnington-castle. It contains a piece of water judiciously managed.

× *Park Place*, — near Henley; Earl of Malmsbury, son of the celebrated author of *Hermes*. Originally formed at great expence by Field Marshal Conway, and mentioned by the Prince de Ligne, in his *Coup d'œil sur les plus beaux Jardins de l'Europe*, as one of the finest seats in England. The present proprietor purchased the estate from the widow of the Marshal in 1796, and greatly improved the mansion, with the assistance of the architect, Mr. Holland. It is situated below the brow of a lofty range of hills, which accompanies the winding of the Thames for several miles. "The many interesting objects concentrated in this demesne, are calculated to excite even the most latent energies of poetic description. The grounds combine beauty, grandeur, and variety. The composition of the home scenery is bold, and the distant prospects varied and extensive. The steep sides of the hills, with their chalky precipices, are overhung with grand masses of stately beech, interspersed with evergreens, which extend to the margin of the stream, and from various points of the landscape, appear like an immense verdant amphitheatre. The projecting lawns correspond with the sublimity of the contiguous scenery, and unite in forming a diversity of rich and beautiful prospects.

Selwood Park, — near Sunning Hill; James Sibbald, Esq. The house is a handsome modern building from the designs of Mr. Robert Mitchell; the grounds consist of 200 acres, the principal part of which is laid out as a *ferme ornée*. A fine ride, of about four miles in extent, embraces the principal part of the scenery, which is richly diversified with stately trees and a large piece of water

× *White Knights*, — near Reading; Duke of Marlborough (1820). The house is a plain building, situated in the centre of the grounds, rather low, and close to an irregular sheet of water. This place is mentioned by Whateley as one of the earliest examples of a *ferme ornée*. The present proprietor has rendered it celebrated for its botanic riches, in which, if it does not surpass, it may vie with any residence in the empire. There is a large walled garden studded with hot-houses of every kind, and another surrounded by a hedge and sunk fence, laid out in the ancient style, and abounding with seats and curious rustic huts. The whole has been lately described, and illustrated by highly finished plates, from the pen of Mrs. and the pencil of Mr. Hoffland. See *Description of White Knights*, fol. 1819.

× *Woodley Lodge*, — near Reading; James Wheeble, Esq. The mansion is a neat, modern edifice, built by the present proprietor's father in the time of George II. The grounds were tastefully laid out by Repton, who mentions this seat in his work. The park having, in 1817, been greatly enlarged by an extensive enclosure; the author of the present work was employed to give designs, which have since been executing under the eye of the proprietor, who has great taste and considerable skill in rural improvements; and is a truly amiable man.

2165. *Royal Residences.*

Frogmore, (Frog-moor), — near Windsor; the favorite residence of the Queen of George III. The house is not large but neat: the grounds occupy a valley, thirteen acres of which is laid out in pleasure-ground, highly enriched by flowers and artificial objects. The whole is diversified with a piece of water, of irregular shape, and winding in different directions, in one place approaching the house, and in another retiring beneath the thick woods. "In this sweet, sequestered spot, every thing is serene and pleasant. The devious path, the umbrageous thicket, the dilapidated ruin, and secluded temple, all conspire to render it peculiarly interesting. Exclusive of the variety of indigenous and exotic trees and shrubs, which are scattered through the grounds, there are fine ornamental buildings respectively denominated the Gothic Temple, the Ruin, the Hermitage, the Temple of Solitude, the Chinese Cottage, and the Barn. The Ruin was erected from a design by W. Wyatt; and being seated on the water's edge, partly embowered in woods, and diversified with fractures in the walls, and ivy, it constitutes a truly picturesque ornament when seen from various points of view. The Hermitage is a small, circular, thatched building, situated in the south-west corner of the garden, and completely embowered with lofty trees. It was constructed from a drawing of the Princess of Hesse Homberg, when Princess Elizabeth, whose taste and skill in drawing are allowed to be considerable. The surrounding scenery is justly contrived to assimulate with the character of the place, the view of every distant object being excluded by trees and underwood. These improvements were superintended by Major Price, brother to Uvedale Price, Esq., the celebrated author of the "Essays on the Picturesque." *Beauties of Eng. and Wales*, (1801.), i. 268.

Since the death of the Queen in 1818, the grounds have been respectably kept up by the female part of the royal family who reside there.

Windsor Castle. The principal residence of the British sovereigns. It was originally a hunting seat of William the Conqueror; improved by Henry I., and the park surrounded with a wall; greatly improved by Edward III. under the celebrated architect, William de Wyckham, who, in 1357, superintended the works at a shilling per day, and ultimately made a fortune by the king's employment. Queen Elizabeth raised the terrace on the north side; Charles II. repaired and embellished the whole structure, and much was done by George III., under the direction of W. Wyatt. The avenues in the park were planted by Charles II., who also formed a bowling-green; but this, with a flower-garden formed by Queen Anne, were destroyed during the late and preceding reigns.

2166. GLOUCESTERSHIRE. A surface of 800,000 acres; elevated, hilly in many parts, and the climate cold; low, fertile, and humid, however, on the banks of the rivers, as in the vale of Gloucester. There are a number of nurserymen in this county, of which the principal are Sweet and Miller of Bristol, who are the most extensive garden tradesmen in the west of England. Miss Wheeler has a nursery at Gloucester, which was founded by her father, the author of a "Gardener's Dictionary."

2167. The following are *Villa Residences.*

Blaise Castle, — near Bristol; J. Harford, Esq. The house is an elegant Grecian design by Mr. Nash; the grounds are recluse, well wooded, and highly beautiful. Not far distant is a picturesque village of thatched cottages, also from the designs of Mr. Nash, the habitations of pensioners of the proprietor.

Buenos Ayres, — near Painwick; B. Hyett, Esq. The house is a handsome modern edifice, judiciously joined to woods, and embellished by new plantations.

Cheltenham. — Tomlyns, Esq. The gardener (Evans) has formed a brick drain along the front of his vine-border. This drain is furnished with hopper-funnels at each end, through which liquid manure is supplied to the roots unaccompanied by the unpleasant smells which are dispersed around when this manure is poured on the surface.

Prinknash, — near Tewkesbury; T. B. Howel, Esq. A low Elizabethean house, on an elevated site, commanding extensive prospects. Considerable improvements were made by the present proprietor in 1806.

2168. *Mansion* and *Demesne Residences.*

Badmington House, — Sodbury; Duke of Beaufort. The house is an extensive building, on a French model, erected in 1682; the park is nine miles in circumference, intersected by noble avenues. The gardens were celebrated in the first duke's time; but are at present rather neglected.

Barnsley Park, — near Bibury; James Musgrave, Esq. The mansion is a sumptuous edifice, in the Italian style. The park is three miles in circumference, and contains some extensive plantations.

× *Barrington Hall*, — near Great Barrington; Lord Dynevor. The house is an elegant Doric structure; in the grounds is a good specimen of a *ferme ornée*: the park is well wooded, and three miles in circumference.

Clear Well, — near Newlands; T. Windham, Esq. A handsome mansion, and plantations around it well disposed.

Dyrham, — near Sudbury; W. Brathwayte, Esq. A handsome mansion, with a front of 130 feet, and a park of 500 acres.

Dunstbourne Abbots, — near North Cerney; Sir M. S. Pleydell. A villa on a singular plan, situated on an eminence distinguished for the beauty of its scenery.

Guiting Park, — near Withington; — Snell, Esq. The house is elegant and compact, and the grounds beautifully varied and well wooded.

Highmeadow, — near Newnham; Lord Gage. A noble mansion, in a bold situation, containing a fine bird's-eye view of the village.

Highnam Court, — near Gloucester; Sir B. W. Guise. A mansion, by Inigo Jones; an extensive park, and pleasure-grounds judiciously disposed.

* *King's Weston*, — near Clifton; Lady de Clifford. The house, one of Vanburgh's best designs, in a situation rarely equalled for beauty and grandeur. The park abounds in fine oaks and elms; the pleasure-grounds with American plants; and there are good kitchen and flower-gardens. The views, towards the Severn and the Avon ravish the senses with their grandeur and beauty; and render this place one of the finest in the county.

Lydney Park, — near Lydney; Rt. Hon. C. B. Bathurst. An old mansion, and near it some fine woods.

× *Oakley Grove*, — near Cirencester; Earl Bathurst. A mansion in the old French style, amidst pines and other evergreen trees.

Rendcombe, — near Chedworth; S. Barrington, Bishop of Durham. The mansion is elegant, and the park extensive, abounding in wood, and furnishing fine prospects.

Sherborne House, — near Sherborne; Lord Sherborne. A monasterial-like mansion of two quadrangles; with two parks, each between three and four miles in circumference.

Southam House, — near Cheltenham; T. B. de la Bere, Esq. A venerable and far-famed mansion of Henry VIII. It is of two stories, and more entire than almost any building of that æra in England. The situation commands some fine prospects in front, and is backed by old and picturesque woods.

Stoke House, — near Clifton; Dowager Duchess of Beaufort. A spacious castellated house in an extensive park, commanding fine views along the vale of Bristol.

Stout's Hill, — near Uley; L. Baker, Esq. A handsome modern edifice with octagonal projections, turreted and ornamented in the pointed style, and surrounded by fine beech woods.

Stowell, — near Northleach; Lord Stowell. The house is on an eminence, in a pleasant park of 100 acres, embellished by well-arranged plantations.

Toddington House, — near Toddington; C. H. Tracy, Esq. A spacious Elizabethean building, with gardens and pleasure-grounds in the modern style, and a park of 150 acres.

Whitcombe Park, — near Malvern; Sir W. Hicks. Situated at the base of some commanding eminences, finely clothed with beech-trees.

Williamstrip, — near Colne; an elevated site, but the house well sheltered by plantations.

2169. WORCESTERSHIRE. A surface of 481,300 acres; hilly in many places, as at Malvern and Broomsgrove, but in general low and very fertile, as in the vale of Evesham. There are some good residences. The white onion is extensively grown near Evesham; crab-stocks, and currants for their fruit, at Pershore; from which place crab-pips are received by the London seedsmen.

Blackmoore Park, — near Malvern; T. Hornyold, Esq. An elegant modern building; the park well wooded, but rather in too formal a manner.

× *Croome Court*, — near Upton; Earl of Coventry. Naturally a dull flat place, but made what it is by Brown, who both designed the house, and laid out the grounds. This place has always been remarkable for the degree of neatness and order in which it is kept.

Dailsford, — at Dailsford; .... late the residence of Warren Hastings, Esq. A handsome house, in a commanding situation; the grounds tastefully laid out, and a piece of water formed; but the design of the whole evidently incomplete.

Galcomb Park, — near Mincinghampton; David Ricardo, Esq. A small place with a handsome house, beautifully disposed grounds, and a good kitchen-garden.

Hagley, — near Broomsgrove; Lord Lyttleton. A square house, with raised pavilions at the angles, in a park long celebrated for the beautiful undulations of its surface, and the fine scattered groves and thickets of beech and other tree.

seat, however, it is deficient in having no pleasure-
d or flower-garden scenery near the house. This
materially lessen the comforts of its possessors in the
r months, who must cross the open park before they
get to gravel paths of any kind. The original dell of
bery and waterfalls, formed by the first Lord Lyttleton
henstone, was denudated some years ago, and only the
r-trees left.

s Court, — near Upton ; J. Martin, Esq. An elegant
ion, lately built, situated on a rising lawn, studded with
ations in an elegant style of improvement.

sbury Hall, — near Droitwich ; J. Philips, Esq. A fine
nansion, dated 1710, full of large windows (the win-
ax being then unknown), with every thing com-
de within, and surrounded by a well wooded park of
cres.

vell Grange, — near Broomsgrove ; Earl Plymouth.
ry extensive house, dated 1712, in the midst of a plea-
park, with hills gently swelling, and a lake of about
res. The plantations are extensive, and abound with
in various stages of growth.

re Wyre, — near Tenbury ; ...... Pytts, Esq. An ele-
mansion, in a highly picturesque park, through which
a rapid stream ; the distant views, like all those in this
of the country, very picturesque, from its broken and
lating outlines, tufted with lofty trees, or smiling with
vation, and enlivened by the meandering course of the en-
ng Tame.

Castle, — near Kidderminster ; J. Knight, Esq. Re-
able for its kitchen-gardens and lofty hot-houses for
ng rare exotics, and in which the *Lee-Chi* ripened its
in 1819, for the first time in England. (1527).

dresfield (Mothersfield), — near Malvern ; Lord Beau-
p. A baronial castle modernized, surrounded by a fine
t of lawn and plantations.

Northwick, — near Broadway ; Lord Northwick. An ancient house modernized, with an extensive and well planted park.

Ombersley Court, — near Worcester ; Marchioness of Downshire. A mansion recently much improved, in the midst of a park, flat but extensive, and bordered by the Severn.

Stamford Court, — near Stedon ; Sir T. Winnington. A commodious and substantial house, situated in an ample park, containing two large pieces of water ; the whole rather deficient in plantations.

Thorn Grove, — near Worcester ; .—.... Lamotte, Esq. A plain mansion on an eminence, with an extensive lawn and serpentine lake, bordered with thriving plantations.

Tickenhill, — at Bewdley ; .—.... Ingram, Esq. A delightfully situated house, in a well-wooded park, commanding fine wild views over a dell to Wyre forest. Through the indulgence of the possessor, it is used by the inhabitants of Bewdley as a public promenade.

Whitley Court, — near Stockton ; Lord Foley. A newly-improved and improving seat, which, when the plantations are grown up, will be truly magnificent.

Westwood House, — near Droitwich ; Sir J. Packington. A fine old Elizabethean mansion, surrounded by garden courts, flanked by towers and other architectural appendages. It stands on an eminence in a very extensive park, much varied in surface, and with extensive oak groves commencing at a certain distance from the house, and extending outwards like the gores of a circle, leaving large avenues between. There is a piece of water of sixty acres, and situations where other pieces might be formed.

Winterdyne, — near Bewdley ; .... Moseley, Esq. A most elegant villa on a hill, embowered in deep tufted shades, covered in some places with ivy ; and surrounded with ornamented walks, interspersed with Gothic seats, towers, and hermitages, and displaying fine views of the Severn and its banks.

70. MONMOUTHSHIRE. A surface of 340,000 acres ; hilly, romantic, rich in pasture woodlands ; abounding in ruined castles, and containing some picturesque seats.

erth House, — near Llanerth ; T. Jones, Esq. A good
, by Mr. Nash, and agreeable grounds, with a piece of
r, laid out by Mr. Lappige.

ssern House, — near Newport ; late Sir Robert Salis-
Bart. A handsome brick house, on an eminence, sur-
ded by plantations, chiefly by Sir R. Salisbury, the late
rietor.

rsfield, — near Chipstow ; N. Wills, Esq. An elegant
e of free-stone ; the grounds extensive, celebrated by
sts for their romantic walks and views along a preci-
washed by the Wye, and described by Whateley in " Ob-
tions." The place owes its celebrity to Valentine Morris,
who began to improve it about 1740.

typool Park, — near Pontypool ; C. H. Leigh, Esq. A
antial mansion, wth most romantic grounds, well fur-
d with wood, water, rocks, some ornamental buildings,
excellent views.

Tredegar Park, — near Abergavenny ; Sir C. G. Morgan. A substantial brick mansion of the time of Charles II. ; the park extensive and finely diversified with variegated features, soft and abrupt, champaign and acclivous, covered with noble plantations of oak, beech, and Spanish chestnut.

Troy House, — near Monmouth ; Marquis of Worcester. A house by Inigo Jones, on the banks of the Trothy. This seat was famed for its gardens in Charles I.'s time, and especially for its delicious fruits. In the apophthegms of the Marquis of Worcester, it is stated, that " Sir Thomas Somerset, a very complete gentleman, delighted much in fine gardens and orchards. The same gardens were famous in Henry VIII.'s time, when in possession of William Herbert, who, we are informed by Evans's " *Letters on Wales*," 184, sent two men, by the names of Richards and Williams, to France and Flanders, for the express purpose of studying horticulture, and importing esculent vegetables and choice fruit-trees.

171. HEREFORDSHIRE. A surface of 600,000 acres ; much varied by hills, some of ich approach to the character of mountains ; it abounds in natural and planted woods, in ploughed and grass orchards ; and the soil is every where deep and rich. There are ne fine seats, and the county will hereafter be celebrated in gardening history as being birth-place, or residence of Uvedale Price, and R. P. and T. A. Knight.

mont, — near Lower Eaton ; —— Matthews, Esq. A
ntic situation on the Wye.

rington, — near Leominster ; Rt. Hon. T. Harley. A
e modern edifice of white stone, in a pleasant park.

Downton Castle, — near Ludlow ; T. A Knight, Esq.
Hort. Soc. Built by his brother R. P. Knight, Esq., the
rated author of "The Landscape," a poem ; of the
nalytical Inquiry into the Principles of Taste," and other
nt and classic works. The house is of stone, with
s, and embattled walls, but internally finished in the
ian style. The park abounds in inequalities of surface
natural woods, which stretch along the banks of the
e ; a stream which flows through the grounds to the
t of about three miles, over a rugged bed. There is also
siderable hill in front of the house, clothed with verdure
natural woods to its summit. On the whole, it is one of
most picturesque residences in England, and having,
in these few years become the residence of T. A. Knight,
promises to be equally celebrated in respect to horti-
ure.

ywood, — near Lyon's Hall ; Earl of Oxford. The grounds
lay a great diversity of scenery, and are ornamented with
fine plantations.

eley, — near Hereford ; Uvedale Price, Esq., the cele-
ed author of " Essays on the Picturesque." A plain brick
sion, beautifully varied by creepers, and surrounded by a
nificent amphitheatre of woods, chiefly oak, beech, and
planted by the father of the present proprietor ; but
ly of cedars introduced by the present occupier. There
fine views judiciously opened in many places, and small
es of water introduced as lights to fix the eye, with
r improvements which display the elegant and cor-
practical taste of the great reformer of landscape
ening.

rnons, — near Weobly ; S. G. Cotterel, Esq. Extensive
flourishing plantations, and fine prospects.

Hampton Court, — near Hope ; Earl of Essex. A mag-
ent Elizabethean mansion, on a lawn of nearly 100
s, surrounded by a park between seven and eight miles in
umference.

Harewood, — near Llanfrother ; Sir H. Hoskyns. The mansion lately improved ; the park well wooded.

× *Holm Lacy*, — near Hereford ; Duke of Norfolk. The mansion Elizabethean, and kept in perfect preservation as a national curiosity ; the grounds pleasant ; the old garden on the model of that at Hampton Court, Middlesex, with a spacious terrace : it abounds in yews, formerly clipt in shapes, and not far distant is a pear-tree which covers nearly a quarter of an acre, and yields annually from twelve to sixteen hogsheads of perry.

Hope-End, — near Ledbury ; J. Baret, Esq. The house and grounds recently improved from our designs ; the latter highly romantic by nature, and well wooded.

Kentchurch, — near Llanfrother ; J. Scudamore, Esq. (*Escuedamours*, *Ecuyer d'Amours*, squire or assistant in love matters.) A pleasant situation, with a park of three or four miles in circumference.

Longworth, — near Bromyard ; J. Walwyn, Esq. A good mansion, recently erected, and the grounds well timbered.

Moend Park, — near Llanfrother ; Sir R. Symmonds. A plain brick mansion ; but the grounds richly wooded.

Moccas Court, — near Longtown ; Sir G. A. Cornwall. A good house, delightfully situated on the southern bank of the Wye, with a large park, finely clothed with oak, and remarkable for a variety of that tree with weeping spray. The growth of the oak in this part of the country is supposed to be more rapid than any where else.

Rotherus, — near Hereford ; C. Bodenham, Esq. A spacious brick mansion, and grounds containing some good timber.

Shobden Court, — near Mortimer's Cross ; Lady Bateman. An elegant seat ; the park between three and four miles in extent, contains rich and picturesque scenery.

Stoke, — near Bromyard ; Lord Foley. A spacious brick house, with a terrace in front : the park and grounds well wooded, and considerably improved under the direction of H. Repton.

Sufton Court, — near Bromyard ; —Hereford, Esq. A handsome mansion of Bath stone ; and grounds improved by H. Repton.

172. SHROPSHIRE. A surface of 849,940 acres ; hilly, and containing some mountains ; soil generally good. It contains a number of good nurseries ; and sends to London king-plums and walnuts.

ton Park, — near Oswestry ; W. Lloyd, Esq. A most
nt mansion, and the natural beauties of the place much
roved by the correct taste of the owner.

Hawkstone Park, — near Whitchurch ; Lord Hill. A good
sion, on a beautiful slope on the north side of a roman-
ill ; the grounds extensive, and combining beauty and singularity. There are bold cliffs, grotesque rocks, most romantic walks, a hermitage, and many other buildings and seats ; a long artificial river formed along a slope, and every where the finest trees. On the whole, it is, and has long been, a place to excite wonder, and also agreeable emotions.

The Leasowes, — near Hales Owen; ———— A pasture farm, chiefly celebrated as having been the residence and the creation of Shenstone. Some of the root houses and grottos in the paths which lead along the hedges, and in the strips of copse and dingles, still remain.

Oakley Park, — near Ludlow; Lady Clive. The mansion on the banks of the Tame; the grounds naturally romantic, and laid out with much taste and judgment.

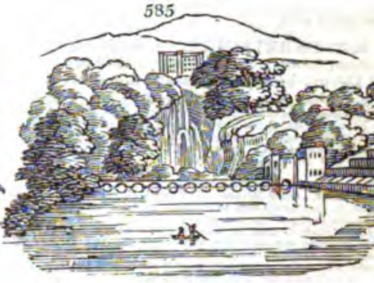
2173. STAFFORDSHIRE. A surface of 780,800 acres; hilly and moory towards the north, but plain and fertile in the other parts. It contains a number of villas and mansion residences, and nurseries are established at most of the principal towns.

Botley, — near Newcastle; J. Wedgewood, Esq. A superb villa mansion, surrounded by highly polished pleasure-grounds, with an excellent kitchen-garden.

Beaudesert, — (fine desart), near Stafford; Marquis of Anglesea. A magnificent residence, improved from a comparatively rude state (*fig.* 584.), by the late Earl of Uxbridge, who, with the aid of H. Repton, formed a large piece of water, planted variously, and rendered the house more conspicuous. (*fig.* 585.)

584

585



Belmont, — near Ipstone; J. Sneid, Esq. The house, pleasantly situated on a gently rising hill, fronting the south-east; nearly surrounded by deep woods, furnished with underwood of ash, hazel, birch, willow, &c., cut every six years for hoops and crate-ware for the potteries. The walks through these woods are rude, natural paths; and on the bordering spaces, not covered with copse, are planted many hardy plants, and there left to grow without farther culture. On the whole, this is a place combining the justest taste, great knowledge of culture, agricultural as well as horticultural, and a strict regard in all things to economy in the first expence and future management.

× *Blithfield Park*, — near Abbots Bromley; Lord Bagot. An Elizabethean building, placed at one side of the park, which is rich in large oaks and picturesque views. Lord Bagot pays considerable attention to horticulture, and cultivates successfully the *loquat-apple*, of which he has given some account in the *Horticultural Society's Transactions*.

Broughton-hall, — near Stafford; Sir T. Broughton. An ancient mansion, surrounded by stately plantations of indigenous trees, especially sycamores. The park is divided by the road; but no art has been used to mark the appropriation of the opposite part to that in which the house stands.

× *Enville*, — near Enville; Earl Stamford. The house, a large brick structure of an impure Gothic character; the grounds formerly celebrated, but now chiefly remarkable for a fine lawn, some old trees, and a cascade formed by Shenstone.

Hagley-hall, — near Rugstone; Lord Curzon. A finely situated house, and the artificial scenery around it very judiciously disposed.

× *Ingestre-hall*, — near Stafford; Earl Talbot. A respectable Elizabethean edifice, surrounded by grounds in the ancient style, but in a great degree modernized by the present proprietor.

Little Aston, — near Tamworth; ———— A splendid mansion, surrounded by an extensive lawn, finely varied by trees, and embellished with a noble lake. Over the latter is thrown a very handsome stone bridge, and opposite to it stands an elegant stone conservatory.

Prestwood, — near Dudley; Sir Thomas Littleton. A fine modern house, the surrounding pleasure-grounds exhibiting a most delightful variety of hill and dale, wood and water, effected chiefly by the hand of nature.

Sandon, — near Newcastle; Lord Harrowby. An elegant mansion, finely situated on the declivity of a considerable eminence, commanding noble and luxurious prospects.

Sandwell Park, — near West Bromwich; Earl Dartmouth. A quadrangular brick building, stuccoed, situated in a romantic valley, and surrounded with a charming lawn, laid out with the highest degree of taste and judgment.

× *Shugborough-house*, — near Rudgeley; Lord Anson. An elegant Grecian mansion, in a low situation, *over-watered* by the Trent. The grounds were laid out at great expence by the late Thomas Anson, Esq. and contain numerous and well-executed ornamental buildings, in different styles of architecture. The present proprietor cultivates a farm in a very scientific manner.

× *Trentham*, — near Newcastle-under-line; Marquis of Stafford. A low situation, with abundance of water, and some rising grounds. Great expence has lately been incurred on the house, and a fine mausoleum built opposite the entrance gates, from the designs of Mr. Tatham; but nothing will ever render this place truly grand. The kitchen is good, and no nobleman encourages any kind of improvement more than the present Marquis.

2174. WARWICKSHIRE. A surface of 639,760 acres; elevated, not much varied, well wooded towards the north; the other parts fertile in corn and minerals. There are many neat cottage gardens in the county, especially near Coventry. The principal nursery is at Birmingham, and there are several market-gardens for the commoner culinary crops near that place.

Ansley-hall, — near Oldbury; I. N. Ludford, Esq. An irregular mansion, with an extensive park, in which, on an insulated spot, is a Chinese temple, by Sir W. Chambers; and in another appropriate spot is a hermitage.

Aubrey-hall, — near Astley; F. P. Newdigate, Esq. An elegant specimen of the florid Gothic, divested of the exuberant and grotesque; the park fine and extensive, well-wooded and adorned with artificial expanses of wood and water.

Bilston-house, — near Bilston: Hon. J. Simpson. A spacious but irregular mansion, entered by iron folding-gates, which conduct to a venerable porch. The gardens are extensive, and preserved in all the formality of the old taste. One walk is still termed Addison's, whose seat this was, and where he generally resided after his marriage with the Countess of Warwick. The grounds being let, are going fast to decay.

Guy's Cliff, — near Warwick; B. Greathead, Esq. A singularly picturesque combination of rock, wood, meadow, and the windings of the Avon, with a mansion respectable, both in size and character.

Merevale, — near Atherstone; D. S. Dugdale, Esq. A handsome residence; the grounds particularly rich in fine and venerable oaks.

Whitby-hall, — near Coventry; Lord Hood. A capacious Elizabethean mansion of stone, commanding agreeable views. The park and gardens agreeable, but rather neglected.

2175. The following are *first-rate Residences*.

Coombe Abbey, — (Cwm, or Cumbe, a low or hollow place), near Coventry; Earl Craven. A noble mansion, in part by Inigo Jones, in a park of 500 acres, well varied by wood and water.

× *Ragley-hall*, — near Alcester; Marquis of Hertford. A specious mansion, improved by Wyatt, on the summit of a round knoll, in an extensive park abounding in majestic oak trees, and also in young plantations, with a fine lake and every feature worthy of this noble seat. The kitchen gardens are noted for the extent of their hot-houses, and for the cultivation of the pine-apple, especially of the Providence kinds.

× *Warwick Castle*, — Warwick: Earl of Warwick. An ancient Gothic structure, on a steep rock rising from the Avon, with a large garden-court, flanked by towers, and with a gate and portcullis, &c. in a truly baronial style, and in excellent preservation. The park is very extensive and finely adorned by wood, and watered by the Avon, as well as some artificial lakes. The pleasure-grounds contain a fine course of broad gravel-walks, and some luxuriant and bulky cedar-trees.

2176. LEICESTERSHIRE. A surface of 522,240 acres; low, generally flat, and one of the richest grazing counties in England. It does not abound in gentlemen's seats; and the farmers, though often rich, have seldom good gardens.

Beaumanor, — near Ashby de la Zouch; W. Herrick, Esq. The park extolled for picturesque beauty, combined with serenity and sublimity of character; it abounds in venerable oaks, ash, elm, and willow.

× *Donnington Park*, — near Donnington; Marquis of Hastings. A magnificent pile of ecclesiastic Gothic, by W. Wilkins, sen. surrounded by a park containing very old trees. The building is in a bottom, half earthed up, and the approach descending to it has a very bad effect. The pleasure-grounds contain a small piece of water, and were laid out by H. Repton.

Gopsal-hall, — near Bosworth; Lady Howe. An elegant mansion, which, with the improvements on the grounds, is said to have cost 100,000*l*. In the park are some fine temples and carved seats.

Lockington-hall, — near Keyworth; Rev. P. Stony. The grounds much improved by the present possessor.

Prestwould-hall, — near Prestwould. C. J. Packe, Esq. A large modern mansion and finely wooded park.

Quenby-hall, — near 'Frisby; Mrs. Latham. A large building on a finely wooded avenue, with a terrace-walk commanding very fine prospects of hanging hills with scattered woods and neatly cultivated enclosures.

Stanton Harold, — near Bredon; Earl Ferrars. A large pile of brick and stone, in a park of 150 acres, containing a lake of thirty acres, and a handsome stone-bridge.

Wanlip-hall, — near Leicester: Sir G. C. Hudson. The pleasure-grounds laid out with much taste.

2177. DERBYSHIRE. A surface of 720,640 acres; hilly, irregular, and in some parts mountainous; the valleys rich and beautiful. There is a good nursery and florists' garden at Derby, by Joseph Mason, and some neat cottage gardens in the county.

Bretby Park, — near Bretby; Earl of Chesterfield. A fine old structure was taken down some years ago, which is said to have been surrounded with gardens disposed after the plan of Versailles, with terraces, statues, and fountains. See a bird's-eye view by Kip, in *Nouveau Theatre de la Grande Bretagne*, and *The Topographer*, vol. ii.

Chaddesdon, — near Derby; Sir R. M. Wilmot. A neat villa with a good kitchen-garden.

Foremark, — near Repton; Sir Francis Burdett, Bart. The house is an elegant and substantial modern building; and the park and gardens respectable.

Locke Park, — near Locke; William Drury Lowe, Esq. The grounds are naturally much varied, and contain a handsome artificial lake; but the plantations having been made when the geometric taste was in fashion, do not accord well with the variations of surface.

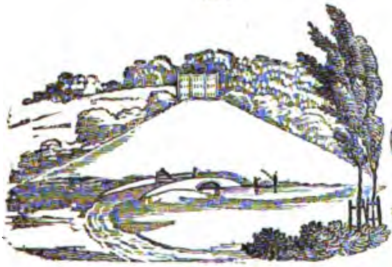
Osbaston, — near Derby; Sir Robert Wilmot. The house is a large handsome edifice; the grounds were laid out by Mr. Eames; the pleasure-grounds occupy five acres, and are very agreeably disposed.

Shipley, — near Belper; E. M. Munday, Esq. The house is modern and elegant, the grounds very well disposed and wooded, and the gardens celebrated of late for their orange-trees.

Willersley Castle, — near Matlock; R. Arkwright, Esq. The castellated mansion is romantically situated in Matlock Dale, and surrounded by lawns, rocks, natural woods, and washed on one side by the Dove. The kitchen-garden and hot-houses are good and well attended to.

Wingerworth, — near Chesterfield; Sir William Hunlocke. A noble seat, improved from a comparative bald state (*fig.* 586.) by Repton, who enlarged the water, and planted some trees, and gave breadth to the lawn in front of the house (*fig.* 587.)

586



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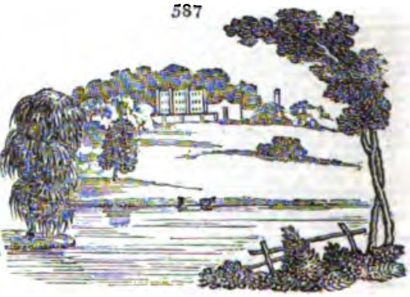

2178. The following are *first-rate Residences*.

× *Chatsworth*, — near Bakewell; Duke of Devonshire. The most celebrated seat in Derbyshire. The palace is an immense quadrangle in the Grecian style; the park lies sloping to the river Derwent, and is nine miles in circumference; it is much diversified with hill and dale, and plantations. The pleasure-grounds are in the ancient taste, and contain the best artificial water-works in England.

× *Haddon-hall*, — near Bakewell; Duke of Rutland. One of the most complete baronial residences now remaining, and though not inhabited, kept in good repair. The extent of the building, and the number of apartments and offices, are calculated for the display of a very extended hospitality; the hall, or great public dining-room, is particularly admired. The park was ploughed up many years ago; the terrace-gardens remain, and consist of terraces ranged one above another, each having a stone balustrade.

× *Hardwick-hall*, — near Normanton: Duke of Devonshire. The house is of stone, and built by Elizabeth Countess of Shrewsbury, whose passion for building is well known: it is also celebrated as having been the place of confinement of Mary, Queen of Scots. The park abounds in fine old oaks, and contains the ruin of a former castle, in which is a room noted for the justness of its proportions, and said by Kennet, to have been thought a fit pattern of measure and contrivance of a room at Blenheim.

× *Keddleston*, — near Derby, Lord Scarsdale. The house is a Grecian pile by Adams, and one of the handsomest in England. The park is five miles in circumference; it contains a fine sheet of water, with cascades and islands, and a venerable grove of oaks.

2179. NOTTINGHAMSHIRE. A surface of 495,360 acres; gently varied, fertile, dry, and healthy, containing the remains of the extensive forest of Sherwood. There are good nurseries, and also some market-gardens and orchards at Retford and Nottingham, and ree-seeds are collected about Worksop and other places.

Alston Grove, — near Nottingham: Sir G. Clifton, Bart. The approach to the house, through an avenue a mile in length, covered with turf, and broad enough for a dozen carriages, to drive abreast. The gardens on the side of a hill originally in the ancient taste, but lately remodelled.

Clifton-hall, — near Nottingham: Sir G. Clifton. Pleasantly situated on the Trent, and deeply embosomed in groves of oak and elm.

Colwick-hall, — near Nottingham: ——— Musters, Esq. A house by Carr, in a bottom, but backed by rising hills, well wooded, and surrounded by neat pleasure-grounds.

× *Clumber Park*, — near Worksop: Duke of Newcastle. A large house: the park containing 4000 acres, and eleven miles in circumference, abounds in plantations, picturesque irregularities, a large piece of water, and a highly enriched bridge. Near the house, however, it is dull and flat.

Kirklington-hall, — near Southwell: Mrs. Whetham. A large edifice, with an undulating lawn, descending to an umbrageous piece of water, surrounded by easy swells.

Nettleworth, — near Mansfield: embosomed in wooded hills, among which two brooks have been expanded by art into irregular lakes.

× *Newstead Abbey*, — near Mansfield: — Tolldman. The building, and such of the grounds as have been purchased by this gentleman, are undergoing improvements: but the place is chiefly remarkable as having been the scene of improvements of Lord Byron, grandfather to the present Lord. When in its splendor, the house was situated in a vale, in the midst of an extensive park finely planted, with a winding lake flowing almost up to the house, with two cannons on the banks, a Gothic prospect house, a fine arch, &c. The gardens contained an ancient Gothic green-house, leading to a flower-garden, formed on what was once the burying-ground of the church, in which is a large circular vault, with a pedestal of white marble, and inscription in memory of the Newfoundland dog buried below.

Ossington-hall, — near Laxton: J. Dennison, Esq. The house unites elegance and comfort; the pleasure-grounds agreeably laid out, and the park extensive.

Osberton-house near Retford: ——— Foljambe, Esq. An elegant modern seat, surrounded by thriving woods and verdant glades, and watered by a rivulet, which expands to a lake.

Staunton, — near Newark; — Staunton, Esq. A noble mansion and gardens and pleasure-grounds, beautiful and extensive.

Trampton-hall, — near Barton: J. W. Emmerton, Esq. A mansion in the style of James I.; the gardens neat and agreeable, and the surrounding scenery picturesque.

× *Thoresby Park*, — near Worksop: Earl Manvers. A comfortable house, in a low situation, well backed with rising ground, thickly planted, and forming part of the park, which is thirteen miles round, and contains some fine pieces of water. The gardens were in part constructed in the French style, by the late Duchess of Kingston.

× *Welbeck Abbey*, — near Worksop; Duke of Portland. A handsome lake by H. Repton: the kitchen-gardens, celebrated in the time of Speechly, but for many years neglected. The park, being part of the forest of Sherwood, abounds in old oaks, and contains numerous young plantations of oak, sheltered by birch, sown or planted by Speechly.

× *Woolaton-hall*, — near Nottingham; Lord Middleton. A square structure, with towers at the angles, and an elevated prospect-room in the centre, executed by John Thorpe, in Queen Elizabeth's time. It is approached by a winding avenue of lime-trees, nearly a mile in length. The park is extensive; the kitchen-garden well managed; the gooseberries grown in pots, and sent to table in that state.

Winthorpe hall, — near Muskham; R. Pocklington, Esq. An elegant building with plantations, and grounds very extensive.

2180. LINCOLNSHIRE. A surface of 1,783,680 acres; great part on the sea-shore, flat and fenny; the wolds, which occupy the north-east, as the word (Saxon) imports, are hilly and void of wood. The London seedsmen receive hemp, turnip, rape, and mustard-seed, from this county; and sell there large quantities of parsley seed, which the farmers sow with their clovers, as a preventative to the rot in sheep. Some garden seeds for the supply of the Yorkshire seedsmen are grown in the Isle.

Burwell Park, — near Burwell; B. Lester. Esq. A handsome mansion, in a commanding situation, surrounded by a park, abounding in timber. Dr. Matthew Lester, great grandfather of the present owner, was physician to Charles I., and is mentioned by Parkinson as one of his patrons in botany.

Caleby-hall, — near Lincoln; General Bertie. A fine old house, with modern additions, and surrounded by thriving plantations.

Grimsthorpe Castle, — near Edinham; Duke of Ancaster. An irregular pile, chiefly by Vanburgh, on a beautifully undulated lawn, descending to two lakes, comprising about 100 acres, beyond which is a rising ground covered with trees.

Panton House, — near Wrayley: E. Turner, Esq. A house by Hawksmoor, a pupil of Sir John Vanburgh, afterwards enlarged by Mr. Carr of York: the park much improved by plantations.

2181. The following are *first-rate Residences:*

× *Belvoir Castle*, — near Belvoir; Duke of Rutland. A magnificent castellated structure, on the summit of a conical hill, rebuilt from the design of H. Wyatt; commanding views over several counties. The park, of great extent, containing a very complete dog-kennel, and the gardens good.

× *Burleigh*, — near Stamford; Marquis of Exeter. One of the most splendid old houses and spacious parks in the kingdom; the house in the Elizabethean style; the park modernized by Brown, who formed a handsome expanse of water, and removed many terraces at the house to form a lawn. A copious account of this place, with views, has been published by Mr. Drakard, of Stamford.

2182. RUTLANDSHIRE. A surface of 128,000 acres; varied, but composed chiefly of fortile vallies.

× *Burley-on-the-hill*, — near Oakham; Earl Winchelsea. The house, a magnificent structure, ranking with Burleigh, Belvoir, Castle Howard, and similar edifices. It was built after the Reformation, by the Earl of Nottingham, in the Doric style. The park contains 1065 acres, abounding in large oaks, and all kinds of forest-trees; the lawn is extensive, and contains a curious grotto, and other decorations. The entrance front of the house has a court-yard, separated from the road by a superb iron-railing; and on the garden front is a terrace-walk, 300 yards in length, and 12 broad.

Exton-hall, — near Stratton; — Noel, Esq. A grand Elizabethean edifice, with a park of 1510 acres, planted in the ancient style, by London and Wise: the gardens have long been famous, and the water and cascades much admired.

Normanton-house, — near Normanton; Sir G. Heathcote. An irregular modern mansion; a well-planted park of 400 acres; and gardens neatly laid out.

2183. NORTHAMPTONSHIRE. A surface of 617,000 acres; fenny towards the north-east; but, in general, elevated, varied, and abounding in country-seats. There are some nurseries; and Cornfield, a florist at Northampton, is considered one of the first growers of the carnation.

× *Althorpe*, — near Brington; Earl Spencer. A large pile, dated 1688, in a park distinguished by large masses of wood, and considerable inequality of surface.

× *Castle Ashley*, — near ¡Ashley; Earl Northampton. A large pile, by Inigo Jones, on a gentle eminence, in a park containing a large lake, by Brown.

× *Cranford Bridge*, — near Cranford; Sir G. Robinson. A modern house, surrounded by an extensive lawn and pleasure-grounds.

Deene Thorpe Park, — near Deene; Earl of Cardigan. A low embattled structure, with a turret terminating each wing; the grounds beautifully varied, well wooded, with a fine piece of water, an island, and various ornamental buildings.

Fawsley-house, — near Fawsley; — Knight, Esq. A motley building of different ages; the park, a fine improved demesne, abounding with forest scenery and water.

Kelmarsh, — near Kelmarsh; W. Hanbury, Esq. A large mansion, with pleasure-grounds pleasingly diversified with the contrasted positions of wood and water.

Rushton-hall, — near Rothwell; ————. A very tastefully disposed seat, by the late possessor, the Hon. W. Cockayne.

Upton-hall, — near Northampton; T. S. W. Samwell, Esq. A large irregular building, on a gravelly soil, displaying fine views of the distant scenery.

Wakefield Lodge, — near Towcester; Duke of Grafton. Delightfully situated on a gentle eminence, which slopes to a large lake, formed by Brown.

2184. YORKSHIRE. A central, and, in part, marine county, of 3,698,880 acres; the surface varied, containing several mountains, extensive moors, and some royal forests; the subsoil most generally rocky or stony; no public garden or park; a subscription botanic-garden at Hull, and nurseries and market-gardens at all the large towns. It abounds in residences, especially in the West-Riding, where nearly 400 are mentioned in the "Beauties of England and Wales," as worthy of notice. The farmers' gardens are kept in a good state in the better parts of the county; and at Leeds there are some neat cottage-gardens. There is a horticultural society held at Leeds, the chief promoter of which is J. Carr, of St. Anne's; and the same gentleman is active in his endeavours to set on foot a botanic-garden. Chapel Allerton near this town, noted when in the possession of R. A. Salisbury, Esq. is now a public nursery.

The Hull Botanic Garden — was established in 1812, by subscription. It occupies 5 acres, and is arranged on the same general plan as that of Liverpool, having been laid out chiefly by Shepherd, the curator of that garden. The principal walks which surround and intersect the garden are eight or nine feet broad, and form a total length of nearly three quarters of a mile; particular quarters are set apart for bog, alpine, and green-house plants; a pond thirty yards in length, for the growth of aquatics, and at the south-west corner of the garden a mount twelve feet high, admitting, though itself surrounded by trees, an extensive view of the Humber, the Lincolnshire coast, and the Wolds. The country round Hull being almost without trees, the shady walks of this garden form an agreeable resource as a promenade for the families of the subscribers. The curator is Mr. William Donn, nephew to the late curator of the Cambridge garden.

Nurseries. — There are a number in this county, and some are of great extent. The oldest establishments are at York and Pomfret; the first carried on by J. Packhouse. Pontey has a considerable nursery at Huddersfield, and there are others of greater extent at Cottenham, near Hull, and at Doncaster. The seed of the York cabbage is supplied by Rigg and Son of York.

2185. *Mansion* and *Demesne Residences.*

Aldworth Hall, — near Rotherham; J. S. Foljambe, Esq. Charmingly situated on an eminence rising from the Don, and skirted with wood down to the river.

Allerton Mauleverer, — near Knaresborough; Lord Stourton. An elegant mansion, in a park of 400 acres of very rich land, and charmingly picturesque. It contains a fine octagonal tower, from which are obtained extensive views.

Birdsal, — near Malton; Lord Middleton. A spacious and commodious mansion and pleasure-grounds well planted and arranged.

Bradford, — at Bradford; —— Hustler, Esq. An ingenious horticultural amateur, who has a good garden and collection of hardy herbaceous plants.

× *Bramham Park*, — near Tadcaster: J. L. Fox, Esq. A stately mansion; the grounds laid out in the last century, in the ancient style, afford a good specimen of geometrical gardening.

Brocklesby Hall, — near Elsham; Lord Yarborough. The park extensive, and diversified with plantations and rising grounds, containing a fine Gothic chapel and mausoleum, by

Wyatt. Considerable improvements taking place in the kitchen-garden by substituting espaliers for standard fruit-trees, which had rendered the garden like a closely planted orchard.

Bilham House, — near Doncaster: W. Hewitt, Esq. The grounds contain a Belvedere (*Bel*, Italian, fine, beautiful; and *vedere*, to see,) which commands the most extensive and richest prospect in Yorkshire.

Burton Constable, — near Hedon: F. Constable, Esq. A park spacious though flat, abounding in trees with extensive walks, a large piece of water, and elegant bridge.

Cave Castle, — near Southcave: H. B. Barnard, Esq. A small but extremely pleasant park, with very large gardens and pleasure-grounds.

Copgrove, — near Knaresborough. H. Duncombe, Esq. An elegant mansion on a rising ground, with a pleasing prospect of the lawn, and a fine sheet of water, bounded with wood winding out of sight beyond a distant hill.

Cusworth Hall, — near Doncaster; W. Wrighton, Esq. An elegant mansion, in one of the finest situations in the kingdom. The grounds are every thing that could be desired in a moderate space; the prospects extensive in all directions over a delightful country embellished with gentlemen's seats, churches, and other enlivening objects.

Denton Park, — near Otley: Sir H. C. Ibbetson. A noble structure, commanding fine views of the vale of Wharf.

Everingham, — near Market Wrighton; M. Constable, Esq. A large and lofty brick mansion in a flat country; the park with a successful imitation of a river.

Finningley Park Cottage, — near Bawtrey: ——— Harvey, Esq. A curious and elegant shooting cottage, surrounded with every sporting convenience.

× *Farley Hall*, — near Otley. An elegant mansion, high on the side of an immense bank, commanding extensive views of the bank opposite, across the vale of Wharf. The kitchen-garden and farm well attended to.

Grimstone Garth, (Grimstone Hill), — near Heydon; T. Grimston, Esq. A superb baronial mansion, on an elevated site in a hilly park.

× *Hackfall*. (Hag-fall, *i. e.* Witches' fall or valley), near Ripon: Miss Laurence. A singularly romantic scene, composed of a steep rocky declivity, descending to a woody glen; the walks along the declivity showing finely varied views, a cascade, and, at an elevated point, Mowbray, a prospect of which M. Gilpin says, nature has worked with her broadest pencil.

× *Hackness*, — near Scarborough: Lady Johnstone. Remarkable for the gardens and pleasure-grounds, executed in a superior style of elegance, in a vale, with a terrace-walk commanding extensive views, and a green-house richly stocked with exotic plants.

Howsham Hall, — near Kirkham: H. Cholmley, Esq. A large and elegant mansion, on a swell rising from a beautiful valley: the pleasure-grounds finely embellished with plantations, but the views rather confined.

Holme, — near Howden: Hon. W. Stourton. A seat on a moor, susceptible of great improvement, and of possessing, at no great expence, a range of pleasure-grounds, which, in magnificence and picturesque beauty, not many places in England could excel.

Kirkleatham-hall, — near Guisborough: Sir C. Turner. An excellent mansion by Carr; the gardens extensive, and laid out with much taste; they contain an octagonal temple, and with the house, the whole has an air of princely grandeur.

Ledston Lodge, — near Abberford: M. A. Taylor, Esq. A handsome mansion, in a fine open country, with agreeable pleasure-grounds.

Melburn, — near Pocklington: Sir H. Vavasour. A handsome brick mansion, in a flat country, finely ornamented with plantations.

Melton-on-the-Hill, — near Doncaster: R. T. Wilson, Esq. A good house and fine grounds, with those extensive prospects so general in this part of the country.

× *Mulgrave Castle*, — near Whitby: Earl Mulgrave. A Gothic house in a commanding situation on the sea coast, the approach roads much admired, and the verdant and marine views both very extensive.

Newby-hall, — near Ripon: Lord Grantham. A brick mansion, supposed by Sir C. Wren, in 1705: the pleasure-grounds laid out with most correct taste.

Owston, — near Doncaster: an elegant structure on a rising ground in the centre of a rich and fertile country; the estate enlarged and a good *arrondissement* formed by the exertions and purchases of the present proprietor.

× *Plumpton*, — near Knaresborough; Lord Harewood. Remarkable for its pleasure-grounds, which are studded with detached rocks resembling large coal cinders; it contains also a lake abounding in sinuosities. The whole scene of twenty acres is supposed to have been formed out of an old quarry; like the beautiful garden mentioned by Brydone (Travels in Sicily) near Syracuse.

Ribstone-hall, — near Knaresborough; Sir H. Goodrick. A house on an eminence, the grounds remarkable for containing the original tree of the Ribstone-pippin.

Sandbeck (Beck, *i. e.* stream,) — near Tickhill: Earl of Scarborough. A magnificent Grecian mansion in a valley, surrounded by high grounds and plantations, containing a fine piece of water and many miles of gravel walks.

Sedmere, — near Bridlington: Sir M. M. Sykes. A mansion from the proprietor's own designs, executed in a superior degree of elegance; the pavilions, hot-houses, green-houses, and other ornamental appendages, all in the most elegant and appropriate style.

Streethorpe, — near Doncaster: G. C. Yarborough, Esq. A handsome modern mansion, and the plantations and pleasure-grounds laid out with great judgment and taste.

Skelton Castle, — near Gainsborough; J. Wharton, Esq. An extensive-fronted mansion, on the banks of a stream which has been expanded into a lake, and appropriate planting and other alterations made in the grounds.

× *Spofforth*, — near Witherby; Hon. and Rev. W. Herbert, an eminent botanist and horticultural amateur. The gardens are rich in curious bulbs and other rare plants.

Sprotbrough Hall, — near Doncaster: Sir J. Copley. A mansion of Charles the Second's time, commanding delightful views of verdant scenery.

Stockeld Park, — near Wetherby: W. Middleton, Esq. In the grounds is a lake, and on its margin, near the house, a rock of a very singular shape, sixty-five feet in circumference and thirty feet high. It is supposed to have given rise to the name of the seat, as Stockheldt, in German, signifies the base or pedestal of an image or statue.

× *Studley Royal*, — near Ripon; Miss Lawrence. The pleasure-grounds used to be reckoned the finest in England. They occupy a valley furnished with a brook swelled into ponds, and forming various cascades, terminating in the fine ruin of Fountains Abbey. They abound in seats and buildings, and contain 300 acres, and the park 700 acres.

Thirkleby Hall, — near Thrickelby: Sir T. Frankland. A good house, by Wyatt, and the grounds and gardens remodelled, partly from the proprietor's own ideas, and partly from those of the late Mr. Meikle. They contain some fine old common pine-trees (*P. sylv.*) and a good kitchen-garden.

Wentworth Castle, — near Barnsley: H. Vernon, Esq. An extensive fabric, on a considerable eminence, surrounded by an extensive park, containing a piece of water. Half-way down the slope, forming, from the house and grounds above, a zone of light which to a stranger has a strange and unnatural effect. Near the house the grounds indicate the remains of the geometric style, and contain some fine cedars and other exotics, and a flower-garden of embroidery.

Wheatley Hall, — near Doncaster: Sir G. Cooke, Bart. On the banks of the Don, in a low but beautiful situation, and decorated with some of the finest oaks in the country.

2186. *First-rate Residences.*

Castle Howard, — near Malton; Earl of Carlisle. A magnificent palace, by Vauburgh, with a front of greater extent than that of Blenheim; the grounds not favoured by nature, but containing a large piece of water and some old woods, considerably enlarged and improved by the present Earl. There are several ornamental buildings in the grounds, and especially a superb mausoleum.

× *Duncombe Park*, — near Helmsley; C. S. Duncombe, Esq. A superb house, by Vanburgh, with a terrace adjoining, which affords delightful prospects over a fertile valley to wooded hills. The grounds contain an Ionic temple and other buildings, and abound in fine trees.

× *Harewood House*, — near Leeds: Lord Harewood. An extensive Corinthian mansion, by Carr, much esteemed for its exterior effect as well as internal arrangement: the grounds laid out by Brown, who formed a large piece of water, and subsequently some improvements were made from H. Repton's designs.

× *Wentworth House*, — near Rotherham; Earl Fitzwilliam. A most magnificent Grecian mansion, erected by the present Earl, consisting of a centre and two wings extending above 200 yards in length; the park contains upwards of 1500 acres, beautifully varied, embellished with a large expanse of water, and containing a marble monumental column and family mausoleum.

2187. DURHAM. A surface of 610,000 acres, mountainous and moory towards the west, but rich in pastures and woodlands towards the east and south. Mustard-seed has long been grown in this county.

Bassingbourne Hall, — near Stanstead: Sir P. Parker. A small place, but the mansion elegant.

Bradwell Lodge, — near Hockley: ————. The house is an elegant building designed by J. Johnson, Esq. with an observatory on its summit. The grounds may be noted as containing decoys for game.

Bathorne House, — near Birdbrook: G. Pyke, Esq. The house was modernised in 1801, and stands in a large park, finely disposed into pleasure-grounds.

Belchamp Hall, — near Belchampwalter: Rev. Sam. Raymond. A specious mansion, fine terrace, and beautiful lawn.

× *Braxted Lodge*, — near Kilvedon: P. Du Cane, Esq. A handsome mansion, pleasantly situated on an eminence, near the centre of a small park, commanding fine views.

Burnhall, — near Merrington: B. Salvin, Esq. A low, recluse, and much improved spot.

Castle Eden, (Castle in the den), — near Watergate; R. Burdon, Esq. A handsome castellated house, on the top of a woody precipice, which descends to a romantic defile.

Croxdale Hall, — near Butterby; W. Salvin, Esq. The house occupies a lofty situation on the Ware, and the grounds are beautifully wooded.

Eggleston House, — near Eggleston; —— Hutchinson, Esq. Occupies a lofty situation on the banks of the Tees, surrounded by plantations, enclosing a garden noted for its botanical collection.

Grange Hall, — near Darlington. G. Allans, Esq. A modern mansion, pleasantly situated, containing an extensive museum of natural history.

Greencroft, — near Lanchester: Sir T. Clavering. A plain but large mansion; and pleasant grounds, ornamented with buildings and plantations.

Newton Hall, — near Durham: Sir T. Liddel. A plain mansion, surrounded by plantations, and containing fine views.

Ravensworth Castle, — near Gateshead: Sir T. H. Liddel, Bart. A modern mansion, sheltered by a fine forest of oaks.

Shincliffe Hall, — near Durham: R. Scott, Esq. A good house, sheltered by a beautiful amphitheatre of hanging woods.

Stub House, — near Winston: —— Harrison, Esq. A respectable modern building, with pleasant grounds and thriving plantations.

Wynyard, — near Gretham: Sir H. V. Tempest. An elegant residence, combining hospitable comforts, and an attractive mixture of varied ground, woods, and waters.

Woodlands, — near Lanchester; T. White, Esq. sen. and successor to the eminent landscape-gardener of that name. A neat mansion, and extensive plantations on a dreary and bleak moor, now rendered beautiful, comfortable, and valuable.

2188. **The following are *first-rate Residences*.**

Gibside, — near Thyton; Earl Strathmore. The mansion is situated on the east side of the Derwent: the park is four miles in circumference, much varied in surface, and well clothed with fine old oak-woods. The winding approach to the house along the brink of a wooded glen; the banquetting-house; the Ionic column of 120 feet, crowned with a statue of liberty, the terrace, and chapel, are much admired.

Hardwicke, — near Sedgefield: M. Russel, Esq. Created from a bog by the former proprietor, J. Bindon, Esq. and now celebrated for the beauty of its pleasure-grounds and the elegance of its ornamental buildings. The improvements were commenced in 1750. The terrace, the bathing-house, the lake, the winding-river, the cascade, the temple, the rivers, and the banquetting house, are much admired.

Lambton Hall, — J. G. Lambton, Esq. A modern building by Bonomi; the grounds lately much improved, and the kitchen-gardens containing a great extent of hot-houses.

Lumley Castle, — near Chester-le-street: Earl Scarborough. The mansion is a quadrangle of the æra of Edward I. placed on the brow of a well wooded valley. At each exterior angle is an octagon turret, machiolated for the purpose of annoying assailants, and in different parts are other ancient arrangements of a former age, rarely now to be seen in the oldest edifices.

Raby Castle, — near Staindrop: Earl Darlington. A noble Gothic pile, on an elevated, rocky foundation. It affords a fine example of magnificence and comfort in the large entrance hall, into which carriages drive before the visitors are set down. The park, pleasure-grounds, and plantations accord with the dignity of the castle. There is a terrace commanding extensive prospects, 750 yards in length. The farm is extensive, and highly cultivated; the farm-yard is close to the castle, and excluded from the view by an embattled screen. The dog-kennels and stables are rendered interesting architectural piles, and on the whole, few places in the empire are so magnificent, so complete, and so well kept up.

Sellaby Hall, — near Sellaby: Earl of Darlington. A freestone and blue slate villa; the grounds disposed with great taste and judgment; the stables are arranged so as to form an ornamental group subordinate to the mansion; and the effect of the whole highly beautiful.

2189. NORTHUMBERLAND. A surface of 1,157,760 acres, much varied by hills and mountains; fertile and well cultivated in the vallies, and abounding in ruined castles. Hexham is noted for the growth of onions, and there are extensive nurseries at Gateshead, near Newcastle, carried on by Falla and Son, and at Morpeth. Brown, the celebrated landscape-gardener, was born at Cambol, or Camphill, near Hartburn, in this county.

Babworth, — near Retford; the Hon. J. B. Simpson. A comfortable residence; the pleasure-grounds laid out in good style by H. Repton.

Chipchase Castle, — near Wark: J. Reed, Esq. A delightful residence, with woods, rocks, and waters, and scenery in all respects enchanting.

× *Gosforth House*, — near Newcastle: C. J. Brandling, Esq. A mansion by Mr. Pain, and the grounds surrounded by a broad belt of wood, and varied internally by clumps, and a piece of water by Mr. White.

Heaton Hall, — near Newcastle: M. W. Ridley, an elegant house by Mr. Newton, the translator of Vetruvius, erected in 1713, on the steep and woody banks of Ouseburn.

Whitfield-hall, — near Newbrough; W. Ord, Esq. The house surrounded by high and bold rocks, and hanging woods thick with hollies, with which the lawn, being in high keeping, forms the finest contrast.

2190. *First-rate Residences.*

Alnwick Castle, — Alnwick: Duke of Northumberland. A most extensive castellated pile, with curious ornaments: the grounds of great extent, watered by the river Alne, and well wooded. The kitchen garden lately much improved by a range of hot-houses erected from the designs of J. Hay, Edinburgh.

Belsay Castle, — near Stamfordham: Sir C. M. L. Monck. A grey house, with a venerable tower, on rising ground, finely interspersed with single trees, and thick groves of wood.

Chillingham Castle, — near Chillingham: Earl Tankerville. A square heavy structure; in a very extensive park, containing a large herd of deer, and another of the *white Scottish bison*, shy, wild, and savage.

Howick, — near Alnwick: Earl Grey. A noble structure by Newton, of Newcastle, in a park near the sea, which has been lately much improved.

Seaton Delaval, — near North Shields: Lord Delaval. A mansion by Vanburgh, and a fine Gothic chapel: the grounds extensive, and containing an obelisk and mausoleum.

2191. LANCASHIRE. A surface of 1,155,840 acres; mountainous and rugged towards the north and east, the other parts nearly plain, rich, but the climate moist. Near the large towns, and assemblages of operative manufacturers, it abounds in neat cottage-gardens, remarkable for their excellence in the culture of the gooseberry, and of florists' flowers. This county has long been noted for its florists' societies, and also a botanical society held at Warrington; and it is now distinguished by the Liverpool Botanic Garden, one of the first in England.

The Isle of Man, which adjoins this county, contains nothing remarkable in the way of gardens; but it is the birth-place of Kewley, the inventor of the *Artificial Gardener*.

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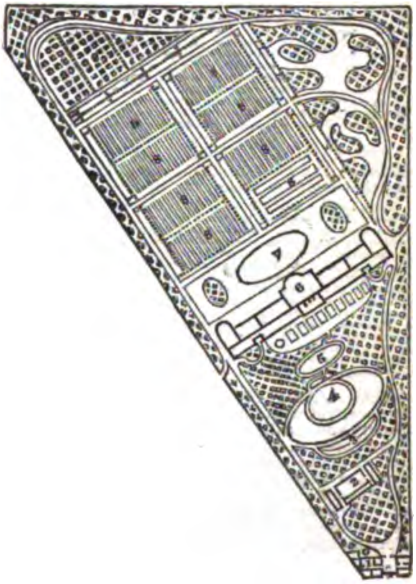

Liverpool Botanic Garden — was established by subscription, chiefly through the influence of the celebrated W. Roscoe in 1800, and opened in 1803. It contains upwards of five acres, in a triangular form (*fig.* 588.). It is entered between lodges (1, 1), which contain the curator's house, committee-room, &c.; and to this a library of natural history is to be added as soon as circumstances will permit. A walk surrounds the garden, and leads successively to the stove (2), rock plants (3), bog plants (4), green-house ground (5), conservatory (6), aquarium (7), herbaceous plants (8), and gramineum (9). The garden was laid out by Mr. John Shepherd, the curator, who published a catalogue of the plants in 1808; and to whose industry, and extensive correspondence, the garden owes, in a great part, its present flourishing condition.

Florists' Gardens. — The principal of these exclusively devoted to the culture of flowers for sale are, Nicholson, and Horrock, both of Bolton. Taylor and Smith are extensive florists at Manchester, and combine also the nursery business. Thomas, at Middleton, near Manchester, has a good assortment; and there are above half a dozen good commercial florists at Oldham.

Adlington Hall, — near Chorley; Sir R. Clayton. A modern house, on a gentle elevation, finely embosomed in wood.

× *Browsholme*, — near Whalley; T. L. Parker, Esq. A large Elizabethean mansion, in a conspicuous situation; the park the remains of an ancient forest, but rather denuded.

Duckingfield Lodge, — near Ashton; lately F. D. Astley, Esq., author of "Hints to Planters." An irregular pile, on a steep hill, with a broad terrace, and grounds particularly grand and romantic.

Haddow Hall, — near Little Milton; T. Weddel, Esq. A most romantic and picturesque situation.

Haigh Hall, — near Wigan; Earl of Balcarras. A venerable mansion, and grounds, remarkable for a summer-house built of Cannel coal.

Heaton Lodge, — near Manchester; Earl Wilton. A handsome stone edifice, by the late Samuel Wyatt, Esq., on a commanding situation, in the midst of a fine park, five miles in circumference, and enclosed with a stone wall. The entrance lodges in Doric, and the mansion in the Ionic style.

Orford-hall, — near Warrington: J. Wakefield, Esq. The garden here was formerly rich in botany; and a catalogue of the plants was published by the gardener, Mr. Neale, in 1779.

Townley-hall, — near Burnley; J. Townley, Esq. A large venerable structure, forming three sides of a quadrangle; the park, enclosed in Henry VII.'s time, contains some very old oaks, which, with the contiguous mountains and distant country, present various combinations of grand and picturesque scenery.

2192. *First-rate Residences.*

Ashton-hall, — near Lancaster; Duke of Hamilton. An old baronial castle, in a park abounding with noble woods and fine marine views.

Knowlesley Park, — near Prescot; Earl of Derby. An ancient mansion and very extensive park, greatly improved by the present owner. The kitchen-gardens are extensive and well managed; and near them is one of the largest aviaries in England. The gardener here excels in growing cucumbers, which he produces at table every day in the year.

2193. CHESHIRE. A surface of 676,000 acres; generally level, with a moist climate, and deep rich soil. There are a number of market-gardens in this county, for the supply of Liverpool, and the shipping; Altringham is famous for the carrot, which bears its name. There are good nurseries at Nantwich and Knutsford; and neat cottage and fine flower-gardens in several places.

Alderley Park, — near Alderley; — Stanley, Esq. Chiefly remarkable for its beech grove, the trees of which are among the largest in the kingdom.

Brom-hall, — near Stockport; W. Davenport, Esq. The mansion is in the Gothic style, and very ancient. The site is elevated, and the prospects are pleasing, over a winding brook in a wooded bottom.

Bolesworth Castle, — near Barn-Hill; Sir O. Moseley. The house is spacious, and in the Gothic style; and the grounds, though possessing little natural beauty, have been judiciously laid out.

Bromborough-house, — near Bromborough; James Manwaring, Esq. The mansion is a handsome building, of the red stone of the country, and the grounds are pleasant, and judiciously laid out.

× *Booth's-hall*, — near Knutsford; P. Legh, Esq. The mansion is plain, the park extensive, and varied by some fine pieces of water.

Carden, — near Farn; John Leech, Esq. The mansion is a venerable building, and the park and grounds are spacious and beautiful.

× *Durham Massey*, — near Altringham; Earl Stamford The mansion is a spacious brick quadrangle; and the park which surrounds it is extensive, and full of fine timber. Some of the oaks are of extraordinary magnitude; and in their tops is a heronry, where many herons associate, and build in society like rooks. The pleasure-grounds are extensive, and well arranged.

Hyde-hall, — near Hyde-Chapel; George Hyde Clark, Esq. The house ancient, and the grounds picturesque and elegant.

Lyme-hall, — near Alderley; John Legh, Esq. The house is a quadrangle, in the style prevalent in James II.'s reign. The park is not well wooded, but remarkable for its trees.

Poynton, — near Stockport; Sir George Warren. The mansion is an elegant Ionic building; the park extensive, and the pleasure-grounds beautifully disposed.

Peel-hall, — near Halton; the property of the Earl of Plymouth. It is one of the most magnificent old mansions in the county, though now only occupied as a farm-house.

2194. The following are *first-rate Residences.*

Cholmondeley-hall, — near Malpas; Earl Cholmondeley. A spacious mansion has lately been erected; and the grounds laid out by Mr. Webb.

Crewe-hall, — near Wyburnbury; John Crewe, Esq. The mansion is a fine structure, by Inigo Jones; and the grounds are judiciously laid out.

× *Eaton-hall*, — near Eaton; Earl Grosvenor (*gros* and *veneur*, Fr.; or grand huntsman; an ancestor of this family having been in this capacity to the King). The house was originally built by Sir John Vanburgh, but has lately been remodelled, in the Gothic style, by Mr. Hardwick. The park is extensive, and, with the gardens, have been much improved from the designs of Mr. Repton.

× *Tatton Park*, — near Knutsford; W. Egerton, Esq. The house is from an elegant design of Mr. Wyatt; the park contains 2500 acres, including a *mere*, or lake, of some extent; the kitchen garden is large, and contains a spacious well-constructed pinery, and shady border for mosses.

2195. WESTMORELAND. A surface of 462,080 acres; much varied by lofty mountains, naked hills, and moors, that call aloud for planting and draining.

Colgarth, — near Ambleside; —— ——. The residence of the late Bishop of Llandaff; chiefly deserving notice for its extensive and judiciously managed plantations.

Curwen's Island, — in Wynandermere-lake, near Ambleside; J. C. Curwen, Esq. A Roman villa, with a dome, in the centre of a small island, well wooded, and the walks and gardens arranged from the designs of the late T. White, Esq. the landscape gardener of the north.

× *Lowther Castle*, — near Lowther: Lord Lonsdale. A first-rate residence, the mansion castellated by Mr. Smirke, of rose-tinted white stone, with an outer and inner court, and a terrace as a basement 500 feet long and 100 feet wide: the whole building rather low for the style of architecture, but in other respects excellent. The parks and pleasure-grounds are of great extent, and command a variety of prospect and scenery, not surpassed perhaps in any other part of the British dominions. There is a terrace of closely mown turf: the grasses of the finest mountain kind. It is nearly a mile in length, and runs along the brink of a limestone cliff, which overlooks a great part of the park, irregularly scattered with forest trees of immense growth and well stocked with deer. It was this park that Lord Macarteney compared to the garden of the Emperor of China at Gehol.

Rayrigg-hall, — near Kendal; Rev. T. Fleming. On the banks of Wynandermere; and said to resemble Ferny, the celebrated seat of Voltaire, near Geneva.

Rydal-hall (Rye-dale), — near Kendal; Sir F. Le Fleming. A romantic seat on a mountain side, clothed with natural oak woods, and celebrated for its waterfall.

Warton, — near Carlisle; J. Jackson, Esq. The gardens resemble those of Kensington; and are said to have been laid out by Mollet, James II.'s gardener, for the Scaiffe family, successors from Edward II.'s time till within the eighteenth century.

2196. CUMBERLAND. A surface of 970,000 acres, entirely mountainous, and abounding in lakes, the most numerous and celebrated of any county in the empire: as in the other north-western counties, the climate is severe, and winter long and dreary.

Corby Castle, — near Carlisle: Henry Howard, Esq. The mansion has lately been improved from the designs of Mr. Nicholson; it is boldly situated on the banks of the Eden, which are well-wooded by nature, and singularly grand and picturesque. The grandfather of the present owner began to lead walks through these grounds in 1706, and is said to have been one of the first persons who broke through the trammels of the ancient style of laying out grounds. The late Mr. Meikle, who was a good deal employed to lay out grounds in the north of England, was originally gardener here.

Muncaster House, — near Ravenglass: Lord Muncaster. Great improvements have been made by planting the bleak hills on this estate; his lordship has also irrigated extensively, and is a very spirited agriculturist.

Nunnery, — near Penrith; Rich. Bambey, Esq. The house is in a low confined situation; but the grounds are extremely beautiful, and laid out with great taste and judgment. They lie along the banks of the Eden whose rugged bed produces several cascades and one waterfall of nearly twelve feet.

Ponsonby Hall, — near Egremont: G. E. Stanley, Esq. The house is modern, and surrounded by numerous plantations and agricultural improvements made by the present spirited owner.

× *Workington Hall*, — near Whitehaven: J. C. Curwen, Esq. The house is a spacious quadrangular building; the park and pleasure-grounds are extensive, and the home farm celebrated, for it ranks Workington and Curwen with Holkham and Coke, Woburn and Bedford.

2197. HAMPSHIRE. A surface of 1,112,000 acres, considerably varied in character of surface, yet without high hills. The Isle of Wight is a detached portion, remarkable for its beauty and fertility; the Downs, a chalky ridge, are bare of timber. The New Forest and Bere Forest occupy large tracts near Southampton, and are the principal *tree-bearing* royal forests in the management of the government: on the borers of Dorsetshire there are large tracts of heath, and on the sea-shore extensive marshes. There are several nurseries at Southampton, of which the principal is that of Page. There is a horticultural society held at Winchester by some gentlemen and gardeners of the county. In the Isle of Wight, at St. Laurence cottage, there is a vineyard managed by a regular vigneron. At Fratton, near Portsmouth, is grown the Portsmouth broccoli, so much esteemed.

Appuldurcombe, — near Godshill, *Isle of Wight*; Sir R. Worsley. A Corinthian mansion of free-stone, with four fronts, in a spacious park in the midst of an amphitheatre of hills, ornamented with trees of large size, and commanding fine prospects.

× *Avington*, — near Winchester; Earl Temple. A brick mansion, in a secluded well-wooded valley.

Belle Vue, — near Southampton; J. Jackson, Esq. A superb modern house, commanding a most exquisite prospect over the Southampton water, with extensive gardens and hot-houses, and an excellent botanical collection.

Bevis Mount, — near Southampton; Edward Horne, Esq. A mount in a bay of the river, and laid out as a wilderness, by Charles Mordaunt, Earl of Peterborough, in Pope's time. His lordship is said to have refused to let strangers see the grounds, unless during high water.

Bonchurch Cottage, — near Bonchurch, Isle of Wight: —— Hatfield, Esq. A comfortable and picturesque house in a most romantic situation.

Bradwell Lodge, — near Hockley: —— ————. The house is an elegant building, designed by J. Johnson, Esq., with an observatory on its summit.

Bramshill, — near Hartley Wintney: Rev. R. Cope. An Elizabethean edifice on an eminence, in a spacious park, and one of the most commanding features of the county.

Broadlands, — near Rumsey: Lord Palmerston. A neat edifice of white brick, in a well-wooded park.

× *Cadland*, — near Southampton: R. Drummond, Esq. The house is plain, but commodious; the park was laid out by Brown, and is five miles in circumference. The whole is in high keeping.

Castle Malwood Cottage, — near Lyndhurst: A. Drummond, Esq. A high situation, with extensive views; the garden kept in high order.

Cams Hill, — near Portsmouth: J. Delmé, Esq. An elegant modern building, in a pleasant park, on the east side of the lake of Portsmouth Harbour.

Cranbury House, — near Winchester: Sir N. Nolland. An extensive mansion; good kitchen-garden and fine prospects.

Cruckeaston, — near Lichfield: ——. Once the seat of Edward Lisle, Esq. author of "Observations on Agriculture;" he died in 1722, having had twenty children, seventeen of whom survived him. Of these nine, sisters, constructed a grotto which has been celebrated by Pope in his Rural Essays,

(This radiant pile nine rural sisters raise, &c.)

and of which only the shell now remains.

Cuffnells, — near Lyndhurst; —— Rose, Esq. A handsome residence, greatly improved by the late owner, the Right Hon. G. Rose; the grounds and part of the forest are every thing that can be desired. The late Mr. Eames, when called in to give his professional assistance, found nothing to do but to arrange the pleasure-ground scenery and the kitchen garden. The whole is now kept in respectable order.

× *Dogmersfield Park*, — near Odiham; P. St. John Mildmay, Esq. The mansion is extensive; the park contains 700 acres, much diversified in surface, and by old woods, new plantations, and a lake of forty-four acres. The pleasure-grounds were laid out by Eames. In the plantations the ash is much and successfully cultivated for hop-poles.

Elvetham, — near Hatford Bridge; Lieut.-Gen. Gwynne. An elegible residence; the park and grounds two miles in circumference, laid out by Mr. Eames, who had a lease of this estate for twenty-one years.

Exbury-house, — near Exbury; Col. Mitford, author of the "History of Greece," by whom the grounds have been greatly improved. The demesne is about eight miles in circumference.

Fairy Hill, — near Ryde; Rev. H. Oglander. A neat house, and the grounds disposed as a *ferme ornée*.

Fernhill, — near Wooten Bridge, *Isle of Wight*: C. Chute, Esq. The house bears some resemblance to a church; the prospects are remarkably fine, and the kitchen-garden good.

Froghill, — near Calbourne; F. Barrington, Esq. A small, but elegant house, and grounds disposed with much taste.

Gatcombe-house, — near Carrisbrooke, *Isle of Wight*: A Campbell, Esq. Beautifully situated on the declivity of a hill, and the park ornamented with natural oaks and coppice-woods.

Grange Park, — near Northington; H. Drummond, Esq. The house by Inigo Jones, and said by Walpole to be one of his best works: the grounds varied and beautiful.

× *Hackwood Park*, — (Hawking Wood), near Oldleasing: Lord Bolton. The house lately improved; the park very extensive, bold, and irregular, and finely clothed with noble beech-trees, many of which, near the house, are mantled with ivy. The pleasure-grounds contain 100 acres, and afford examples of an aquatic menagerie, a verdant theatre, French garden, and music temple.

× *High Clere*, — near Lich-field: Earl of Carnarvon. The mansion, an elegant modern structure of brick, stuccoed; the park thirteen miles in circumference, and few in the kingdom display a surface more varied, or scenery more interesting. Almost every thing has been done by the present owner, who is also a great encourager of horticulture.

Hurstbourne Park, — near Whitchurch: Earl of Portsmouth. The mansion by W. Wyatt: the grounds delightfully wooded, and furnishing fine prospects.

Mottisfont-house, — near Romsey: Sir C. Mill. A spacious and venerable edifice, with commodious gardens and pleasure-grounds, noted for their plane-trees.

Moyle's Court, — near Ringwood: — Lisle, Esq. A good building in a park, small, but agreeable.

Newtown, — near Boldre; H. C. Plowden, Esq. A spacious and elegant mansion, with a circular room at the top, from which extensive views are obtained. The gardens are small, but neatly kept.

Norris, — near East Cowes, *Isle of Wight*: Lord Seymour. A Gothic edifice, with an extensive front, by J. Wyatt, Esq. The park small, but affording fine marine views.

Northcourt-house, — near Shorwell: R. Bull, Esq. A building of the time of James I., with the grounds nearly in the same state as originally disposed, in ranges of small terraces, with seats, and walls for fruit.

Paultons, — near Fordingbridge: Lord Mendip. The whole demesne is about five miles in circumference: it was submitted to Brown, who thinned the natural woods, and opened ample lawns.

Pilewell-house, — near Boldre. A beautifully situated house, with lawns and pleasure-grounds, extending to the sea-side.

Portswood-house, — near Southampton: G. Stiltebert, Esq. A handsome building by Mr. Crunden, situated close to Southampton Water, with extensive pleasure-grounds, beautifully diversified.

Priory, — near St. Helen's Green, *Isle of Wight*: Sir Nash Grose. This demesne consists of a narrow strip of ground, about a mile in length, extending along the shore: both house and grounds have been much improved by their present owner.

Red Rise, — near Stockbridge: H. Errington, Esq. Pleasantly embosomed in woods, and surrounded by open downs.

Stoneham Park, — near Winchester: Mrs. Fleming. An old mansion, recently much improved: the park extensive, and laid out by Brown.

St. Lawrence Cottage, — near Undercliff: Sir R. Worsley. Here a vineyard has been formed, and is now directed by a French vigneron (vine gardener). It was begun in 1792; occupies three acres of rocky ground, sheltered from the north. Muscadines are chiefly planted in beds, twelve feet wide, and the plants a foot and a half apart each way. The stools are kept at about eight inches high, and two shoots are annually grown from each, to succeed. the two of the former year then in fruit. These shoots are not allowed to extend more than three feet and a half. A pleasant, light wine is made from the grapes.

× *Stratton Park*, — near Winchester: Sir F. Baring. The house and grounds recently much improved: the gardens and hot houses extensive, and well managed.

Vine, — near King's-Clere: W. Chute, Esq. The situation rather low; the grounds well wooded.

2198. *First-rate Residence.*

Strathfieldsay, — near King's-clere Duke of Wellington. The house, now undergoing great alterations, is rather low; the park is extensive and well wooded. The alterations are by Mr. Wyatt, the architect of Drury-lane theatre.

2199. WILTSHIRE. A surface of 821,120 acres; elevated, varied, but not much wooded: the climate dry and cold. Gary and Moody, nurserymen, near Salisbury, grow the best crocuses in England, of which they send large quantities annually to London, and other parts: there is a famous grower of ranunculuses and anemonies at Marlborough, and a good nursery at Devizes, besides various market-gardens. *Savernake Forest*, in Tottenham Park, is the only one in the kingdom belonging to a subject.

Ashcombe, — near Cranbourne: P. Methuen, Esq. The house is singularly situated on an isolated knoll, which has been not unaptly compared to an inverted basin, placed in the middle of a large China bowl.

Braemore, — near Downton: R. Brestow, Esq. An Italian villa, by Mr. Falkham, of which the stables are of a very superior kind. The grounds and exterior scenery highly picturesque and beautiful.

Clarendon Lodge, — near Salisbury: F. H. Bathurst, Esq. A commodious modern edifice, surrounded by extensive grounds, abundantly wooded, and containing a natural lake, from which issues a stream.

Coneyfield-house, — near Downton: Sir A. Paget. A true *ferme ornée*: the fields regularly encompassed with ornamental hedge-rows and trees, with generally a turf drive, or a gravel-walk: the views from these hedge-paths are extensive.

Earl's Stoke. — Connected with this spot is a rustic village *by design*. It consists of several cottages placed on the sides of the road, each detached from the others, and every one accompanied by its garden-creepers, trees, honey-suckles, &c.

Lake-House, — near Ambresbury; Rev. Edw. Duke. A respectable, and truly picturesque edifice, with bay windows, gables, yew hedges, terraces, &c. in the genuine style of the last age.

Liddiard Park, — near Wooton Basset; Lord Bolingbroke. Extensive grounds abounding in fine old trees, and containing a fine pond of water.

Longford Castle, — near Salisbury; Earl of Radnor. A house remarkable for its ground-plan, which was intended to resemble the catholic monogram of the Trinity, erected about 1591, from the designs of John Thorpe. An entirely new structure, in the castellated style, is in contemplation. The park is rich in woods and picturesque views, and is watered by the Avon.

Littlecot Park, — near Ramsbury; E. L. Popham, Esq. Four miles in circumference, well wooded, and containing a hill, and the river Kennet passing through the pleasure-grounds.

Melchett Park, — near Downton; J. Osborne, Esq. The grounds remarkable for a beautiful Hindu temple, erected by the late owner as a tribute to the merits of Warren Hastings, Esq.

Pyt-House, — near Wardour; J. Bennet, Esq. A modern Grecian edifice, with an elegant chapel attached, and pleasure-grounds extensive, and laid out with considerable taste.

Roche-Great-Court, — near Salisbury; F. T. Egerton, Esq. An Italian house, by C. H. Falham, Esq., and 2000 acres of ground, laid out as park, garden, and farm scenery.

Rood Ashton, — near Trowbridge; R. G. Long, Esq. A mansion lately improved, and a park of considerable extent, abounding in woods.

× *Tottenham Park*, — near Marlborough; Earl of Ailesbury. This seat, including Savernake Forest, is sixteen miles in circumference; the whole intersected by numerous walks and avenues, eight of which diverge from a common centre. The house is a square brick building with wings; opposite to it is a lofty column, erected by a late earl as a testimony of gratitude to its former possessor.

Wilcot-House, — near Upheaven; Admiral Montague. A modern mansion, adorned with a finely wooded park, bounded by a branch of the Avon.

Wilbury-House, — near Amesbury; Sir C. W. Malet. A comfortable stone house, with a park recently planted, and likely to be soon eminently deserving notice.

2200. *First-rate Residences:*

× *Bowood*, — near Calne; Marquis of Lansdown. An extensive mansion, chiefly by Adams, on an eminence, in a park, and pleasure-grounds extensive, greatly diversified in natural features, and richly adorned with plantations. Within the boundary of the park are contained numerous valleys, each of which is characterized by its own peculiar form, feature, and scenery, and one is covered by a broad and irregular lake, the waste waters of which flow over a much-admired artificial cascade.

Corsham-House, — near Corsham: P. C. Methuen, Esq. An Elizabethean house, altered and enlarged by Browne, and subsequently, in a very superior style, by Mr. Nash. The grounds, laid out by H. Repton, are extensive, but little varied. A hot-house and conservatory have been erected by Mr. Stewart.

Charlton Park, — near Malmsbury: Earl of Suffolk. A noble pile, by Inigo Jones, but unfurnished: the park extensive, but at present cultivated as a farm.

× *Fonthill Abbey*, — near Hindon: W. Beckford, Esq. A magnificent and unique mansion, in imitation of a Gothic abbey, in style, situation, and surrounding scenery very peculiar, and considered the most remarkable seat in the west of England. "The natural and scenic features of this place are bold, grand, and highly diversified. Nearly the whole of an eminence, which gradually ascends from the open country on the north, and from a fine inclosed country to the south, is covered with woods, some of which are of ancient growth, but the greater part planted by the father of the present possessor. From the apex of a hill, amidst a grove of ancient pines, rises the lofty tower, turrets, pediments, and pinnacles of a mansion, which assumes externally the character of an ancient monastic edifice. It consists of a central tower about 270 feet in height, a lofty entrance hall, a vestibule, a wing, or transept, extending from the tower to the east, and two other wings, branching off from the centre to the north and south. The exterior elevations of each of these portions is dissimilar to the others, and each is appropriated to the different accommodations and purposes of an elegant and commodious mansion. State-rooms, gallery, libraries, eating-rooms, parlours, drawing-rooms, &c. are fitted up in a truly splendid style; and adorned with the choicest works in literature and the fine arts. The architect of the whole was James Wyatt, Esq., and many of the most eminent artists of the country were employed in finishing the interior."

The abbey is approached by a broad avenue of turf, upwards of a mile in length, on the summit of a ridge, the sides of which are thickly wooded. A public road formerly intersected the park, but that road is now in great part arched over, and lighted by openings at intervals. There are numerous green drives, (the subsoil being chalk; these are always dry,) and gravel-walks, which conduct through the grounds, and especially the woods, the under-growths of which, in many places, are formed of the most choice sorts of roses and American plants, purchased and placed in their appropriate soils at great expense, and afterwards left to run wild. There are whole acres of azalias, rhododendrons, mangolias, &c. which have a most delightful effect. Herbaceous plants are equally profusely scattered; and there are a few seats and buildings, but these are chiefly confined to the lower grounds, where there are several large pieces of water, cascades, grottos, &c. near to the site of the former Grecian mansion. This we were fortunate enough to see before its removal in 1806. The kitchen garden is good, and no expense spared to render it productive in exotic as well as hardy esculents and fruits.

× *Longleat*, — near Warminster; Marquis of Bath. A magnificent mansion, and the proudest architectural ornament of this part of Wiltshire, built in the latter part of the 16th century from the designs of an Italian architect. The grounds were laid out in Charles II.'s time by London and Wise, and subsequently remodelled by Brown, whose plans were followed by the late Marquis to his death in 1796, and have been continued by the present proprietor. A broad and luxuriant valley contains the house and a large sheet of water: the park stretches up the sides of the surrounding hills, covered by the finest old timber, and fifteen miles in circumference; the approach from the south is a straight avenue nearly a mile; the others are different, and that from the Warminster road displays nearly the whole of the domain.

Stoke Park, — near Devizes; J. Smith, Esq. A house and offices, with a front of 356 feet, on the summit of an eminence, surrounded by a well wooded and watered park, in which the pleasure-ground occupies a narrow winding valley, containing a rivulet, the waters of which, form several cascades. On the whole, few spots in England present such a combination of lawn, hill, vale, waters, and diversified plantations.

× *Stourhead*, — near Mere; Sir R. C. Hoare. The mansion from the designs of Colin Campbell, author of the *Vitruvius Britannicus*: the grounds long noted for their Sylvan beauties and picturesque features. The scenery consists of ridges of hills, forming long extended terraces, and deep narrow valleys with rivulets. The sides and summits of some of these eminences are thickly, and others partially, clothed with wood. One of the valleys is covered with water by means of a dam, and various cascades are formed on the brooks: throughout the whole place, temples, obelisks, bridges, covered seats, and other buildings are introduced.

Wardour Castle, — near Salisbury; Earl Arundel. A large magnificent mansion, by Paine in 1776, the grounds are much diversified in surface and by planting, and they contain the ivied ruins of the old castle.

× *Wilton*, — near Wilton; Earl Pembroke. An extensive pile, of rather incongruous architecture, by Hans Holbein, Solomon de Caus, Inigo Jones or his successor Webb, and James Wyatt, Esq. The park contains some ornamental buildings, old trees, and pieces of water.

2201. DORSETSHIRE. A surface of 775,000 acres, divided in two parts by a range of chalk hills, which run east and west: the climate dry and healthy, and the soil rich. Near this county is the Isle of Jersey, which, with Guernsey, supply roots of the Amaryllis sarniensis to the seedsmen, and some grapes to the fruiterers. Parsnips are grown to a great size in these islands; and there is a general taste for flowers, and neatness in the gardens, to which their mild winters are particularly favorable. The Arum maculatum is so abundant in the Isle of Portland, that the common people gather the roots, prepare them as sago, and send the produce to London, where it is sold as Portland sago.

Encome, — near Kimeridge; William Morton Pitt, Esq. The situation is extremely fine, and the grounds are disposed with much taste. On this estate, in 1753, was found a mushroom that weighed eight pounds, was fifteen inches long, ten round, eight deep, and almost in the form of the figure 8.

Kingston Hall, — near Poole; Henry Bankes, Esq. The house was erected in 1663, and is large and substantial. The kitchen garden is well attended, and the park scenery good.

Lullworth Castle, — near Lullworth; T. Wild, Esq. The house is a noble pile; the park occupies a circuit of nearly four miles, and has lately been much improved.

× *Milton Abbey*, — near Milton Abbas; Earl of Dorchester. The house, by Sir W. Chambers, is one of the most magnificent piles in the county; the grounds beautifully varied and richly wooded, were in part laid out by H. Repton. A village was transplanted from the vicinity of the house, and erected in a regular style in a distant situation.

More Critchell, — near Winborne; Charles Sturt, Esq. This is a romantic seat, with an excellent mansion, commanding extensive views.

Waterbourne Herrington, — near Dorchester; Edward Williams, Esq. The house is a large quadrangular building, and the grounds contain some fine oaks, and chestnuts of the growth of two centuries and upwards.

Sherborne Castle, — near Milton: Earl of Digby. The mansion is a singular structure, in the form of a Roman H; the centre part was built by Sir W. Raleigh, and is dated 1514. In the park is a grove, said to have been planted by Sir Walter. The grounds were much improved from the designs of Brown.

2202. SOMERSETSHIRE. A surface of 991,360 acres, hilly and stony towards the N.E., with ferns, marshes, and moors, towards the centre; the remainder high and hilly. There was a curious market-gardener at Bath, about 20 years ago, who proposed ripening grapes under hand-glasses; and, in Switzer's time, there was a seat there abounding in curious water-works. Salter is the principal florist and nurseryman, and has published a tract on florists' flowers. There are also good nurseries at Taunton, Froome, and Bridgewater.

Enmore Castle, — near Enmore; Earl Egmont. A quadrangular embattled structure, the stables and offices all under ground: the shrubbery neat and elegant, and the views over a finely cultivated and inclosed country.

Goathurst, — near Enmore; Sir C. Tynte. A noble building, with a park, and home pasture farm, of great extent, exhibiting as fine scenery of the verdant and cultivated kind as any in England.

2203. DEVONSHIRE. A surface of 1,600,000 acres, abounding in mountains, hills, and valleys, the former barren and moory, the latter mild in climate, beautiful and fertile; orchards abound in the southern part, and the centre contains that barren, bleak tract, called the forest of Dartmoor, now happily under a spirited course of improvement. Ford at Exeter, and Luccombe of the same place, (who raised the variety of the common oak which bears his name,) are the principal nurserymen. The father of Galpine, author of the "Compend. of British Plants," had a nursery at Brenton. The Duchess of Bedford has a picturesque cottage retreat on the banks of the Tamar (*fig.* 589.), one of the last places at which the late H. Repton was consulted.

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Bicton, — near Bicton; Lord Rolle. The mansion is spacious; the park pleasantly situated, and well wooded.

Borington, — near Plymouth; Lord Borington. The house was built at the end of the fourteenth century, though now occupied as a farm-house; the park contains 500 acres richly wooded, to which continual additions are making on the side of Dartmoor.

× *Castle-hill*, — near South Molton; Lord Fortescue. The mansion is situated on the acclivity of a finely wooded eminence; the grounds are well diversified, and contain a fine sheet of water.

Callipriest-House, — near Tiverton; Thomas Winsloe, Esq. The mansion has lately been enlarged, and the grounds improved.

Escot-House, — near Honiton; Sir John Kennaway. The house has been improved by H. Wyatt; the plantations are among the most luxuriant in Devonshire.

Faringdon-House, — near Ottory St. Mary; J. B. Chelwick, Esq. The grounds are pleasant, and the plantations particularly flourishing.

Great Fulford, — near Exeter; B. Fulford, Esq. The mansion is one of the most ancient in the county, and still retains much of its original character: the park is much diversified internally by undulations, and the judicious dispositions of trees and the distant river are interesting.

Haldon-House, — near Exeter; Sir L. Palk. The house is a model of Buckingham-House in St. James's Park. The ornamental grounds are extensive, and the plantations cover many acres.

Lindrige, — near Chudleigh; Rev. J. Templar. The mansion is large; the grounds are picturesque and finely wooded, and contain some of the largest trees in Devonshire.

Luscombe-House, — near Dawlish; C. Hoare, Esq. The house is an elegant design of Mr. Nash, who has endeavoured to unite the picturesque, the beautiful, and the ornamental. The grounds are beautifully varied by, nature, and well planted.

Mamhead, — near Kenton: Lord Lisburne. The mansion is of considerable antiquity: the park abounds in fine plantations of firs and other forest trees: and the lawn in the garden front of the house is beautifully varied by groups of trees.

× *Mount Edgecumbe*, — near Plymouth: Earl Mount Edgecumbe. The house is a very ancient building: the grounds are among the most remarkable in England for boldness, fine trees, and marine views. The grounds have been considerably improved by the present Earl, and an account of them lately published, entitled " A Walk round Mount Edgecumbe," with eight views, 1821.

Nutwell, — near Topsham; Lord Heathfield. The mansion is large, and the park scenery highly interesting.

Oxton House, — near Kenton: Rev. J. Swete. A new house has been built, and the grounds, which had been laid out at great expense in the old style, are modernized, and a fine lake formed from a natural brook.

× *Powderham Castle*, — near Kenton: *Lord* Courtenay. A very ancient seat, with a venerable Elizabethean mansion, and extensive grounds finely planted. The circumference of the park is nearly ten miles: and the pleasure-grounds and kitchen-gardens are replete with appropriate productions.

The Retreat, — near Kenton: Sir Alexander Hamilton. An elegant seat, kept in good style.

Saltram, — near Plympton St. Mary: Lady C. Parker. The situation is eminently beautiful: the mansion is the largest in the county: the new approach is particularly admired.

Tawstock, — near Barnstaple: Sir B. Wray, Bart. An imposing mansion and woods, remarked by authors as taking in at one view the best manor, best mansion, finest church, and richest rectory in the county: the house is in the Gothic style, and the grounds have recently been much improved.

× *Ugbrooke*, — near Chudleigh: Lord Clifford. One of the most enchanting spots in Devon: the grounds contain every variety of objects which constitute beautiful scenery: wood, water, rock, and unevenness of surface; and the exterior scenery is highly interesting.

Walford Lodge, — near Honiton: General Simcoe. The house is large, and decorated with fine old woods and many plantations, which clothe a declivity, and form a semicircle around it.

Yeo Vale, — near Bideford: Rev. F. H. Morrison. An ancient seat, recently much improved.

2204. CORNWALL. A surface of 758,000 acres, mountainous and hilly, but temperate in climate, and the valleys rich.

Carclew, — near Falmouth: Sir William Lemon, Bart. The house is of granite, in the Ionic style; the grounds are beautiful, and much improved by plantation.

Clowance, — near Hale: Sir John St. Aubyn, Bart. The house is enveloped in wood, the park is large, and the pleasure-grounds delightful.

Cotchele or Cuttayle-house, — near Calstock; Earl of Mount Edgecumbe. The house is an irregular quadrangle, situated on a bold knoll, on the banks of the Tamar. The woods which descend from the house abound in some of the most magnificent oaks and chestnuts in England.

× *Menabilly*, — near Menabilly: Philip Rashleigh, Esq. The house is of stone, and commands an extensive prospect over the British Channel: it contains one of the finest collections of native minerals in the kingdom. The kitchen-garden is well managed; and the grounds are distinguished for their very beautiful grottoes.

Pendarves, — near Clowance: John Stackhouse, Esq. The house is a large handsome granite edifice; and the grounds contain a large lake.

× *Port Elliot*, — near St. Germains; Lord Elliot. The mansion is irregular, and the grounds very much so, and greatly improved and embellished, in part from the designs of Mr. Repton.

Pentilly Castle, — near Cotchele: Mrs. Tilly, (1820.) The house, which is modern but embattled, is finely situated on the banks of the Tamar. The declivities towards the river are most luxuriously wooded with elms and limes, and the back-ground scenery is distinguished by a tower in which the late Mr. Tilly was inhumed sitting in his elbow chair with bottles, pipes, &c. before him.

Tehidy Park, — near Redruth: Lord de Dunstanville. The house is of granite, from a design by Mr. Edwards; the park contains 700 acres, of which 150 are appropriated to a lawn and sheep-walk; on the rest extensive plantations have been made. The situation is bleak, and it is said the pineaster is planted as a nurse to other species, and that the larch will only grow in sheltered situations.

Trebartha Hall, — near Launceston: Colonel Radd. A torrent dashing over immense rocks, amid mountainous and woody scenery, renders this a singularly grand and picturesque place.

Trelawny House, — near West Cove: —— Trelawny, Esq. The mansion is in the Elizabethean style, and the views are over the valley of the Love river, which contains some of the finest scenes in England.

Sect. II. *Wales.*

2205. A hilly mountainous surface of 5,206,900 acres, with a climate colder than that of England, and more moist in the proportion of 34, the average number of inches of rain which falls in Wales, to 22, the number for England. The soil is generally of an inferior description, and the great proportion of mountainous surface is fit only for planting, which is the principal branch of gardening followed in Wales; horticulture and floriculture are chiefly confined to the low grounds near the sea and internal valleys.

There are no public gardens; but few commercial ones; and the number of gentlemen's seats is very limited: cottage and farmers' gardens indifferent, though generally well stocked with the commoner varieties of cabbage or borecoles and leeks.

2206. **ANGLESEA, or MONA.** A hilly bleak island of 200,000 acres; ill adapted for any branch of gardening, but containing a few seats worthy of notice.

Baron Hill, — near Beaumaris; Lord Bulkely. A house improved by Mr. Sam. Wyatt, but supposed to be too high for its base and elevated situation. The grounds much varied by nature, and improved by lawns, groves, bridges, and other ornamental buildings, and from a tower on Baron Hill the finest prospects in the island are obtained.

Bodorgan, — near Aberfraw; O. P. Meyric, Esq. A house by Mr. Dufford, on an eminence, in a small park well clothed with wood.

× *Plas Newydd*, — near the banks of the Menai; Marquis of Anglesea. An elegant castellated mansion, with an extended front by Mr. Potter, of Litchfield; built of native marble. The home grounds extend along the Menai, contain a fine lawn, marine terraces, baths, green-houses, and gardens, and are abundantly wooded; the park is not very extensive, but contains some antiquated oaks, many new plantations, fine drives and walks, and very picturesque views.

2207. **CAERNARVONSHIRE.** A mountainous surface of 310,000 acres, with few gardens of any sort whatever.

Faenol House, — near Caernarvon; T. A. Smith, Esq. A handsome modern structure, deeply embosomed with trees, with an extensive lawn sloping to the Menai.

× *Penrhyn Castle*, near Bangor; Lady Penrhyn. A castellated mansion of considerable antiquity, improved by Mr. Wyatt, surrounded by plantations, for the extent of which and for the various uses to which the Penrhyn slab is applied, this residence is chiefly remarkable. Park pales, gates, doors, window-shutters, troughs, mangers, stall-partitions, hot-bed frames, and a variety of other articles are formed from it, and found to be very durable.

2208. **DENBIGHSHIRE.** A hilly tract of 410,000 acres, the soil various, but not rich or favourable for cultivation, excepting in the valleys. The seats are chiefly on the Chester side of the county.

Lleweni Hall, — near Denbigh; M. Hughes, Esq. Situated on a flat lawn, with a bleachery too near, and not properly planted out.

Pontriffith Farm, — near Denbigh; Mrs. Lloyd. A *ferme ornée*, handsomely laid out and kept in good order.

Pool Park, — near Rathin; Lord Bagot. Delightfully situated, and finely wooded with old chestnut trees.

Plas Newydd, — near Llangollen; Lady Eleanor Butler, and Miss Ponsonby. An elegant residence fitted up in the cottage style, and the grounds beautifully laid out by the elegant and accomplished proprietors.

Llandysilio Hall, — near Llangollen; T. Jones, Esq. A handsome structure of brick, in a flat situation, with a park composed of this bottom, and part of the surrounding hills finely wooded.

Erddig, — near Wrekham; S. Yorke, Esq. Chiefly remarkable for the beauty of the approach through a dense wood; there are also other umbrageous walks, a rivulet, lawn, and banquetting-house, much admired.

Bern Hall, — near Wrexham; T. Lloyd, Esq. A handsome modern mansion, embosomed in fine rich plantations; the situation flat, but the surrounding scenery hilly and grand.

Acton Hall, — near Wrexham; Sir F. Cunliffe. A good mansion, on an elevated lawn; the grounds extended, and greatly improved by the present proprietor.

Upper Gwersilt Hall, — near Gresford; Mrs. Atherston. The grounds most tastefully laid out, with highly romantic walks, alternately umbrageous, and open on the banks of the Alun.

Llanarch-house, — near Denbigh; D. Leo, Esq. A beautiful park, with a fine piece of water, commanding extensive views. The gardens were formerly laid out by M. Davies, Esq. on his return from Italy, with formal walks, clipt trees and hydraulic statues. Among the images and water-tricks was a sun-dial, which, on the spectator's approach, spouted in his face, and apologized for the rudeness by an indecorous description. The whole place is now modernised, and the fine old house too much so.

× *Wynnstay*, — at Ruabon; Sir W. W. Wynn. The house, an extensive pile, erected at different times, approached through a straight avenue a mile in length; the trees, old and large, elms, oaks, beeches, and planes. The park is eight miles in circumference, surrounded by a high stone wall; the surface is not much diversified, but it contains a fine sheet of water and numerous plantations, with an admirable artificial cascade, similar to that in Bowood Park, near Calne. The horticultural and floricultural establishments are very complete: and here the Banana was fruited, and its fruit used at the dessert for the first time in England. There is a large farm under the care of an excellent Berwickshire bailiff.

2209. **FLINTSHIRE.** A surface of 160,000 acres, less mountainous or varied than any of the Welsh counties, and not unfavourable to gardening.

Downing, — near Whitford; D. Pennant, Esq. A mansion H-shaped, with Gothic wings, in a low sequestered situation, surrounded by finely wooded grounds, which owe their tasteful disposition to the late eminent naturalist, father of the present possessor.

Hanmer-hall — near St. Asaph; Sir T. Hanmer. A handsome brick structure, situated in grounds naturally fine from their consisting of eminences and slopes. These are embellished with woods and plantations, and a lake of 50 acres.

Heartsheath-hall, — near Mold; G. L. Wardel, Esq. Beautifully situated on a gentle slope, showing three fronts, with an excellent range of stables and offices peeping through fine plantations in the back ground.

Leeswood, — near Mold; Sir G. Wynne. The grounds occupy a fine slope, and were laid out by Switzer above a century ago, whose magnificent iron gateway, through which the fore-court of the house is entered, still remains.

Penguern, — near Whiteford; Sir E. P. Lloyd. A modern structure, surrounded by grounds extensively planted, and otherwise greatly improved by draining in some places, and irrigation and levelling, and removing of detached stones, in others.

2210. **CARDIGANSHIRE.** A surface of 500,400 acres, more mountainous than any in South Wales; the mountains generally bleak and bare of wood.

× *Havod*, — near Aberistwith; ———— late the seat of T. Johnes, Esq. By far the most grand and picturesque residence in either North or South Wales. The house, in a peculiar style of Gothic or Moresque architecture, in the side of a secluded basin, among high mountains: the approaches to it full of beauty and contrast, the numerous walks displaying waterfalls, precipices, views, prospects, cultivated scenes, rude spots, seats, buildings, &c. singularly romantic and sublime. The kitchen-gardens and farm were extensive, and successfully cultivated. This place has been described by many tourists; but in the most elegant manner, by Sir J. E. Smith, P.L.S. in a "Tour to Haford."

Stradmore Vale, — near Llandysil; R. Taylor, Esq. An elegant mansion, desirably situated in a rich bottom, on the banks of the Teivi, and backed by a luxuriant forest of oak.

2211. **GLAMORGANSHIRE.** A surface of 422,000 acres, mountainous towards the north, but more level and suited to culture in the southern parts.

Gnoll Castle, — near Neath; —— Grant, Esq. The house rises with baronial pomp and grandeur, on the point of a hill, overlooking the town and adjacent country. The grounds most judiciously laid out by the late Sir H. Mackworth.

Llantryddyd, — near Cowbridge; Sir J. Aubrey. An Elizabethean mansion, in a park richly wooded, of considerable extent, and surrounded by a stone wall.

Margram, — at Margram; — Talbot, Esq. The house fallen to decay; but the park, which is extensive, and well wooded, still preserved in its original state, and considerable attention paid to the pleasure-grounds, which are remarkable for the orangery. This is a Doric edifice, built in 1787, 327 feet in length, and 81 in width, with a square room, parted off at each end. There are 110 orange-trees, several of which are 18 feet in height, and remarkably handsome. In summer they are removed to the lawn, and arranged as a grove. Various traditions exist as to the bringing of the trees to Margram; but that generally credited is, that they were originally designed as a present from the King of Spain or Portugal to Elizabeth: but that the vessel stranding on the Margram estates, they become the property of the Lord.

Penrice Castle, — near Swansea; R. M. Talbot, Esq. A commodious and elegant mansion: the grounds laid out with great taste, and ornamented with some artificial pieces of water.

Stout-hall, — near Swansea; J. Lucas, Esq. Great taste displayed in the disposition of the pleasure-grounds and gardens.

2212. **PEMBROKESHIRE.** A peninsular surface of 335,600 acres; generally plain and fertile.

Cyfartha, — near Martha Tydvill; William Crawshaw, Esq. The hot-house department of the kitchen-garden extensive, and the pine-apple extensively and successfully cultivated.

Castle Maelgwn, — near St. Dogmaels; —— Hammet, Esq. The grounds embrace the Teivi, and are laid out with great taste; the mansion also materially improved by the late proprietor.

Lawranny-Hall, — near Milford; H. Barlow, Esq. A pleasantly situated house, the grounds bordered by a creek on one side and Milford-haven, on the other.

Picton Castle, — near Milford; Lord Milford. A mansion of considerable antiquity, castellated, with a fine terrace in front, and enlarged and improved to suit the modern style of magnificence in domestic economy. The grounds on an extensive scale, richly wooded and watered by the confluence of two mountain streams.

× *Stackpool Court*, — near Llandifa Vawr; Lord Cawdor. A grand and imposing building, situated on the precipitous margin of a narrow valley, which has been converted into a lake. Along the front next the water, a broad terrace has been formed; and the other, which contains the entrance, looks into some elegant pleasure-grounds. The kitchen-garden is most successfully cultivated by Mr. Buchan, who, in 1821, cut 1020 pines, and upwards of 13 cwt. of grapes.

Pentre, — near St. Dogmaels; ——— Saunders, Esq. The house in a pleasant rural spot embosomed in trees; the gardens in the old style, carefully kept up; the whole greatly admired.

2213. RADNORSHIRE. A surface of 326,400 acres; partly level and partly mountainous.

Boultibrooke, — near Presteigne; Sir H. Jones. Mentioned as worthy of notice.

Walton, — near Old Radnor; R. Urwic, Esq. A handsome modern house.

Wellfield House, — near Builth; D. Thomas, Esq. A neat modern house; the grounds containing some flourishing young plantations.

Maeslough, — near Paine's Castle; W. Wilkins, Esq. A respectable structure; the grounds watered by the Wye, and their position extremely beautiful.

2214. MONTGOMERYSHIRE. A surface of 500,000 acres; generally mountainous, but verdant, fertile, and wooded. Some of the vales are beautiful; and there are many fit situations for residences.

Newtown-Hall, — near Newtown; Sir John Pryse. A finely wooded park of considerable extent.

Bodfach, — near Llanfyllin; B. Lloyd, Esq. A good mansion, and the grounds greatly improved by the late owner, who was the greatest planter in the county, having planted 60 acres with 901,000 trees.

Powys Castle, — near Welch Pool; Earl Powis. A castellated mansion of red sand-stone, situated on the ridge of a rock, the entrance by an ancient gateway, between two massy circular towers. The ascent by two immense terraces rising one above another, connected by steps, and ornamented by vases, statues, and other antique remains. There were hanging gardens composed of a series of terraces, connected by flights of steps cut out of the solid rock, with water-works, &c.; but these are now altered, or, like every thing else here, going rapidly to decay. The park is much varied by nature, and combines turf as smooth, close, and green as the finest lawn, blended with broken ground, rocks, and rough thickets of thorns and oaks. It contained much old timber, but great part of this has been lately felled.

2215. MERIONETHSHIRE. A much-admired and romantic surface of 500,000 acres; abounding in streams, rocks, and ruined castles; but with few residences of wealthy proprietors, and consequently little display of gardening.

Nannau, — near Dolgelly; Sir R. W. Vaughan. A substantial and elegant structure in a well wooded park, with fine prospects, and remarkable for a small herd of deer, which make venison of a superior flavor. There is a good kitchen-garden, but the present proprietor is chiefly attached to agriculture, and is considered a good corn-farmer and tolerable breeder.

Tan-y-Bwlch Hall, — near Dolgelly: ——— Oakley, Esq. An elegant villa in a lawn, at the bottom of a hill, surrounded by pleasure-grounds tastefully disposed, and containing a good kitchen-garden.

Dol-y-Myllynllyn, — near Dolgelly: ——— —————, late the property of W. A. Maddocks, Esq. A cottage as romantically situated on the side of a wooded hill as can well be imagined, with a fine mountain stream at the door, and hard bye, one of the most remarkable waterfalls in Wales.

Tremadoc House, — near Tremadoc; late the property of W. A. Maddocks, Esq. A cottage villa on a protuberant lawn, near the base of a hill side, surrounded by thriving plantations, commanding fine views of Trath-mawer, the scene of extensive embanking operations.

2216. BRECKNOCKSHIRE. A surface of 512,000 acres, entirely mountainous, with the exception of some of the narrow vallies; in general it is *terra damnata* as to every branch of gardening, excepting planting.

Dan-y-Park, — near Crickhowel: E. Kendal, Esq. A good house, with a meadow and some rising grounds formed into an agreeable park, bordered by the Usk. The kitchen-garden contains some substantial cast-iron hot-houses.

Llangard Castle, — near Builth: J. Macnamara, Esq. A new mansion commenced, and other improvements in progress. According to Malkin ("Scenery of South Wales," &c. 251.), this place may, and probably will be, one of the first in Wales.

Penpont House, — near Brecknock: P. Williams, Esq. A respectable mansion, with a finely wooded park, watered by the Usk.

2217. CAERMARTHENSHIRE. A surface of 228,000 acres; fruitful in corn and grass, and the least hilly of any county in South Wales.

Henllys, — near Llandovery: Col. Williams. The grounds occupy both sides of the river Tywi, and are connected by a foot-bridge, raised upon two projecting rocks, and of a construction that harmonizes with the wild and romantic character of the scene.

Abermarlais, — near Llandovery: Admiral Foley. A modern house in a small park, but which contains some good trees and picturesque views.

Edwinsford, — near Llandeilo; Sir J. H. Williams. The mansion and grounds exhibit an appearance of magnificence, and contain a lofty avenue, which serves as an approach.

Tuliaris, — near Llandeilo; Lord R. Seymour. Low, flat ground, but well wooded.

Newton House, — near Llandeilo: Lord Dynevor. A plain square building, with a small turret surmounting each angle, in a park comprising a considerable extent of ground, and exhibiting, perhaps, a richer display of picturesque beauty than any spot of equal size in the kingdom. The scene is finely described by Dyer in his poem of Grongar-Hill.

> Gaudy as the opening dawn
> Lies a long and level lawn, &c.

Golden Grove, — near Llandeilo: Lord Cawdor. An indifferent house on low grounds, lately begun to be planted and improved.

Middleton Hall, — near Llandeilo: Sir W. Paxton. One of the most splendid mansions in South Wales, by Mr. Cockrell; the grounds finely planted, and containing an elegant prospect tower, and a good kitchen-garden.

Sect. III. — *Scotland.*

The surface of this country is estimated at 18,944,000 acres, in three natural divisions. The first lies north of the chain of Highland lakes, which stretch from Murray to Mull, and consists of little else than dreary mountains and some moors; the second, or middle division, extends from this chain of lakes to the rivers Forth and Clyde; it is mountainous, but cultivated in the vallies and on the eastern shore to a considerable extent; the remaining division is covered by hills with some mountains, but every where cultivated or improvable, and highly favorable for most branches of gardening. The country residences of Scotland are almost entirely confined to the two last divisions; in general they excel those of England in the prominence of their natural features, being generally backed by hills or mountains; encompassed by a river or stream; or situated on a lake, or the sea-shore. But they are inferior to those of the south in magnificence, and even in taste, both as to architecture and landscape gardening. The gardeners of Scotland have long been in esteem for skill and assiduity in their profession; they excel in the culture and general management of the kitchen-garden, those of a certain rank, as Neill has observed, being generally kept in much better order, and at less expence than gardens of the same kind and rank in England.

The garden productions in which Scotland excels are, turnips, potatoes, strawberries, raspberries, and gooseberries. In fruits, Scotland does not excel, nor can this be the case till the practice of producing a dessert be more common among the ordinary gentry of the country than it is, or was ten years ago. A dessert is rare among the middling classes; and fruit pies or cyder are quite unknown to the operative inhabitants. The most extraordinary gardening exertions which have been made in Scotland are in the planting department, and chiefly in the middle division of the country, which already begins to assume a new and sylvan character. The cottage gardens are generally carefully cropped with the more common vegetables, and form a useful appendage to the laborers' dwelling. The farmers' gardens are rather neglected.

The principal commercial gardens lie around the capital; taken altogether, they occupy about 530 acres, of which 130 are employed as nursery grounds by seven or eight individuals, who hold from fifty to four acres each. The four hundred acres of market-garden ground are cultivated by nearly eighty gardeners in holdings of from half an acre to about twenty acres each. There are market-gardens in almost every county, and the total extent of ground occupied as nurseries in the kingdom is estimated at 700 acres. Some of these nurseries raise and dispose annually of ten or twelve millions of seedling and transplanted forest trees. Previous to 1760, when the taste for planting and rural embellishment in Scotland began to increase, there were not above six nurseries in Scotland; and these, taken together, did not occupy above sixty or seventy acres. In 1812, one house in Edinburgh shipped upwards of two million of seedlings, chiefly larch and spruce fir, Scotch pine, birch, elm, ash, alder, and hawthorns.

2218. MIDLOTHIAN. A surface of 230,400 acres, varied by inequalities, and in some places by hills. Round Edinburgh are some neat suburban cottage and villa gardens, some good market-gardens, three extensive nurseries, and a botanic garden. The Caledonian Horticultural Society, and also the Caledonian Gardener's Lodge, is held in the capital.

Public Promenade. — Holyrood Park is a piece of level ground of moderate extent, adjoining the palace of Holyrood. The hill of Arthur's Seat, and adjoining inequalities and vallies, contain upwards of 400 species of plants, and a great variety of mineral productions, with varied and extensive views and prospects. See 2039.

The *Edinburgh Botanic Garden,* — as it existed till lately, contained five statute acres, of a varied surface, and properly situated to the north of the road which leads past it. It was founded by Sir A. Balfour about 1680; removed from its original to its late site under the auspices of Dr. Hope in 1767, and is now (1821) removing to a more extensive area, under the superintendance of the present Professor, Mr. Graham, and his able curator, Mr. M'Nab. This site contains 16 acres; and will display extensive hot-houses, and both a Linnæan and Jussieuean arrangement.

Market Gardens. — Few of these, of any extent, are known to have existed previously to 1746. At that time Henry Prentice cultivated peas, potatoes, turnips, and other culinary articles, on an extensive scale: before his time, the supply was limited to what could be carried in baskets. Next to Prentice, Thomas Peacock may be mentioned as an extensive grower about 1750; and his successor, who now occupies about twenty acres, produces at this time the best asparagus, cauliflower, and celery, sent to market. Ross's garden is about the same extent; the rest are considerably smaller. Besides culinary herbs, most of these grounds are stocked with standard fruit-trees; and since the custom of making British wines became so fashionable as it now is in Scotland, great part is occupied with currants, gooseberries, and raspberries. Strawberries are grown to greater perfection than probably any where else in Britain, at Roslin, on the banks of the Esk.

Orchards. — There are but few of these in this county, and those are chiefly near Laswade and Dalkeith. Edinburgh market is supplied with fruit from the standard trees in the market-gardens, and from such private gardens as are let to commercial gardeners by their occupiers, on account of absence or otherwise. This is also the chief source of forced and exotic fruits, as very few of the market-gardeners venture to build hot-houses. Fletcher, however, built a vinery, and produces the best early grapes.

Seed Gardens — are unknown in Scotland. Some cabbage, borecole, and leek seeds, are raised in the country; but most garden seeds are procured from London, and some from Holland.

Herb Gardens. — There are one or two on a very small scale, in which peppermint is chiefly cultivated.

The *Leith Walk Nursery,* — Messrs. Dickson and Shankley, a respectable establishment of nearly fifty years' standing, in which every description of nursery article is propagated according to the demand, and the whole kept in excellent order and neatness.

The *Broughton* or *Adelphi Nursery* — (from Αδελφος, a brother), Messrs. Dicksons, brothers, an extensive establishment of ten or twelve years' standing, kept in good order.

The *Jock's Lodge Nursery,* — Henderson and Co., an extensive establishment, judiciously managed.

The *Comely Bank Nursery,* — Cunningham. This establishment is conducted more on the plan of the London nurseries than any of the others. Flowers and tender exotics are cultivated with success; and mushrooms also in flat beds, in the open garden, uncovered either with mats or litter. They are originated without planting spawn, on beds like what are called lazy beds of potatoes; but the details of the method the inventor is said to decline making public.

There are some other nurseries, but not of sufficient note to require being particularized in our very limited space.

Calder-house, — near Mid-Calder; Lord Torphichen. A stately fabric, surrounded with very extensive plantations.

Hatton-house, — near Calder: —— Davidson, Esq. A venerable, ancient house, the grounds, containing 800 acres, till lately exhibited one of the most perfect specimens of the old style in the county, or perhaps in Scotland; with artificial cascades, fountains, alcoves, terraces, and an excellent kitchen-garden. They are supposed to have been laid out by London and Wise, or some of their pupils, about the beginning of the last century.

Dalmahoy, — near Edinburgh; Lord Morton. A good house, in a park of between 400 and 500 acres, inclosed by a well-built wall, and subdivided into lesser commodious inclosures by strips of plantation.

Collington-house, — near Edinburgh: Sir J. Foulis. A substantial house, in a commanding situation, embosomed in wood.

Dreghorn Castle, — near Edinburgh: —— Trotter, Esq. A magnificent castle, in the Gothic style, commenced, and the grounds much improved and planted; the mountainous parts from designs by the celebrated landscape painter, Nasmyth.

Braid-house, near Edinburgh: —— Gordon, Esq. A handsome and costly house, placed in the bottom of a ravine, or narrow glen, well wooded, and watered by a stream.

Pennycuick-house, — near Pennycuick: Sir G. Clerk. A handsome Grecian house, finely situated on a level lawn, on the Esk; the situation rendered interesting by a turn of the river; the ruins of a castle on its banks; and the Pentland hills in the distance. The kitchen-garden contains an extensive range of hot-houses.

Melville Castle, — near Laswade: Lord Melville. An extensive mansion, in the pseudo Gothic style, in a romantic situation on the Esk, and surrounded by high banks covered with wood.

Dalhousie Castle, — near Laswade: Earl of Dalhousie. An old castellated mansion, lately modernized, surrounded by extensive and romantic pleasure-grounds. The river Esk washes the base of the castle; and its lofty wooded banks afford delightful summer walks.

Newbattle Abbey, — near Laswade: Marquis of Lothian. A large modern building, with a lawn of thirty acres, and a park beautifully varied, and well clothed with trees; the kitchen-garden good, and well managed.

× *Dalkeith-house,* — near Dalkeith: Duke of Buccleugh. A building without pretensions to style, nobly founded on a naked rock; which, however, was earthed up about the beginning of the last century. The park contains upwards of 800 acres, surrounded by a stone wall nine feet high: it is magnificently wooded, and watered by two streams, the North and South Esk, which pass near the house. The kitchen-garden contains twelve acres, and is reckoned one of the first in Scotland: the hot-houses and flower-garden are proportionately extensive.

Morton-hall, — near Liberton: —— Trotter, Esq. A massy stone fabric, on the south bank of a hill, surrounded by a beautiful park.

Duddingston-house, — near Edinburgh: Marquis of Abercorn. A handsome Grecian house, by Sir W. Chalmers, and the grounds (*fig.* 590.), by Robinson, nephew to the royal gardener of that name at Kensington. They are thus described in the Beauties of Scotland. "This villa, with the pleasure-grounds or park which have been annexed to it, exhibits an example of all that money or art can do to adorn a nearly flat surface, through which a small stream of water naturally runs; clumps, groves, canals, lakes, isles, cascades, temples, shrubbery, serpentine walks, and spreading lawns. In every corner, art and expence have been ostentatiously displayed, and nature is evidently employed merely as her handmaid. Such a place as this, however, has considerable beauty, and excites much interest in a country like Scotland, where bold natural scenery so much abounds, by the striking contrast which it exhibits to the general aspect of the surrounding territory," vol. i. 354.

Woodhouselee — near Roslin: —— Tytler, Esq. A venerable and romantic house and grounds; the latter remarkable for containing the largest silver fir-tree in the county; for a fine terrace-walk, and superb holly-hedge. Some curious ornaments, in the geometric style of gardening, which existed here, were obliterated when the grounds were remodelled in 1787.

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2219. EAST LOTHIAN. A surface of 190,363 acres, little varied on the east side, but hilly and mountainous towards the southern extremity. It is remarkable for the excellence of its agriculture; and it contains some good kitchen-gardens. There is a small nursery at Haddington; and a number of market-gardens in the county, of from half an acre to two and a half acres in extent, for local supply, and for the supply of Edinburgh, and the shipping of Leith, and other sea-ports along the coast. There are small orchards at Ormiston and Prestonkirk.

North Berwick-house, — near North Berwick: Sir H. D. Hamilton. A good house, surrounded by an extensive suit of enclosures, subdivided by straight lines and strips, or double rows of trees in the ancient style; the object being to combine the general effect of a park as to wood and pasture, with the utility and convenience of enclosures.

Wemyss-house, — near Aberlady: Earl of Wemyss. A magnificent mansion, by Adams, in which the smoke of all the chimneys is conducted to three stone domes, and issues by their summits. The three principal rooms are of gigantic proportions, with only one window to each. It is situated close to the sea-shore, on level ground, laid out and planted by Ramsay; but the house is not yet finished.

Aimsfield, — near Haddington: Earl of Wemyss. A noble building with wings, the central front 109 feet long. The park is flat, and not extensive; but there is a large and excellent kitchen-garden.

Yester-house, — near Yester: Marquis of Tweedale. An elegant and magnificent structure of stone, with a park containing some fine old trees, and a good kitchen-garden.

Salton-hall, — near Salton: —— Fletcher, Esq. An ancient house, lately much improved, as well as the grounds, which were among the first in which exotic trees were introduced about a century ago. Some fine specimens of these still exist, particularly of the cork tree, and other species of quercus. The park is extensive, divided by inconspicuous enclosures, and managed as a grazing farm.

Dunglass-house, — near Dunglass: Sir J. Hall. Romantically situated on the banks of a stream, and surrounded by ancient woods and new plantations.

Tynninghame, — near Dunbar: Earl of Haddington. Remarkable for its fine old woods, planted in the beginning of the last century, by a former Earl, who wrote a treatise on Planting. There is also a remarkably fine holly-hedge of the same standing, and a good kitchen-garden. In 1805, pine-apples were grown here in a pit, with a brick vault below, into which steam was introduced. Some of the plants were in pots, and the rest planted in the soil.

Ormiston, — near Haddington; —— Cockburn, Esq. A good kitchen garden, and well-planted pleasure-grounds.

2220. BERWICKSHIRE. A surface of 326,400 acres. The northern part mountainous, with few country seats; but the south and east districts gently varied in surface; rich in soil in some places; and every where under a system of farming which has been long celebrated. In this part of the county are a few gentlemen's seats, but none of any note. There are only two or three market-gardens near Berwick, and near Dunse.

Dryburgh Orchard. — Planted by the Earl of Buchan in 1788, and now very productive in pears and apples.

Retreat, — near Abbey: Earl of Wemyss. A singular house, of a circular form, in a retired situation on the banks of the Whitadder, in the heart of the Lammermuir mountains, surrounded by natural woods, romantic dells and extensive artificial plantations.

Dunse Castle, — near Dunse: —— Hay, Esq. A respectable old place.

2221. ROXBURGHSHIRE. A surface of 472,320 acres, chiefly hilly and mountainous, and in great part under pasture. There are a few acres of market-garden ground near Kelso and Jedburgh; and some orchards at these places, at Melrose, and at Gattou. At Jedburgh are pear-trees upwards of three centuries old.

Hawick and Hassendean Nurseries. — Messrs. Dicksons' extensive establishments, at the villages bearing these names; begun in 1729; they supply the north of England and south of Scotland, and from them originated the Leith Walk nursery, in Midlothian; and the Perth nursery, in Perthshire.

Orchards of Melrose and Jedburgh: — apple and pear-trees, planted by the priests of the abbeys of these towns, in the 16th century, which are still very prolific, especially the pears: the two principal kinds, are called the *duke's* and *monk* pear.

Crailing-house, — near Crailing: —— Paton, Esq. A neat villa, most romantically situated on the high banks of the Jed.

Minto-house, — near Minto: Earl Minto. Finely situated on the south side of a well-wooded hill, with judiciously arranged pleasure-grounds, and a good kitchen-garden.

Fleurs, — at Kelso: Duke of Roxburgh. A miserable house, in one of the finest situations in Scotland. It stands on a terrace, at the bottom of which a fine lawn stretches to the Tweed; behind rise wooded hills; and in front and on each side is extensive park scenery, with the bridge and ruined abbey of Kelso.

2222. **SELKIRKSHIRE.** A surface of 153,600 acres, of hills and mountains, almost entirely under pasturage.

2223. **TWEEDALE.** A surface of 188,160 acres, hilly and mountainous, generally in pasture; but with some barren moors and fertile vales.

2224. **DUMFRIESHIRE.** A surface of 644,385 acres, consisting, in great part, of hills and mountains; but with some low fertile lands towards the south. There is a nursery at Dumfries, and about twelve market-gardens, averaging three acres each.

Orchards. — There are a number of private orchards in this county, some of them a century old, and very productive. The greater part of the produce is sent to market.

Langham Cottage, — near Langham: Marquis of Queensbury. A picturesque heath-covered cottage, built as a temporary residence by the late Duke of Buccleugh, in a romantic situation, with beautiful pleasure-grounds.

2225. **KIRCUDBRIGHTSHIRE.** A surface of 561,641 acres, hilly, rocky, and with some mountains, the greater part in pasture. There are some market and fruit-gardens along the coast, which send their produce to Dumfries and Ireland. An extensive orchard was formed by Lord Selkirk about 1790; and small collections of fruit-trees have been planted at most of the farm-houses on his Lordship's estates.

St. Mary's Isle, — near Kircudbright: Earl of Selkirk. A substantial house, lately much improved, in an island, lately rendered a peninsula by an embankment. The grounds much diversified by wood, interspersed with thorns, briars, and brambles, in imitation of a natural forest, by a former possessor. There is a handsome gravel-walk, by which a stranger makes a tour of the whole.

Broughton-house, — near Gatehouse: —— Murray, Esq. A good house of granite, with extensive pleasure-grounds, laid out by Ramsay.

Cree-house, — near Gatehouse; Sir S. Hannay. A substantial granite house, in an elevated situation, surrounded by plantations.

2226. **WIGTONSHIRE.** A surface three miles broad, varied and fertile, with few hills and no mountains.

Galloway-House, — near Garliestown; Earl of Galloway. A large house surrounded by extensive plantations, enclosed by substantial stone walls.

Burnbarrow, — near Wigton: John Vans Agnew, Esq. A fine old place, greatly improved by the late and present proprietor.

Castlewig, — near Whithorn: —— Hawthorn, Esq. A good house, situated on an elevated surface, and backed by old woods and young plantations.

2227. **AIRSHIRE.** A surface of 1600 square miles; partly hilly, and very generally under pasture. There are some good gardens of almost every class: that of Ballochmoyle was formerly reckoned one of the first private gardens in Scotland. There are in plantation 25,000 acres.

Monkwood Botanic Garden and Nursery — is situated near Ayr, and was founded by the present proprietor, Mr. James Smith. It contains about two acres: and the collection includes above 2000 hardy exotics, besides a very full collection of British, and above 500 sorts of green-house plants.

Kilmarnock Nurseries. — Messrs. Sampsons have an extensive and highly respectable establishment; and there is another equally respectable, but of more recent origin.

Market Gardens, — there are several, from one to six acres in extent, in the neighbourhood of Kilmarnock and Ayr. Their main crops are onions and carrots, of which they export large quantities to Ireland. There are also market gardens at Irvine, Stewartown, and Saltcoats. There are few or no orchards.

× *Culzean Castle*, — near Culzean: Earl Cassilis. A noble mansion, in the hybrid Gothic style of Adams, placed on a bold precipice on the Carrick shore: the offices adjoining forming a fine subordinate group. The park contains 700 acres, finely wooded, and abounding in marine views; in the pleasure-grounds is an extensive collection both of hardy and tender exotics; and there is a productive kitchen-garden: the whole in high keeping.

Eglinton Castle, — near Kilwinning; Earl of Eglinton. A noble castellated mansion, which, with the grounds, were greatly improved by the late Earl. The trees of the park are large, of picturesque forms, and much admired. The kitchen-garden one of the best in the county.

Loudon Castle, — near Kilmarnock; Marquis of Hastings. An extensive Gothic building by Mr. Elliot, inclosing part of the old castle; the grounds lately planted from suggestions by Mr. Nasmyth.

Ballochmoyle, — near Mauchlin; —— Alexander, Esq. Remarkable for its excellent kitchen-garden, about 1790 reckoned one of the first in Scotland. The gardener's name, John Livingston, formerly gardener to General Scott, of Bellvue, near Edinburgh.

Barganny Park, — near Ayr: Sir H. D. Hamilton. A residence greatly improved, and most extensively planted by the present proprietor.

2228. **RENFREWSHIRE.** A surface of 153,307 acres; abounding in hills and moors, and with a cold, moist climate in the elevated district. The most remarkable gardening feature in this county is the florists' gardens of Paisley.

Market Gardens and Orchards. — There are several market-gardens round the sea-ports of Greenock and Port Glasgow; and some orchards at the latter place. There is also a very old orchard at Paisley, which, owing to the extension of the town, is now situated near its centre: it contains two Scotch acres, and some pear-trees of a large size and venerable aspect.

Gardens of the Operative Manufacturers of Paisley. — "The operatives of Paisley, taking them at large, exhibit a condition of improvement very rarely indeed, if at all to be paralleled among persons in the same rank of life: and they are particularly remarkable in their taste for objects which please the eye by their beauty, for such occupations for amusement as require nice attention, and for various intellectual gratifications. In their dress, in the furnishing of their houses, and in matters of a similar kind, they study a great degree of neatness. Even their pigeons, which they keep in considerable numbers, are known in the vicinity to be distinguished for their beauty and variety. Several operatives greatly excel in the management of bees; and communicate to each other their experiments and success. It will perhaps be difficult to find elsewhere, in the same classes of the community, an equal proportion of persons who occasionally entertain themselves with *making* verses. And it is probable, that for miscellaneous information, they are not to be equalled by the operatives in any place. The only operatives in this nation, or perhaps in any other, who can be compared with them for information, are the miners at Lead-hills, who work but six hours a day, and have with success devoted much of their leisure to the improvement of the mind. But the intellectual attainments of the Paisley operatives must be more various than theirs, and are probably in no department inferior.

"By a statement of the private reading societies in Great Britain, which was some years ago exhibited in the newspapers, it appeared that a very considerable proportion of the whole (it is believed not less at that time than one-third) existed in Paisley. How far any of these attachments and habits may have been promoted by the inspirations of Flora, it may not be easy to determine, but all of them in some measure preceded the epoch of her homage and influence at Paisley.

"It has been remarked by a gentleman of learning and philosophical observation in Paisley, the Rev. William Ferrier, that 'the attention to flowers, which is so conspicuous there, is in a considerable degree an effect of the peculiar manufacturing habits of the people. It is well known, that not only for the execution of the most delicate ornamental muslins, but for the invention of patterns, the operative manufacturers of Paisley stand unrivalled. Their ingenuity is continually in exertion for new and pleasing elegancies, to diversify their fabrics. Now, where such habits obtain, the rearing of beautiful flowers, which is an object very congenial to them, will easily be adopted, and pursued as a favorite amusement. On the other hand, it seems highly probable, that the rearing of flowers, by a re-action, must tend to improve the genius for invention in elegant fancy muslins.

"'The florists of Paisley, (it is observed by the same gentleman,) have long been remarked for the peacefulness of their dispositions, and the sobriety of their manners. The Florist Club not only represses all irregularities at its weekly meetings, which dismiss at ten in the evening; but would erase from its lists any disreputable name. It is pleasing to think, that not only the attachment of individuals to the culture of beautiful flowers, but the association of persons possessing this taste, seems to be favorable to social order.'"

Origin of the Florists' Society. — "The culture of pinks became an object of attention in Paisley and its vicinity, between the years 1785 and 1790. Till then, none but those of the most ordinary kinds were known there. But at that period, some seeds, reputed of good quality, were procured from London: the great bulk of these produced plain pinks. In a few instances, however, *laced* sorts appeared; which, being new, were greatly admired. The seeds of these were carefully preserved and cultivated; and many good sorts were procured from them. The florists persevered in cultivating these; and, at the same time, did not neglect other kinds brought year after year from London, where they were greatly excelled in varieties. And, by proceeding continually on the simple principle of saving and using the seeds of the finest pinks, the original qualities were not only preserved but improved. For some years past, all importation has ceased. On the contrary, plants reared in Paisley have been sent by order to London, and have been pronounced equal or superior to any in England.

" The spirit for improving pinks, and many other kinds of flowers, is cherished in Paisley by an appropriate institution, established in the last year of the past century, and which encourages and methodizes a constant amicable competition. Those which are called Competition Flowers, are eight in number: viz. Auricula, Polyanthus, Hyacinth, Tulip, Anemone, Ranunculus, Pink, and Carnation. There is usually an annual competition of the best specimens of one or other of those eight kinds.

" Some idea of the zeal of the Paisley cultivators may be formed, when it is stated, that several of them can shew 70 or 80 of the most choice varieties of pinks; others 200 varieties of the choicest tulips; others 60 or 70 varieties of the best carnations all named; besides many excellent inferior varieties of each kind."

Rules of the Florist's Society. — The society have weekly meetings every Thursday evening, from the flowering of the Polyanthus, till the disappearance of the Carnation, and they have also annual meetings for determining remunerations. At the weekly meetings, " every member may produce specimens of as many kinds of the eight competition flowers as are in season; and the best specimen of each kind entitles the possessor to one enrolment of his name in the Society's minute-book for prizes. The successful competitor in the kind which the judges declare to be the most frequent among them presented for the night is enrolled in a department of the minutes appropriate to the competition for the predominant flower. The successful competitors, for the secondary flowers of the night, are each enrolled in a list, called the Competition of All Flowers. Should only one specimen of a kind be presented, the enrolment still takes place; because none would cut down their finest plants, were the accidental want of a rival specimen to render this sacrifice vain. But when each of the competition flowers is in the prime of its season, a competition for the best collection of specimens of six varieties of it is announced at one meeting, and decided at the next; and the name of the gainer is twice inserted. The weekly competition is determined, in ordinary cases, by two judges. If these do not agree, a thirdsman is chosen by the Club to decide; and should he demur, another judge is added. When the six best flowers of a kind are required, three judges are appointed. At the end of the year, those records are investigated; and there is exhibited to the Society a statement of the different winners, of the number of the appearances of each in the books, of the particular flowers in which he excels, and even of the merits of those flowers. Honorary rewards are then distributed. The most successful florist receives perhaps a spade; the next a rake; and the third a trowel or knife.

" In the books there is likewise a department for Border Flowers: and here the names of such members as from time to time produce the best of each sort are entered. And there is another department for the name of every member who presents the earliest blown flower of its kind. When the books are annually reviewed, the comparative merits of the competitors in each of these last departments are estimated; but no prizes are assigned. When the earliest specimen, however, is a competition flower, the name of the florist stands not only in the department for the earliest flowers, but also in the prize minute-book.

" At the annual meetings five judges are appointed: of whom, for the most part, two are strangers, who are known to be skilful florists. Two guardians receive the articles for competition; and affix to each a private number, so that the judges cannot know to whom any of them belong till after the decision. The first prize, which is a silver medal, of about the value of a guinea, with a suitable inscription, is awarded to the person who presents, of his own rearing, the twelve specimens of the competing flower, which, taken collectively, are the best. The twelve next in general excellence entitle the cultivator to an inscribed silver medal, worth about 15s. After the decision, the flower for next annual competition is announced. Pinks are brought into competition twice as often as any other species of flowers."

On these occasions from 40 to 100 manufacturers and tradesmen of the place dine together: and every one who has formerly gained a medal, is expected then to wear it. *Gen. Rep. of Scot. App.* vol. i. chap. ix.

2229. LANARKSHIRE. A surface of 556,900 acres, hilly and bleak, but with some fertile vallies. There is a botanic garden, and some good nurseries and market-gardens round the capital; Clydesdale is noted for its orchards, and the total number of acres in the county occupied in this way is estimated at 340 acres. There are some Gardener's Lodges, Florists' Meetings, and a Horticultural Society, held at Glasgow.

Glasgow Botanic Garden. — This garden owes its origin in a great measure to the exertions of T. Hopkirk, Esq. jun. of Dalbeth, a gentleman attached to botany, advantageously known as the author of "Anomalies of Plants," and who has long cultivated a collection amounting to 3000 species. It contains eight acres, and is the joint property of the College, and a number of subscribers, who are incorporated under the title of the " Royal Botanic Institution of Glasgow."

The plan of the garden (*fig.* 591.) combines variation of

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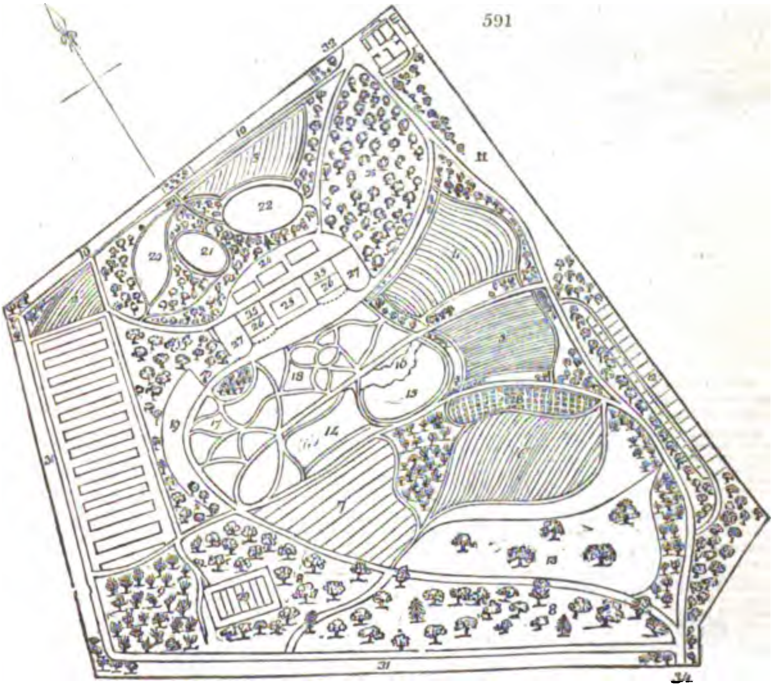

landscape and scientific arrangement in a very eminent degree. It was devised by a Committee of Subscribers, and chiefly by T. Hopkirk, and R. Austin, Esqrs., the latter a well known nurseryman. It consists of the following details :

1. A general collection of herbaceous plants.
2. A collection of grasses.
3. A Linnæan arrangement.
4. Arrangement according to the natural method of Jussieu, &c.
5. British plants.
6. Medical plants.
7. Plants used in agriculture or commerce.
8. Forest-trees.
9. Willows.
10. Borders for annuals.
11. Collection of biennials.
12. Esculent vegetables, fruits, &c.
13. Grass lawn.
14. American borders.
15. Aquarium,
16. Rock-wort.
17. Collection of roses.
18. Borders for florist's flowers, as pinks, carnations, &c.
19. Border for bulbs.
20. Collection of variegated plants.
21. Alpine plants.
22. Green-house ground.
23. Shrubs.
24. Forcing-beds, frames, &c.
25. Green-house.
26. Stoves.
27. Stove; a conservatory, on the west end.
28. Medical plants in quantity, for sale.
29. Inclosure for cultivating rare plants.
30. and 31. Duplicate borders.
32. North entrance from the Sandyford-road, with the Lodge and Lecture-room.
33. Queen Mary's yew, propagated from the famous tree at Cruikston Castle, twenty years ago.
34. South entrance from Dumbarton-road.
35. Under-gardener's rooms and potting-sheds.

On the enclosing wall, which is ten feet high, and also in the esculent department (12), the most approved sorts of hardy fruit-trees are cultivated: so that this garden, like that of Paris, will combine horticultural as well as botanical information.

The plan was executed under the direction of Stewart Murray, the present very intelligent and satisfactory curator of the garden. It was begun in May 1817, and completed in two years. The total sum subscribed by the members of this institution, amounts to nearly 11,000*l*. T. Hopkirk has presented to it the whole of his collection, and through his exertions and those of the other proprietors, and especially of that distinguished botanist, Dr. W. J. Hooker, the College Professor of Botany, the garden, in 1821, contained upwards of 9000 species.

The surface of the area is happily considerably varied, which adds greatly to the effect of the irregular groups and compartments; and it is fortunate also in having agreeable exterior scenery (*fig.* 592.), which, to the spectator walking in the gardens, forms a fine back-ground to the hot-houses, and at the same time shelters them from the north winds.

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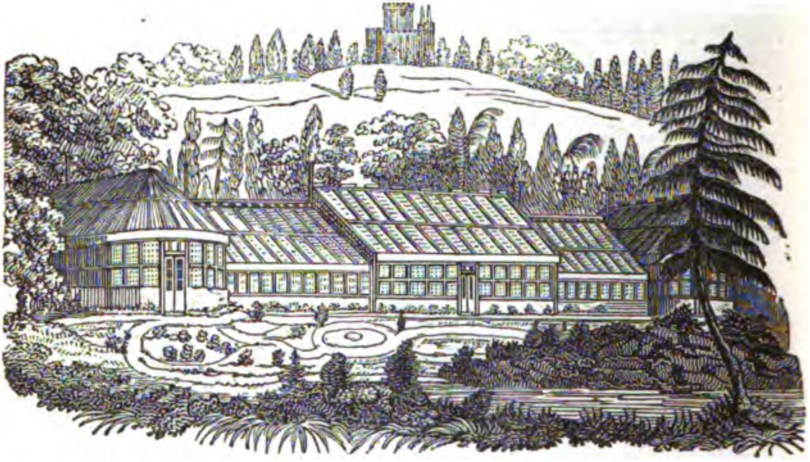

Glasgow Nurseries — occupy about 60 acres; the principal are carried on by Austin and Co. and Brown.

The Market Gardens of Glasgow — are estimated to occupy 260 or 270 acres, which are cropped chiefly with the commoner articles; sea-kale, artichokes, beet, endive, French beans, and shallots are not in demand; and other rarer sorts are unknown. Thirty acres, however, are occupied in raising strawberries for the Glasgow market, and an acre in a good season is estimated to produce from 800 to 900 Scotch pints, or about four times that number of pottles.

Clydesdale Orchards. — These are 60 in number, and occupy from 210 to 220 acres between Glasgow and Lanark. The largest contains about 30 acres. The fruits produced are apples, pears, plums, gooseberries, and currants. Many of them occupy steep banks, and are never cultivated. The others are chiefly ploughed, unless where the small fruits are grown in the intervals of the trees. The produce finds a ready sale in Glasgow and the sea-ports, and the demand seems increasing.

× *Hamilton Palace*, — at Hamilton: Duke of Hamilton. A gloomy old fabric, situated on one side of an extensive park watered by the Clyde; well wooded with old oaks, and distinguished by an extensive frontage, or false palace, on an eminence, called Chatelherault (Herald's Castle), said to be in imitation of the Duke's residence of that name in the circle of Vienne, in France. The acorns grown in Hamilton-Park are reckoned the best produced in Scotland.

Bothwell-house, — near Bothwell: Lord Douglas. A romantic and truly noble residence on the banks of the Clyde, with excellent gardens, an extensive collection of plants, and most romantic walks and rustic structures. The whole kept in the highest order.

2230. DUMBARTONSHIRE. A surface of 159,356 acres, chiefly mountainous, abounding in mosses and moors, with some natural woods, in which the holly and yew are more common than any where else in Scotland.

Orchards. — These are rare, though fruit-trees thrive well in the county. Excellent apples are produced in the tradesmen's-gardens of Dumbarton, and there is an orchard at Lochlomond, belonging to Macdonald Buchanan of Ross, which contains two of the largest and most healthy golden pippin trees in Scotland, generally very productive.

Rossdoe, — near Luss; Sir J. Colquhoun. The house delightfully situated on a peninsula projecting into Lochlomond: the grounds well wooded by nature, and a good kitchen-garden, lately formed at considerable expence.

Ross, — on Lochlomond: H. M. Buchannan, Esq. Remarkable for its beautiful beech-trees.

2231. STIRLINGSHIRE. A surface of 450,560 acres of hills and fertile vallies; the latter generally under aration. There is a nursery at Stirling, and some market-gardens of the commonest kind between that town and St. Ninians, and at Falkirk.

Orchards. — There are upwards of 20 of these in this county, generally very prolific in pears, apples, and plums; cherries are little grown in Scotland. The green-gage plum ripens in these orchards as a standard, and there are some large and prolific pear-trees nearly two centuries old. The alluvial soil of the Carseland is from 30 to upwards of 100 feet in depth, of rich mud, and in this the top roots of the pear-tree find an ample range.

Callander, — near Falkirk: -- Forbes, Esq. The grounds remarkable for large and venerable oak, ash, and beech-trees, which were among the earliest artificial plantations reared in Scotland.

Mynudoc Castle, — near Buchannan: James, Duke of Montrose. A noble place, surrounded by extensive plantations, the present Duke having been one of the greatest planters in Scotland.

2232. **LINLITHGOWSHIRE.** A surface of 71,580 acres, agreeably varied, generally under mixed culture, and beautifully watered on one side by the Forth. There are a few market-gardens about Borrowstounness and Linlithgow.

Barnbougle Park, — near Queensferry; Earl of Roseberry. A castellated mansion on a rock within high-water mark, lately much improved by Mr. Wilkins; the park extensive and finely wooded, and subdivided in the manner peculiar to the country, so as to be rendered available as a grazing farm.

Hopeton-house, — near Queensferry: Earl of Hopeton. One of the most stately and imposing mansions in Scotland in the Grecian style by Sir W. Bruce, and finished by Adams. It stands on a lawn of a mile in length, washed by the Forth, and is surrounded by extensive woods and plantations, a pleasure and kitchen-garden in high cultivation.

Newliston, — near Ratho; —— Hogg, Esq. A good house with extensive grounds planted by the Earl of Stair, in the ancient style; the trees in platoons, arranged, as it is vulgarly said, in the order of two engaging armies. The grounds in some places were formerly cut into curious flights of steps and terraces (*fig.* 593.); but much of this taste was obliterated about the beginning of the present century. The trees are for the greater part hornbeams, that species being at once of rapid growth and patient of pruning and clipping. The timber, however, is of little value, excepting for fuel.

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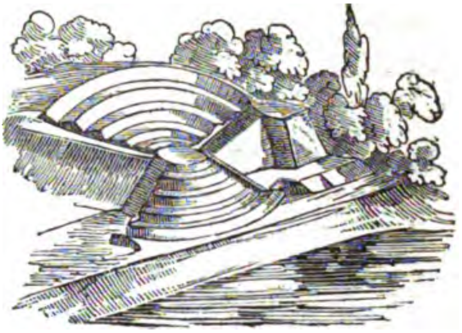

2233. **CLACKMANNANSHIRE.** A surface of 30,720 acres, beautifully varied, with few hills, and generally well cultivated. There is a market garden at Alloa, of about five acres, and some small nurseries.

Orchards. — There are some near Culross: one called Castlehill is at least two centuries old. The apple-trees are nearly exhausted with age: but the pear-trees remain in full bearing; the Crawford and sugar are the principal early, and the Achans the late sorts.

Shaw Park, — near Kincardine: Earl of Mansfield. The grounds contain extensive plantations of oak trees, and are capable of being rendered a beautiful and extensive park.

Tillibodie, — near Alloa: Sir Ralph Abercrombie. The house and grounds backed by the Ochil-hills, one of which is finely planted from the designs of Nasmyth.

2234. **KINROSS-SHIRE.** A surface of 39,702 acres, considerably varied by hills, vallies, streams, and a large lake.

Blair Athol, — near Kinross: W. Adam, Esq. Remarkable for the extent of the plantations on a barren-like peat soil, but now covered with finely-sheltered grass fields, and the general climate improved by the drainage and warmth.

2235. **FIFESHIRE.** A peninsular surface of 322,500 acres, finely varied by hills, vallies, a mountain, some lakes, and bounded on one side by the Forth, the other by the Tay, and the third by the open sea. It is an old county, well cultivated, and containing some fine country seats of moderate extent. Though the climate is unfavorable for the larger fruits, yet in no county of Scotland are gardens so general from the cottage to the mansion, or so well managed: as a proof, there is scarcely such a thing as a market-garden in the county.

Kircaldy Nursery, — at Kircaldy: Mr. Sang, editor of *The Planter's Kalendar*, and an extensive contractor for planting and managing plantations. There is also a nursery at Cupar, and at some other towns.

Market-Gardens. — There is one of six acres, surrounded by a high fruit-wall at Kircaldy; one of nearly equal extent at Pathhead, and one or two more at different parts of the county.

Orchards. — There are none of recent formation, excepting one laid out by Sang in 1811: but the remains of fruit-trees are still to be seen at the ancient Abbey of Lindores.

× *Wemyss Castle*, — near Kircaldy; Gen. Wemyss. Long famous for its kitchen-garden, laid out by the late Mr. Nicol, and its pleasure-grounds by Mr. White of Durham. The house is surrounded by extensive plantations, and the whole place is kept in the highest degree of order and neatness.

× *Raith*, — near Kircaldy: —— Ferguson, Esq. Most excellent kitchen-gardens also by Nicol, and finely-planted grounds in high keeping.

Balgonie Castle, — near Markinch: Earl of Levin. A quadrangular structure, on the banks of the Levin, of great antiquity; surrounded by finely-wooded grounds, containing a good kitchen-garden.

2236. **PERTHSHIRE.** A surface of 4,068,640 acres, much varied by hills and mountains, but containing some fertile valleys called straths and carses. It contains some excellent country residences. There is a respectable nursery at Perth, one at Dundee, and some lesser ones at Dunkeld, and other places; there is also a Horticultural Society held at Perth.

Perth Nurseries — contain between 50 and 60 acres; the principal is by Messrs. Dickson and Brown, in whose extensive and highly respectable establishment some fine varieties of the Scotch rose have been originated from seed.

Market-Gardens. — Dundee is said to be better supplied with vegetables than any other town in Scotland. The quantity of ground on which they are grown is estimated at 100 acres; and James Reid, in 1750, was the first who excelled in this mode of culture. The shipping ensures a brisk demand for common articles.

Orchards. — There are upwards of twenty in the Carse of Gowrie, situated on the flat northern shore of the Tay, chiefly from Kinfauns to the town of Dundee. The oldest are about 100 years: the soil is a deep mud or clay. They occupy in all nearly 130 acres. There are also a few old orchards along the south base of the Ochil hills.

Scone Palace, — near Perth: Earl of Mansfield. A noble castellated mansion by Mr. Atkinson, in one of the finest situations in Scotland, with a lawn in front of great extent, washed by the Tay, and backed by rising grounds covered with wood. The gardens and pleasure grounds extensive, complete, and well-managed.

Duplin Castle, — near Perth: Earl of Kinnoul. A good house and well planted grounds.

Dunkeld-house, — at Dunkeld: Duke of Athol. A large plain house in a bottom, surrounded by hills and mountains, celebrated for their extensive plantations, especially of the larch, and for their romantic walks, water-falls, streams, and rocks. Obvious defects of this place are, that there is no proper walk or wood to make a tour of the whole, and that the walks on the hill side, do not ascend in regular gradation, but are desultory and deficient in grandeur.

Blair House, — near Blair: Duke of Athol. A genuine Highland residence, chiefly remarkable for the extent of the surrounding plantations which clothe many hundreds of acres of lofty mountains and craggy steeps and hills.

× *Blair Drummond*, — near Stirling; —— Drummond, Esq. Celebrated as being the residence where Lord Kaimes displayed his taste in planting and improving in the latter half of the last century. The evergreens planted at that time are now singular ornaments to the grounds.

× *Taymouth*, — near Kenmore; Earl of Bredalbane. The most magnificent residence in the county. The house a spacious Gothic mansion, erected at different times, placed on a lawn about a mile in breadth, between two mountains, which open to Loch Tay on one side, and the Tay river passes within two furlongs of the house. The mountains, lawn, and the banks of the waters, are richly clothed with wood, through which are led magnificent walks. Of the trees, the limes and larches have attained to a great size, and there is an avenue of the former 450 yards in length, scarcely equalled any where.

× *Drummond Castle*, — near Crief; Lord Gwydir. The castle enlarged, and the grounds extended and highly improved by the present owner, assisted by his ingenious steward, Lewis Kennedy, Esq.

Ochtertyre, — near Crief; Sir P. Murray. A finely wooded place, greatly improved by the present owner; the kitchen-garden and hot-houses laid out by Nicol.

Lundie-house, — near Dundee; Lord Duncan. An excellent kitchen-garden, by Mr. Hay of Edinburgh.

Valleyfield, — near Culross; Sir R. Preston. A romantic residence, laid out from designs by Repton, whose son visited this place about 1804. The principal feature deserving a stranger's notice is the approach through a wooded glen.

Gartmore, — near Crief; —— Graham, Esq. A fine old place, noted for its fine forests, old cedars from seeds brought from Syria, and a good kitchen-garden by Nicol.

Gleneagles, — near Stirling; Sir R. Abercrombie. A house in the mixed style of Gothic and Grecian, of Adams, standing in finely varied grounds, well planted, and containing a fine piece of water, by White.

Castle-Gray, — near Perth; Earl Gray. A good house, by Mr. Atkinson, in a delightful and well-wooded situation.

2237. ANGUS, or FORFARSHIRE. A surface of 593,920 acres, consisting of mountains with extensive and fertile vallies; the former generally bearing good pasture, and the latter under aration. Montrose and Arbroath have a few small market-gardens; Brechin and Forfar have no market-garden; but many of the trades-people cultivate spots of ground for their recreation; and besides supplying their own families, produce a sufficiency of culinary vegetables and small fruits to meet the demands of their townsmen. It is estimated that upwards of 33,000 acres are covered with plantations.

The Forfar Botanic Garden — was founded by George Don, a well known botanist, who added more plants to the British Flora than any botanist of his time. The garden contains little more than an acre; but embraces almost all kinds of soil and situation, and in it were crowded together nearly all the hardy herbaceous plants and shrubs known in Britain. There is also a small green-house, containing above 1000 different species. Mr. Don died in 1814; but the botanic-garden is still kept up.

Castle Glammis, — near Glammis; Earl of Strathmore. A very ancient building, renovated by Inigo Jones; the grounds in the ancient style, and containing some fine old trees.

2238. KINCARDINESHIRE. A surface of 243,444 acres, mountainous towards the north, but more level and fertile on the south-east.

Brodie-house, — at Brodie; Alexander Brodie, Esq. F.L.S. A fine old place, much improved, and planted, by the present proprietor; and containing a good botanic garden, and some noble avenues.

2239. ABERDEENSHIRE. A surface of 718,806 acres, generally flat, but varied by knolls, wavy ridges, and gentle inequalities, formerly moory and bleak, but now extensively planted. It is said, that there is scarcely a gentleman in the county who has an estate of 100*l*. a year who has not planted some hundred thousands of trees, and that there is above 50,000 acres in the county covered with artificial plantations. There are a number of nurseries round Aberdeen noted for raising seedlings, many of which are sent to the south of Scotland and to England.

The Aberdeen Nursery, — Messrs. Reid. An old and respectable establishment chiefly devoted to the culture of forest-trees, and especially to seedlings of Scotch pine, larch-fir, and thorns. The father of the present occupier, who is also proprietor of the soil, (twelve acres), was gardener to Sir Archibald Grant of Monymusk, the greatest planter in Scotland.

Rose's Nursery — is a newly established concern, carried on with great spirit. There are various other nurseries.

Market-Gardens. — These are numerous, both for the supply of the town and shipping. Almost the entire parish of Old Machar is laid out in this way, and occupied by several hundred industrious men. At Peterhead there are also gardens for growing vegetables for the shipping of that place.

Orchards. — There is an extensive one at Pitfour, containing ten acres, including the ruins of the ancient abbey of Deer and its gardens; one of five acres at Auchterie, and some in a neglected state between Kene and Monymusk.

Monymusk, — at Monymusk; Sir A. Grant. Remarkable for its extensive plantations, the late proprietor having planted about fifty millions of trees; some of which, at the time of his death, were near one hundred feet high, and above six feet in circumference. The gardens and pleasure-grounds are beautiful and extensive.

Invercauld House, — near Invercauld; —— Farquharson, Esq. Famous for its pine forests, the timber of which equals that of Norway.

Slaines Castle, — near Slaines; Earl of Errol. Situated on the margin of the sea, with few trees around, but with a good kitchen-garden.

Den of Rubislaw, — near Aberdeen; Professor Davison. A romantic villa, the gardens forming terraces cut out of granite rock, watered by a stream, near which grow naturally many rare plants, and among others, Linnæa borealis. The whole kept in the highest order and neatness.

2240. BANFSHIRE. A surface of 649,600 acres; hilly and mountainous, with fertile valleys well cultivated. There are some good market-gardens at Banf.

× *Duff-House*, — near Duff; Earl of Fife. A magnificent quadrangular building, by Adams, in a park fifteen miles in circumference, chiefly laid out by the late Mr. White. On the other parts of the estate more trees have been planted than on any property in the country.

Gordon Castle, — near Gordon; Duke of Gordon. A large house; the grounds celebrated for their fine woods, extensive gardens, and romantic walks.

Cullen-House, — near Cullen; Earl of Findlater. Remarkable for its fine old woods: the late earl being one of the earliest and most extensive planters in the country.

2241. MORAYSHIRE. A surface 42 miles long, by 20 miles broad; great part hilly or mountainous, with extensive pine forests; but with a considerable tract, only gently varied and well cultivated. There is a market-garden at Elgin, in which onions are chiefly grown for the parishioners, and two small orchards: one at Logie, formed in 1786, and the other at Pitgaveny, formed in 1798.

2242. NAIRNSHIRE. A surface 17 miles long, by 10 miles broad; the greater part level and fertile.

2243. CROMARTYSHIRE. A peninsular surface of 68,480 acres; chiefly an elevated tract of heath, but undergoing rapid improvement by the agriculturist.

2244. CAITHNESS. A surface of 395,680 acres; generally flat; described by Pennant as an immense morass, with some fertile spots. From the materials which compose this morass, it appears to have been formerly full of wood; but recent attempts to raise plantations have not been very successful. There is a market-garden at Thurso of seven acres; a remarkable circumstance, as there are none in the counties of Cromarty, Ross, or Sutherland.

Thurso Castle, — near Thurso; Sir J. Sinclair. Chiefly remarkable for agricultural improvements, but displaying also some plantations, and a kitchen-garden, and many ingenious but abortive attempts at amelioration.

2245. The ORKNEY and SHETLAND ISLES contain nothing that we have heard of worthy of notice in the way of gardening. Such a thing as an orchard is unknown in these islands. In Orkney, Neill observes (*Gen. Rep.* sect. ii. p. 180.) a few apples are produced on wall-trees; in Shetland still fewer, and that only in particularly good seasons.

2246. SUTHERLANDSHIRE. A mountainous uncultivated surface of 1,478,400 acres; about half of which is the property of the Marquis of Stafford, who has enlarged the farms, built new farmeries, and planted extensively. See "An Account of the Improvements on the Marquess of Stafford's Estates, &c. by James Loch, Esq." 8vo. 1820.

Dunrobin Castle, — at Dunrobin; Marquis of Stafford. There is no mansion employed as a residence, but it is said a magnificent one is in contemplation, and there is a park devoted to the breeding and feeding of 1000 mountain deer. In the garden, apples, pears, and cherries thrive perfectly well, and every thing might be obtained by the use of glass.

Skibo, — at Skibo; —— Dempster, Esq. Extensive plantations have been formed, and in the gardens apricots and walnuts have sometimes ripened.

247. ROSS-SHIRE. A surface of 1,776,000 acres; the eastern part fertile, and containing some country-seats; but the rest rude, mountainous, and fit only for plantations and pasture. In no part of Scotland have the proprietors been more assiduous in forming public roads, and in planting extensive moory tracts.

Market-Gardens and Orchards. — There are none of the former; but there is an old orchard at Redcastle, in which the nonpareil ripens as an espalier. At Castle Braham, Novar and Braelangwell, are also orchards of recent formations.

Invergordon Castle, — near Invergordon; —— M'Leod, Esq. A handsome house, by Mr. Gillespie, of Edinburgh, surrounded by thriving plantations, on grounds where eighty years ago not a tree was to be seen.

Novar, — near Cromarty; Sir H. Monro. A great and finished place, and one of the most complete in the north; the situation of the house is elevated, and it commands a fine view of the bay of Cromarty.

Roxburgh-House, — near Avoch; —— ——. A modern edifice, substantially built and commodious. It is situated on a beautiful bank near the sea, and surrounded by a Scottish park, that is, an assemblage of grass-fields, surrounded by strips and varied by masses and groups.

Balnagowan, — near Kilmuir; Sir J. C. Ross. A most desirable seat, surrounded by an immense extent of thriving plantation.

New Tarbat, — near Kilmuir; Earl of Cromarty. A superb modern house, inferior to few seats in Scotland, surrounded by extensive grounds and plantations, which join those of Balnagowan.

Braham Castle, — near Urray; Lord Seaforth. A fine building, pleasantly situated on the river Conan, and surrounded by extensive and well planted grounds, containing a good kitchen-garden and an extensive collection of exotic and hardy plants.

Red Castle, — near Loch Beauly; Colonel Grant. An ancient and respectable residence considerably improved.

2248. INVERNESS-SHIRE. A surface of 2,000,000 of acres, being the largest county in Scotland. It consists of two ranges of mountains, separated by a chain of lakes now united by the Caledonian canal. The vallies are fertile; many of the mountains are covered with natural forests inhabited by the red and roe-deer, the alpine and common hare, and other exquisite sorts of game.

Inverness Nursery, — at Inverness; Messrs. Gibbs. A very extensive establishment for forest-trees and hardy fruit-trees; with branch nurseries at other towns. Here is a very complete nursery orchard of all the hardy fruit-trees which ripen their fruits as standards, and from which the scions and cuttings for propagation are taken.

Orchards.—There are but few public or commercial orchards, but some private ones, of which great part of the produce is sent to market. One of the largest is at Auchnagairn, near Inverness. It was planted in 1788, chiefly with the Herefordshire cyder apples. The trees are now in a full bearing state. They are placed thirty feet apart; till lately the intermediate spaces were regularly cropped, according to the rotation of the farm, along with which the orchard is let; now, however, the branches nearly meet, and grass is found to be the preferable under-crop. The old garden at Castlestewart, belonging to the Earl of Moray, and situated seven miles north-east of Inverness, may also perhaps be ranked as an orchard. The trees are chiefly morella and Kentish cherries, and the large black gean. They are generally of great size, and many of them shattered with age, having seen several centuries; yet they often produce most plentiful crops. At Milltown, of Ketwall, there are some remarkably large lammas and auchan pear-trees, about a century old. They are very productive. An apple-tree here in the orchard of Easter Lovat, on the river Beauly, covers a space of forty-seven feet in diameter. A Beauly pear-tree is spoken of, which used to produce 16 sacks of fruit in a season.

Kilravock, — near Croy; —— ——. Gardens laid out with taste; fruitful orchards and extensive woods, embracing an elegant modern house, situated on a rock hanging over and washed by the Navin.

Cantray, — near Croy; —— Davidson, Esq. A commodious house, and the grounds planted and greatly improved.

Glenguiry-House, — at Glengairy; —— M'Donald, Esq. The house on the shore of Loch Orich, surrounded by wood, and approached from the lake by a fine old avenue.

Castle Grant, — at Grant; Sir J. Grant. The house consists of three sides of a quadrangle, improved by R. Adam, beautifully situated on the north side of the Spey. It commands an extensive and noble landscape, including the park in which it stands of 4000 acres, and the natural forest of Abernethy of 40,000 acres, at the base of the lofty mountains of Cairngorum. Eastward lies the wide-bending cultivated vale of Cromdale watered by the Spey.

2249. ARGYLESHIRE. An extensive surface of 3,800 square miles, consisting of hills and mountains, with several islands, considered as belonging to it. It abounds in lakes and inlets of the sea, and contains some natural woods; but the climate is moist, and, excepting in the department of arboriculture, does not excel in gardening. There are some small market gardens at Cambleton; and a branch nursery from that of Gibbs at Inverness, at Inverary.

× *Inverary Castle,* — near Inverary; Duke of Argyle. square castellated mansion, with a tower at each corner, and a high glazed pavilion, shooting up above the towers from the centre of the roof. It is built of a grey stone (*Lapis ollaris*, or pot-stone) which becomes black with a shower of rain, and is immediately restored by a gleam of sunshine, which is a fertile source of singular effects in this moist weeping climate. It stands on a lawn, which extends to Loch Fyne, an inlet of the sea fifteen miles in circumference, surrounded by rising groves of plantations on the sides, and reaching towards the summits of the highest mountains and rocky steeps, sprinkled with rising trees. (*fig.* 594.) "One of these mountains is Dunicoick, covered with wood, excepting where the rugged rocks project through the trees, and add greatly to its grandeur. On its top stands a lonely watch-tower, which, like every thing useful or characteristic, has a good effect. Had this hill been crowned with an ornamental building, the effect would have been absurd. A plan was prepared for substituting ramparts and bastions, which would have been equally fatal to its present simplicity and grandeur.

The bold, and in some places savage, features of this part of the country, require only a judicious disposition of wood to render them more hospitable to the eye, and to improve the pasture and the climate. The larch-tree has already effected wonders in Argyleshire; and what its effects may be over the whole of the Highlands by the time half a century more has elapsed, it is difficult to imagine. Savage will then be changed to, or at least combined with, sylvan grandeur.

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2250. BUTESHIRE comprehends the islands of Bute and Arran, and some smaller isles; hilly, but with a moderate climate, and in general favorable to the growth of trees and hedges. There are two or three small orchards and market-gardens near Rothsay and Mount Stewart.

Mount Stewart, — Marquis of Bute. An elegant house, commanding a fine view of the Firth of Clyde, surrounded by extensive plantations, formed by the late Marquis, abounding with various sorts of game, and in which the turkey is naturalized. The gardens contained a good collection of plants; but, excepting the kitchen-garden, they are now in a state of comparative neglect.

Sect. IV. — *Ireland.*

The surface of this kindgom, which is estimated at 11,067,712 Irish acres, is much less varied than Scotland and Wales, but rather more so than England, though great part of it consists of bog and wastes, yet these are every where improvable by draining and culture, or planting. The climate is more temperate than that of Britain, but also more moist; it is, on the whole, highly favorable to the culture of leaves and roots; and favorable for all the other branches of gardening.

The political situation of the country, as we have already observed (135.), has prevented much from being done; but, from the cheapness of land and labor, and the natural advantages every where presented, the most extensive parks, pleasure-grounds, and kitchen-gardens, might be created at comparatively a moderate expense.

The names of residences here given are selected from the "Travellers' Guide," published in Dublin in 1819: the characteristic epithets added are from that work, and the English reader will of course make due allowance for Irish phraseology. We have made the general tour of Ireland, and been engaged professionally in three or four counties, and we know that many places, styled delightful and enchanting in the "Guide," would cut but a poor figure if placed beside hundreds of seats in England whose names we have omitted. There is very little old timber in Ireland, and very few of the "demesnes" that have any other park than a grass field, without trees, in which the house stands. Deer parks are rare, and also kitchen-gardens with hot-houses. Mr. Mackay of the Trinity College botanic garden, and Mr. M'Leish of Harold's Cross, are well calculated for furnishing designs for both these improvements, and happily there is at present a spirit for employing these gentlemen. If to this the proprietors would join a more constant residence on their estates, every thing would in time be effected that could be desired.

2251. DUBLIN. A fertile and little-varied surface of 147,840 Irish acres, well adapted for horticulture and floriculture. At Dublin is a royal park, and two excellent botanic gardens; there are two good nurseries by Simpson and Todd, and some culinary commercial gardens.

The Phœnix Park, — near Dublin; a public promenade and a royal park, seven miles in circumference, beautifully diversified with woodland, champaign and rising grounds, tastefully adorned with extensive sheets of water, and plentifully stocked with deer. The civic regal residence here is respectable and commodious.

The Botanic Garden, — at Glassnevin (*fig.* 595.); Dublin Society. Established with the commencement of the 19th century, chiefly through the exertions of Dr. W. Wade, author of several works on Irish botany. It is situated at Glassnevin, within two miles of Dublin castle, and contains 30 statute acres. "Nothing," the authors of the History of Dublin observe, "can exceed the command of aspect which the irregular beauty of the surface presents, and of which the planners (chiefly Dr. Wade) of the garden have been careful to avail themselves. Having ample room for every botanical purpose, they have not sacrificed taste to convenience, or disturbed such objects as contributed to the beauty of the old demesne, originally that of Tickel the poet. The summit, having considerable elevation, gradually or abruptly slopes to the river Tolka, which forms a sweeping boundary to one side of the garden. Here large clumps of venerable elms, or other forest-trees, shade the sloping steeps, or, running along the ridges, separate the ground into irregular divisions. Through these the ivy-crowned ruin of some venerable arch presents a passage, so that many of the compartments are approached by some picturesque or striking entrance. Nor is the systematic arrangement less judiciously managed. Nothing can be conceived more ungraceful than the formal regularity necessary in such an arrangement; every plant following in its order, and labelled with its name, presents to the eye an irksome sameness. To avoid this appearance, each class is subdivided into smaller compartments, insulated in green-sward, and commencing by pathways, and the intervals filled up with scattered shrubs; so that, while the most exact regularity is observed in the classification, and the series of plants follow each other in such succession that the most minute can be immediately found, the whole presents the aspect of unstudied confusion."

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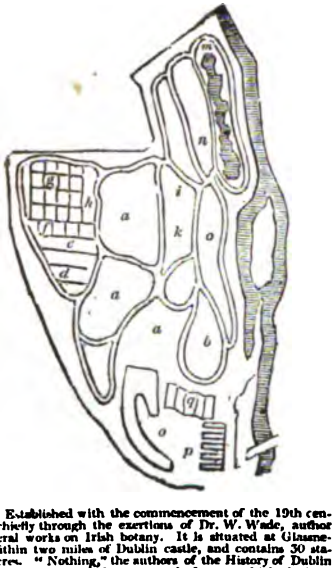

This garden contains the following arrangements, or subdivisions:

A. Hortus Linnæensius (a), subdivided into a herbaceous division, and one for shrubby, fruit-bearing, and forest-trees. Six acres are assigned to this division. To each plant is prefixed a metal label, inscribed with its number in the Glassnevin catalogue.

A. Hortus Jussieuensis (b), rather limited, yet sufficiently extensive to comprize all the orders of which there are hardy specimens introduced in Britain.

A. Hortus Hibernicus (c), or garden of native Irish plants, containing upwards of 1345 species, including Cryptogamiæ.

A. Hortus esculentus (d), containing not only the usual culinary vegetables, but all others in which wholesome and nutritious qualities reside, in such a degree that they can be converted into human aliment.

A. Hortus medicus (e), or garden of plants used in medicine, arranged on the plan of Woodville's Medical Botany; and containing every hardy plant in which any medical virtue is known to reside.

A. Hortus pecudarius (f), or cattle garden, in which are arranged all plants which the animal to whom the plant is appropriated is fond of eating, and which are wholesome food for it; also such as he is not fond of eating, though not unwholesome. On the opposite side are arranged such plants as the same animal will eat, but which are injurious to it, and likewise such as it refuses to eat whether injurious or not. Each of these particulars is noted on the label, pointing out the plant, and likewise whether the plant be indigenous or foreign.

A. Hortus rusticus (g), or garden of plants used in rural economy, including the grasses, clovers, &c.

A. Hortus tinctorius (h), containing all the plants used in dyeing, particularly those which are indigenous to Ireland.

A. Hortus plantæ volubiles repentes, et scandentes, fruticosæ et herbaceæ (i, k), or garden of twining, creeping, and climbing plants, shrubby, and herbaceous.

A. Hortus plantæ saxatiles, or garden of rock-plants on rock-work. This is formed on an artificial mound, constructed on the most elevated part of the garden. "The fragments of rock for this purpose were transported from the Hill of Howth, and such was selected as were already clothed with various species of mosses and lichens. These were piled together without any apparent order, so as to give the appearance of a natural rocky mound. But it is so constructed that spiral walks winding round the sides, but not visible at a distance, conducts the visitor to the summit. Here, as he ascends, he sees every grey stone clothed with its appropriate vegetation, and in every fissure of the rocks some alpine plants. When arrived at the summit of this mount, the eye is gratified with a view of the whole garden, lying beneath displayed as in a map." History of Dublin, page 1298.

A. Hortus lacustris et palustris (m), or garden of aquatic and marsh plants. On the banks of the Tolka lies an extensive flat, lower than the bed of the river, in which an irregular lake is formed, two hundred yards in length, for the aquatics; and on the shores, and in an island formed on purpose at one extremity, the marsh plants are grown. At convenient intervals green promontories project into the water; which, while they give a picturesque variety to the banks, afford an opportunity of approaching such plants as the botanist may wish to examine. The grounds surrounding the lake are varied with American pines and other transatlantic woods that love a swampy soil, and beyond these the rising grounds are entirely devoted to ornament.

A. Hortus Cryptogamicæ (n), or garden of cryptogamous plants. This is a steep bank, shaded by lofty trees.

A. Hortus Floræ (o), or flower-garden in which the florist's flowers are cultivated in parterres.

A. Hortus Exoticæ (p), or garden for tender exotics, comprising a conservatory, two green-houses, and a hot-house parallel, close together, and commencing by a common passage at the north end.

A Professor's house and Lecture-room (q), with a library, Hortus siccus, &c. The house of the former proprietor, Tickel, is preserved, and arranged for this purpose.

This garden is managed by a professor and lecturer, with a salary of 300l., a superintendant at 100l. two assistants at 60l. each; twelve gardeners at 12s. per week; and six apprentices at 9s. The total annual expence, including 75l. as rent for the land, is about 1500l. a year. Besides the usual number of apprentices, six, who having passed the usual period under private gardeners, are received here to complete their knowledge and experience, especially in the hortus esculentus. After passing two years here they are received as gardeners into private houses, and are much sought after. A premium of five guineas is given by the society to those who are recommended by the superintendant for assiduity and good conduct; and the superintendant receives 5l. as a gratuity for his trouble in instructing them.

The Botanic Garden at Trinity College.—This garden was begun in 1807. It is situated in low grounds, and contains three and a half acres, of an irregular shape, surrounded by a wall twelve feet high. " There are separate arrangements for trees, shrubs, and herbaceous plants, according to the Linnæan system; and a very full collection of medicinal plants, arranged according to the natural method of Jussieu. To each plant is prefixed a label containing the systematic and English names, and class, and order, both of Linnæus and Jussieu. Separate arrangements are formed for the perennial, biennial, and annual herbaceous plants, and for the grasses. Only one wing of the intended range of glass has yet been built, which comprises a stove thirty-five by sixteen, and a green-house forty feet by sixteen. In front is a small aquarium. This garden is rapidly increasing in riches under the excellent management of its present curator, G. Mackay.

Clarehall, — near Donnybrook; —— ———. Stupendous, rocky scenery, with old trees in the park.

Marino, — near Dublin; Earl of Charlemont. A delightful edifice, in a demesne of 200 acres, judiciously and tastefully planted, with a fine ornamental temple.

Merville (sea villa), — near Donnybrook; —— ———. A beautiful mansion and grounds.

Mount Merrion, — near Donnybrook; Lord Fitz William. A magnificent mansion, with gardens and trees.

Newtown Park, — near Donnybrook; —— ———. A magnificent mansion, and trees in the park.

Rathfurnham Castle, — near Rathfarnham; —— ———. A magnificent castellated structure, with agreeable pleasure-grounds.

Tullagh Palace, — at Tollagh; Archbishop of Dublin. An ancient venerable structure, with extensive gardens, kept in fine order.

2252. **WICKLOW.** A finely varied surface of 305,404 Irish acres; with fine dells and brooks, and bordering on the sea.

Belview, — near Bray; D. Latouche, Esq. A romantic residence, with extensive gardens and hot-houses, on which no expense is spared to preserve their reputation of being the first in Ireland.

Kilruddery, — near Bray; Earl of Meath. A romantic country residence, in a deep valley, overshadowed by lofty mountains.

Newtown Mount Kennedy, — near the village of that name; Lord Rossmore. Extensive plantations, and a waterfall of 100 feet, in what is called the Devil's Glen.

Powerscourt, — near Enniskerry; Lord Powerscourt. An extensive fronted edifice, in a demesne of 600 acres tastefully planted, and ornamented with water and buildings.

Charleville, — near Enniskerry; Lord Monck. Situated on the river Dargle, with a luxuriance of rural beauties.

Blessington Park, — near Blessington: Marquis of Downshire. A fine park; the house consumed in the rebellion of 1798, and not yet rebuilt. This place was formerly famous for the first kitchen-gardens in Ireland.

Rusborough, — near Nans; Earl Miltown. The front of the house and offices form an extensive facade of hewn stone, nearly 700 feet long. The grounds finely varied and well planted.

2253. **WEXFORD.** A peninsular surface of 315,396 Irish acres, of good soil, but little varied in aspect.

Camolin Park, — near Enniscorthy: Earl Mountmorris. A beautiful demesne.

2254. **KILKENNY.** A surface, somewhat varied by hills, of 318,249 Irish acres. There is a good nursery here, by John Robertson, who has distinguished himself by some excellent papers published in the " Transactions of the London Horticultural Society."

Ballyraget-house, — near Ballyraget: Lady Ormond. A charming demesne; the mansion burned down during the rebellion of 1798, but restored by her ladyship.

Desart, — near Bennet's-bridge: Lord Desart. A magnificent mansion and extensive demesne.

Ashbrooke, — near Durrow: Lord Ashbrooke. A magnificent mansion, with an extensive demesne.

2255. **KILDARE.** A flat surface of 242,245 Irish acres of fine arable soil.

Bishop-court, — near Kill: Lord Ponsonby. A magnificent mansion and highly cultivated demesne.

Bolan, — near Tinolin: Lord Aldborough. A beautiful seat with extensive plantations.

Castletown, — near Celbridge: ——— ————. A mansion on the banks of the Liffey; as superb an edifice as any in Ireland, and the plantations correspond in magnificence.

Kiladoon, — near Celbridge: Lord Leitrim.

Carton, — near Maynooth: Duke of Leinster. A superb mansion, the demesne extensive, a vast lawn waves over gentle hills, interspersed with plantations to a great extent, affording a variety of beautiful prospects. A stream winding through the whole has been widened to a river, over which an elegant bridge is constructed, and a lofty square prospect tower has been erected on one of the most elevated knolls.

Newberry, — near Castle Carberry; Lord Harberton. A beautiful seat.

2256. **KING'S COUNTY.** A surface of 282,200 acres, little varied, and of which nearly one half is bog or waste.

Charleville Forest, — near Tullamore; Earl of Charleville. A demesne of 1500 acres, partly the remains of a natural forest, on which the present Earl has built a magnificent and commodious mansion in the castellated style, and laid out the grounds with great taste.

Frankford, — near Frankford: ——— ————. An antique mansion, with a fosse and draw-bridge, in an extensive flat demesne.

2257. **QUEEN'S COUNTY.** A surface, consisting chiefly of bogs, mountains, swamps, and wastes of 235,300 acres.

Stradbally hall, — near Stradbally: ——— Cosbie, Esq. A beautiful seat.

Brockley Park, — near Stradbally: Earl Roden.

Dawsons-court-hall, — near Stradbally: Lord Portarlington. A magnificent seat.

Ballyroan, — near Ballyroan: Lord de Vescey. A magnificent residence.

2258. **CARLOW.** A surface of 137,000 acres, of grand and picturesque surface and good soil.

2259. **EASTMEATH.** A fertile surface of 227,900 acres, generally flat, but with only a moderate portion of bog and waste.

Gormanstown-house, — near White Cross: Lord Gormanstown.

Slane Castle, — near Slane: Earl Conyngham. A splendid mansion, now erecting, and the grounds, through which flows the Boyne, planting and being otherwise improved.

Dunsany Castle, — near Dunshaughlin: Lord Dunsay.

Ardbraccan Palace, — near Trim: Bishop of Meath. A chaste and simple building.

Headfort, — near Kells: Marquis Bective. A magnificent mansion, and extensive and beautifully planted demesne.

2260. **WESTMEATH.** A surface of 249,943 acres of bogs, hills, a number of lakes, and some fertile ground.

Gaulstown Park, — near Gaulstown; Lord Kilmaine. A superb residence.

Craggan, — near Moat-a-Grenogue: ——— ————. A fine mansion and beautiful demesne.

Trasternaugh, — near Morinstown: Sir P. Piers.

Lacken, — near Mullingar: ——— ————. A beautiful mansion and demesne.

Ballinlough, — near Mullingar; H. O'Reilly, Esq. A charming residence.

Castletown Delvin, — near Mullingar: Earl of Westmeath. A charming residence.

Packenham-hall, — near Castle Pollard: Earl Longford. A splendid seat.

2261. **LONGFORD.** A surface of 134,700 acres of rich and beautiful spots, interspersed with bogs, mountains, morasses, and fens.

Castle Forbes, — near Newtown Forbes: Earl Granard. A splendid residence.

2262. **LOWTH.** A surface of 126,960 Irish acres, fertile, undulating, and thickly interspersed with lofty hills.

Barmeath, — near Clogherhead: Sir E. Pellew. A charming mansion, encircled with an extensive and well planted demesne.

Clermont, — near Largan Green; Earl Clermont. An elegant seat.

Colon, — near Slaine: Hon. John Foster. A demesne tastefully ornamented with extensive plantations.

PROVINCE OF MUNSTER.

2263. **WATERFORD.** A surface of 262,800 Irish acres, rough, rocky, and mountainous, with a soil varying through all the gradations of loam and peat.

Ballinamonn, — near Tramore: ——— ———. A well-planted demesne.

Curraghmore, — near Waterford: Marquis of Waterford. An extensive demesne, which for beauty and variety cannot be surpassed in any part of the united kingdom.

Lismore, — near Lismore: Duke of Devonshire. A magnificent pile, now repairing, and the grounds being improved.

2264. **CORK.** The largest county in Ireland, comprising a surface of 1,048,709 Irish acres, of which 231,959 are bogs, mountains, and waste. There is a nursery by Thomas Sheehan.

Cork Botanic Garden, — was founded in 1809, by the Royal Cork Institution, (a society of gentlemen incorporated after the manner of the Dublin Society, and like that society supported by annual grants from Parliament), six acres are enclosed by a hedge, and one acre near the centre by a wall, includes a hot-house and green-house. The plants in the garden are arranged in the Linnæan manner; it is managed by a committee, and the curator is Mr. James Drummond, A. L. S. a good practical botanist and intelligent gardener. Of late years the funds of the Cork Institution have been so low that it has been found necessary to turn the greater part of the garden into a nursery, and dispose of the produce.

Castle Martyn, — near Youghal: Earl of Shannon. A magnificent mansion and demesne.

Rastillion, — near Middleton: Earl Inchinquin. A noble seat. The tide gently flows to the garden walls.

Moorfield, — near Kilworth: Lord Mount-Cashel. A superb residence.

2265. **TIPPERARY.** A surface of 554,950 Irish acres, rugged, coarse, and mountainous in the west, but level and fertile in the east, where the lands are considered amongst the most productive in Ireland.

Kilmore, — near Clonmel. ——— Bagnal, Esq. A beautiful seat.

Newtown, — near Clonmel: Sir T. Osborne. A neat mansion.

Knocklofty, — near Clonmel: Lord Donoughmore. An enchanting residence on the banks of the Suir, finely planted.

Shanbally, — near Clogheen: Lord Lismore. A splendid residence.

Killcordy, — near Ballyporeen: Sir W. Barker. A delightful residence.

Cashel Palace, — near Cashel: Bishop of Cashel. The gardens beautiful and tastefully arranged.

Cashier, — near Cashier: Lord Butlers. A delightful residence.

Ballygriffin, — near Goldeer: Earl Clanwilliam. An enchanting residence.

Suir Castle, — near Golden: Lord Massay. A beautiful situation on the banks of the river Suir.

Dancers Court, — near Tipperary: Lord Milton. A fine residence.

Castletown, — near Templemore: Marquis of Lansdown. A fine romantic seat.

Templemore, — near Templemore: Sir J. C. Carden. An elegant seat.

2266. **LIMERICK.** A surface of 386,750 Irish acres, generally flat and very rich, especially the tract of low lands on the Shannon, which are deemed the richest and most prolific in Ireland. There is a nursery at the county town, by Thomas Lees.

Ballymort, — near Askeyton: ——— Massey, Esq. A beautiful seat.

2267. **CLARE.** A surface of 476,200 Irish acres, of which more than half is bog, mountainous, and waste; the mountains numerous, and the soil and surface of the lower grounds very various.

Innislymon, — in the village, the castle of the elder branch of the O'Brien family.

2268. **KERRY.** A surface of 647,650 Irish acres, much varied in surface and soil, and to a tourist the most interesting county in Ireland, as containing the Lakes of Killarney.

Mount Meredith, — near Castle Island; O'Donohue, Esq. A charming residence.

Kenmare Lodge, — near Kenmare; Marquis of Lansdown.

Kenmare-house, — near Killarney: Lord Kenmare. A delightful demesne along the banks of the river Deneagh, at the mouth of which the aquatic excursion of the lakes is commenced. Round the Lakes of Killarney is Bellview, and various other houses of little or no interest, otherwise than from their situation. The banks and islands of the lakes are rich in botany; and display truly interesting copses and single specimens of *arbutus unedo,* as well as grand and picturesque views.

PROVINCE OF CONNAUGHT, WEST.

2269. **ROSCOMMON.** A surface of 346,650 Irish acres, with some lofty hills, but no lakes of any magnitude: it is generally in pasture.

Clover-hill, — near Mount Talbot: ——— Latouche, Esq. A beautiful residence.

French Park, — near Belanager: ——— ———. A delightful mansion and demesne.

Stokestown, — at Stokestown: R. Mahon, Esq. A magnificent mansion.

2270. **GALWAY.** A surface of 989,959 Irish acres; varied and rich, but without hills or mountains: generally in pasture.

Portumna Castle, — near Portumna: Marquis of Clanrickard. A venerable mansion.

Flower-hill, — near Portumna: Lord Riverton. A delightful residence.

Spring-garden, — near Eyrecourt: ——— Pearce, Esq. A beautiful residence.

Dalystown, — near Woodford: Right Hon. D. B. Daly. A fine mansion and well planted demesne.

Queensborough, — near Eyrecourt: Earl Louth. A fine seat.

Gort-house, — near Gort: B. Smyth, Esq. A fine seat.

Garbally, — near Ballinasloe: Lord Clancarty. A splendid residence.

Bally-donnellan — near Aghrim; ——— ———. A beautiful demesne.

Oramore Castle, — near Oramore: ——— Blake, Esq. A venerable mansion.

Dunsandle, — near Kilconnel: J. Daly, Esq. A splendid and magnificent residence.

Clonbrook, — near Ahascragh: Lord Clonbrook. A beautiful mansion, and highly improved demesne.

Bellew, — near Newtown Bellew: Sir E. Bellew. A beautiful seat.

2271. **MAYO.** A surface of 790,600 Irish acres; a great portion mountainous and waste, and the rest chiefly in pasture.

Castlebar-house, — near Castlebar: Lord Lucan. A venerable structure, solidly situated on the brow of a steep eminence overhanging the river.

Moat, — near Ball: Sir R. B. Lynch. A delightful residence.

Neal, — near Ballinrobe: Lord Kilmaine. A magnificent mansion and extensive demesne.

Newpark, — near Swineford: Sir A. Brabazon.

Hollymount, — near Hollymount: ——— Lindsay, Esq. A fine mansion and demesne.

Newbrook-house, — near Hollymount: Lord Clanmorris. A magnificent mansion.

2272. **LEITRIM.** A surface of 255,950 Irish acres; hilly, with fertile vallies, and numerous streams and lakes; the whole well adapted for every branch of gardening.

Lurgan, — near Lurgan-bay: Right Hon. S. Winne. A beautiful residence.

PROVINCE OF ULSTER, NORTH.

2273. **SLIGO.** A surface of 247,150 acres, nearly the third quite waste, the rest fertile in corn and potatoes.

Haslewood, — near Sligo, on Lough Gill: ——— ———. The house and demesne aptly composed in elegant magnificence.

CAVAN. A surface of 301,000 Irish acres, abounding in fenny pastures and coarse

ourt, — near Swadlinben: Earl Enniskillen. A sidence.

-house, — near Kilmore: Lord Farnham. A splendid residence, in an extensive demesne, abounding in lakes, hedgerows, and meadows.

FERMANAGH. A surface of 283,400 Irish acres, chiefly boggy and mountainous; ing to tourists as containing Loch Erne.

- on an island in Loch Erne; Earl Ross. The ains 200 acres, charmingly diversified by hills, gentle declivities, which are richly clothed with , through which gravel walks are conducted, and a temple erected, from which a panoramic view is obtained, not only of this, but of all the other wooded islands of the Loch. One of them is exclusively used as a deer park.

MONAGHAN. A surface of 179,600 Irish acres, much encumbered with bogs and ins, but in part rich and cultivated.

ancy, — near the village of that name; Lord . delightful residence, commanding a fine view of a lake, thickly interspersed with islands richly planted with trees.

TYRONE. A surface of 467,700 Irish acres, a great portion rough and moun-

rt, — near Newtown Stewart; Marquis of Aber- agnificent mansion, but no park scenery, or gar- ing notice. Extensive plantations, however, have in various parts of the demesne.

ill, — near Caledon; Lord Caledon. A delight- ce.

Aghinvas, — near Caledon: Lord Belmore. An elegant mansion and extensive demesne.

Parn-hill, — near Dungannon: Lord Northland. A magnificent residence.

Stewart-hall, — near Stewart Town: Lord Castlestewart. A magnificent residence.

DONEGAL. A surface of 679,550 Irish acres; the greatest portion reclaimable claimable mountains.

DERRY. A surface of 318,500 acres; its surface varied but without mountains, soil generally fertile.

ARMAGH. A surface of 181,450 acres, with an irregular surface that has not been compared to eggs placed on end in a bason of salt.

sford, — near Market Hill: Lord Gosford. An emesne fringed with trees.

llon, — near Richwell: Sir C. Molyneux. An emesne, containing a handsome sheet of water, skirting the base of a hill covered with a very thriving plantation.

Lurgan-house, — near Lurgan: Right Hon. W. Brownlow. A delightful residence. Near this seat is Loch Neagh, a lake of 60,361 acres.

DOWN. A surface of 348,500 Irish acres, considerably varied, with but few moun- d moors.

tle, — near Moira: Marquis of Hastings. Con- old trees, and also some young plantations; gar- ll its branches having been here attended to by owner's father, when neglected in almost every of Ireland.

gh Castle, — near Hillsborough: Marquis of A magnificent residence.

- near Newtown Breda: Lord Dungannon. A t residence.

Lissige, — near Newry; Earl Clanwilliam. A splendid residence.

Ballymoney, — near Ruthfryland: Marquis of Downshire. A fine country residence.

Bryansford, — near Narrow Water: Lord Clanbrassil. A delightful and sequestered residence, well planted, with a river, and a succession of picturesque cascades.

ANTRIM. A surface of 420,999 Irish acres, considerably varied with mountains s, fertile vallies, bogs, and dry wastes. It is noted by tourists as containing the Causeway. There are two nurseries at Belfast.

stle, — near Antrim, on the borders of Lough . O'Niel. An enchanting residence.

astle, — near Glenarm: Earl Antrim. A venerable ficent mansion.

Castle Upton, — near Templepatrick: Lord Templeton. A beautiful seat.

CHAP. IV.

Of the Literature of British Gardening.

Every thing in civilized society has its origin in some original propensity of our Man is an animal fond of talking, and of being listened to. After the inven- letters he began to write books, as a more extensive kind of conversation; be- e felt more satisfaction in displaying his knowledge to an unlimited extent, rely speaking or discoursing to those about him; besides, he considered that s would remain after him, and be read and admired by countless numbers of . Books increased as the knowledge of letters became more general; and the of them were generally those with which men of letters were most conversant. of men have existed in all ages and countries, who have undertaken to explain eries of nature; some classes of them are called priests, and others philoso- ut by whatever name they may be known, the object of their pursuits is the explain, either by reason or revelation, the nature of things. These men were to write books. Next came the historians, whose relations were found enter- and, by degrees, letters became known to the vulgar. Books were at last seful in the common acts and pursuits of life, and the writing of them, origi- private pleasureable recreation, became, in time, a business: some were found on any subject, (general authors, writers of all work; as Lord Byron terms d some on particular topics, (special writers, or original authors).

rst books, expressly on agriculture and gardening, were written by the Romans r shortly before, the commencement of the Christian æra. In the ages which d the fall of the Roman empire, few books were written, excepting on religion;

the first which appeared on rural matters was by Crescenzio, in Italy, early in the fifteenth century; but none appeared in Britain till that of Fitzherbert, published about the middle of the century following. Before the end of the same century appeared Tusser, Mountain, Mascal, and Hyll, who wrote expressly on gardening, partly from their own experience and observation, and partly by translating from the Latin and Greek authors. In the seventeenth century appeared as gardening authors, Plat, Lawson, Gardiner, Standish, Parkinson, Plattes, Austin, Tradescant, Evelyn, Cowley, Blake, Rea, Worlidge, Meager, Temple, and some others. These writers were chiefly amateurs, or gentlemen gardeners and botanists. Those of the succeeding century are numerous, and consist in great part of practical or professional gardeners, who wrote from their own experience; of these are London and Wise, Collins, Switzer, Fairchild, Miller, Cowell, Stevenson, Hitt, Hill, Wheeler, Abercrombie, Boutcher, Swinden, Speechly, Forsyth, Maddock, M'Phail, Repton, and Nicol.

Of amateur or gentlemen gardeners, and botanists, who wrote on gardening during the eighteenth century, there are Laurence, Bradley, Evelyn, Justice, Hanbury, Weston, Whateley, Chambers, G. Mason, Mason the poet, Anderson, R. P. Knight, T. A. Knight, U. Price, M. Marshall, and C. Marshall.

The nineteenth century has produced one or two practical authors, as Pontey, Hayward, Emmerton, and Hogg; one gentleman writer on the subject, Hope; besides a number of authors of both classes, who have contributed papers to the Horticultural Societies.

The old gardening books previous to the Restoration, Professor Martyn observes, (*Pref. to Mill. Dict.* xxxv.) " are of very inferior value, with scarcely any pretence to originality, if we except Scot, Lawson, Parkinson, and Austen.

" Evelyn made a new era in planting and gardening. His first little work was from the French, and published before the Restoration; but his great work, " The Silva," was original, delivered before the Royal Society in 1662, and first printed in 1664. The same year his Gard'ner's Almanac was also published, and maintained its ground until Miller's Kalendar appeared. Cook attended him in the article of planting; Sharrock and Rea in that of gardening; which Cowley and Rapin ornamented with the flowers of poetry. Quintinie, with his followers, London and Wise, figured in gardening at the end of the same century: Liger, Laurence, and Bradley, at the beginning of the next; these were followed by Switzer and Fairchild, who lead us to the time of Miller, in 1724. Contemporaries with Miller were Batty Langley, and Cowell. Miller, during his long career, had no considerable competitor, until he approached the end of it, when several writers took the advantage of his unwearied labors of near half a century, and fixed themselves upon him, as various marine insects do upon a decaying shell-fish. I except Hitt and Justice, who are both originals; as is also Hill, after his fashion; but his gardening is not much founded in experience.

" The first considerable treatise on ornamental gardening is Whateley's, entitled Observations on Modern Gardening, and published without his name. Shenstone published his Unconnected Thoughts in 1764. There is an anonymous pamphlet on the Rise and Progress of the Present Taste of Planting Parks and Gardens in 1767; and an Essay on Design in Gardening in 1763, by George Mason. The English Garden, a poem, by Mason, appeared in 1772. Knight published The Landscape, a didactic poem, in 1794. Repton, the same year, Sketches and Hints on Landscape Gardening. Marshall, a Review of the Landscape; and in 1796 he treated on ornamental gardening, in the second edition of his work on Planting. Essays on the Picturesque, by Uvedale Price, Esq. in 1798. In 1803, a second magnificent work by Repton, entitled Observations on the Theory and Practice of Landscape Gardening, appeared; and another, entitled Fragments on Landscape Gardening and Architecture, in 1816. Loudon's Observations on Planting and Landscape Gardening appeared in 1804; and his Treatise on Country Residences in 1806.

The most useful works on gardening at the present time are, in horticulture those of Forsyth, Nicol, and Abercrombie; in floriculture, that of Maddock; in arboriculture, those of Pontey and Sang; and in landscape gardening, those of Whateley and Repton. In the transactions of the horticultural societies are some valuable and original communications on the first branches, and especially on horticulture.

After this general view of the subject, we shall enumerate the principal British works on gardening, including some few of those on husbandry and botany, naturally connected with our subject. We shall adopt the order of the appearance of their authors, as writers on gardening; and where we can, we shall give short biographical notices. Such translations and foreign works as have obtained some degree of currency, or are known in England, we shall place in a separate section.

Sect. I. *British Works on Gardening.*

1502. *Arnolde, Richard*, an ancient English chronicler and haberdasher, in St. Magnus's parish, London; flourished in the end of the fifteenth and beginning of the sixteenth centuries; died about 1521.

1. The Customs of London, from the time of Richard I., &c. commonly entitled Arnold's Chronicle, and first printed at Antwerp in 1502, fol.; reprinted along with a series of English chronicles. London, 4to. 1811. It is divided into chapters, and contains the following articles:

The act for trees above 20 yeres growing to pay no tyths. The crafte of graffynge and plantynge and alterynge of frutys, as well in colours as in taste. A treatyse of the four elementys and four seasons, &c. and of the canyculare dayes. The fourme and mesur to mete lande by. Percely (probably cress,) to grow in an hour space.

1527. *Anon.*

The Grete Herbal, which gyveth parfyt knowledge and understandyng of the boke lately printed by me Peter Treveris.

Peter Treveris was the first printer in Southwark; the book to which he alludes was 'the Grete Herbal, 1516,' and the first or second production which issued from his press.

1532. *Fitzherberd*, Sir *Anthony*, a learned lawyer, and the father of English husbandry, born in Derbyshire, made judge of the common pleas in 15th Henry VIII., wrote various works on law, besides those on husbandry, and died in 1538.

1. The Book of Husbandry, very Profitable and Necessary for all Persons. Lond. 4to. 1532.
2. Surveying and Book of Husbandry, 8vo. 1537.

1557. *Tusser, Thomas*, Gent. born near Witham in Essex, 1515, received a liberal education at Eton school, and at Trinity-hall Cambridge; lived many years as a farmer in Suffolk, and afterwards removed to London, where he published his first work in 1557, and died in 1580.

1. Five Hundred Points of Good Husbandry, as well for the Champaign and Open Country as for the Woodland. Lond. 1557, 4to.
2. Another edition, entitled, Fiue Hundreth Points of Good Husbandry, vnited to as many of Good Huswiferie; first deuised and now lately augmented, with diuers approved Lessons concerning Hopps and Gardening, &c. Lond. 1573, 4to.

1571. *Mountain, Didymus.*

1. The Gardener's Labyrinth; containing a Discourse of the Gardener's Life, in the yearly trauels to be bestowed on his plot of earth, for the vse of a Garden; with Instructions for the choise of Seedes, apt times for Sowing, Setting, and Planting, and Watering; and the Vessels and Instrumentes seruing to that vse and purpose; wherein are set forth, diuers Herbes, Knottes, and Mazes, cunningly handled for the beautifying of Gardens; also the Physike of eche Herbe, &c. Gathered out of the best approued Writers of Gardening, Husbandrie, and Physicke, &c. Lond. 1571, 4to.
2. The Second Part of the Gardener's Labyrinth; vttering suche skillful experiences and worthy Secretes, about the particular sowing and remouing of the moste Kitchen Hearbes; with the wittie ordering of other daintie Hearbes, delectable Floures, pleasant Fruites, and fine Rootes, as the like hath not heretofore bin vttered of any; beside the Physicke benefites of each Herbe annexed, with the commoditie of Waters distilled out of them, right necessarie to be knowen. Lond. 1577, 4to.

1574. *Hill, Hyll*, or *Hyle, Thomas*, a London author of various works on Dreams, Physiognomy, Mysteries, an Almanac, Astronomy, Arithmetic, &c.; died in the beginning of the seventeenth century.

The Profitable Arte of Gardening: to which is added much necessarie matter, and a number of secrets, with the Phisicke helps belonging to each hearbe, and that easily prepared. To this is annexed two proper Treatises, the one entituled the Marvailous Government, Propertie, and Benefite of Bees, with the rare Secretes of the Honnie and Waxe. And the other, the Yerely Conjectures mete for Husbandmen. To these is likewise added a Treatise of the Arte of Graffing and Planting of Trees. Gathered by Thomas Hyll, citizen of London. Lond. 1574. 4to.

1594. *Platt*, Sir *Hugh*, author of various philosophical works, and apparently a lawyer. "Sir Hugh Platt, (says Mr. Weston,) spent part of his time at Copt-hall in Essex, and at Bishop's-hall in Middlesex, at each of which places he had a country seat; but his town residence was Lincoln's Inn. In the Jewel House of Art and Nature, he is named Hugh Platte or Platt, (for it is spelt both ways) of Lincolnes Inne gentleman. By the same book it appears that he then (1594) lived at Bishop's-hall, and that he had an estate near St. Albans.

He does not inform us what profession he was of, only that it was alien from the studies of husbandry and gardening. He must have had a numerous family, for six of his children died of the worms.

It appears from his Garden of Eden, (p. 96.) that he was living in the year 1606; and that he had a garden in St. Martin's-lane.

1. The Jewel House of Art and Nature, containing divers rare and profitable Inventions, together with sundry new experiments in the Art of Husbandry, Distillation, and Moulding. Faithfully and familiarly set downe, according to the Author's own experience, by Hugh Platte, of Lincolnes Inne, Gentleman. Lond. 1594, 4to.
2. The Garden of Eden, or an accurate Description of all Flowers and Fruits now growing in England, with particular Rules how to advance their Nature and Growth, as well in Seeds and Hearbs, as the secret ordering of trees and Plants. By that learned and great Observer, Sir Hugh Platt, Knight. The fifth edition. Lond. 1660, Small 8vo.
3. The Second part of the Garden of Eden, &c. Never before printed. Lond. 1660.

1597. *Gerarde, John*, a surgeon and famous herbalist, was born in Cheshire, 1545; died about 1607. He lived in Holborn, where he had a large botanic garden, one of the first attempts of the kind in England.

The Herbal, or General History of Plants, gathered by John Gerarde, Master in Chirurgerie; with cuts. Lond. 1597, fol.

1597. *Lawson, William*, a practical author, who wrote besides his Orchard, *Tractatus de Agricultura*, 1656, 4to. He professes to write wholly from experience, and not to delight in curious conceits as planting and grafting with the roots upwards, inoculating roses on thorns, and such like.

A New Orchard and Garden; or the best way for Planting, Graffing, and to make any Ground good for a rich Orchard: particularly in the North, and generally for the whole Commonwealth; with the Country Hous-wifes Garden for Herbs of common use: their Virtues, Seasons, Profits, Ornaments; variety of Knots, Models for Trees, and Plots, for the best ordering of Grounds and Walks. As also the Husbandry of Bees, with their several Uses and Annoyances: all being the experience of forty and eight years' labour, and now the third time corrected, and much enlarged. Whereunto is newly added, the Art of Propagating Plants, with the true Ordering of all manner of Fruits, in their Gathering, Carrying home, and Preservation. London. 4to. Followed by a most profitable new Treatise, from approved experience, of the Art of propagating Plants. By Simon Harward.

1604. *Anon.*

The Fruiterer's Secrets, 4to. black letter. It contains some curious directions for preserving fruits and other garden productions.

1612. *C.—— R.——*

An old thrift newly revived, by R. C. of planting and preserving of timber and fewel, by R. C 1612. 4to. in four parts.

1613. *Standish, Arthur.*

New Directions of Experience, authorised by the King's most excellent Majesty, as may appear, for the Planting of Timber, and Fire-wood, &c., and how as great store of fire-wood may be raised from hedges as may plentifully mainetaine the kingdome for all purposes, without losse of grounde; so as within thirty yeares all spring woods may be converted to tillage and pasture. Lond. 1613, 4to.

1620. *Bacon, Francis*, Viscount of St. Albans, a most distinguished philosopher, and High Chancellor of England, in the reign of James I.; was born in London 1560, and died 1626.

Essay on Gardens, &c. in Instauratia Magna, sive Novum Organum, &c., of which there are numerous editions both in Latin and English: one by Shaw with notes. Lond. 3 vols. 4to. 1725.

1622. *Bonfeil, John.*

Instructions how to plant and dress vines, and to make wine, and how to dry raisins, figs, and other fruits, and also olives, oranges, lemons, pomegranates, almonds, and many other fruits. Printed with his Treatise on the Art of making Silk, page 36—88. Lond. qto.

1628. *Markham, Gervase, Jarvise, or Gervas*, an English author who wrote on a great variety of subjects during the reigns of James I. and Charles I., and died about 1685. He appears, says Mr. Harte (Essays, ii. 32.) to be the first Englishman who deserves to be called a hackney writer. All subjects seem to have been alike easy to him. His thefts were innumerable, but he has now and then stolen some very good things, and preserved their memory from perishing.

The Country Housewifes Garden, by Gervase Markham.

1629. *Johnston, Thomas*, M.D. a learned botanist, a native of Yorkshire, bred an apothecary, and established in that profession in London; he made various botanical tours, and published the first local Flora, which appeared in England; died 1643.

The Herbal; or General History of Plants, gathered by John Gerarde, enlarged and amended. Lond. 1629, fol.

1629. *Parkinson, John*, a celebrated herbalist and botanist; born in 1567, bred an apothecary, and acted in that capacity and as herbalist and botanist to James I. and Charles I.; died about 1640. Professor Martyn says his Paradisus is the first gardening book worth mentioning, and that considering what had been done before it, it has the greatest merit.

1. Paradisi in Sole Paradisus Terestris, or a Garden of all sort of pleasant flowers which our English ayre will permitt to be noursed up: with a Kitchen Garden of all manner of herbes, rootes, and fruites, for meate or sause, used with us; and an Orchard of all sorte of fruitbearing trees and shrubbes fit for our Land, together with the right orderinge planting and preserving of them, and their uses, and vertues. Collected by John Parkinson, apothecary of London, 1629, fol. There is an engraved title page by Switzer, representing the Garden of Eden; with 109 wooden cuts of flowers and fruits, and a portrait of the Author. Dedicated to the Queen.

2. Theatrum Botanicum; or an Herbal of great extent. Lond. 1640. 2 vols. fol. 1746 pages, with many wood cuts.

1631. *Austen, Francis.*

Observations on Sir Francis Bacon's Natural History, so far as it concerns fruit-trees; 4to.

1633. *Plattes, Gabriel*, a poor man, but a useful writer. Harte says, he had a bold adventrous cast of mind, and preferred the faulty sublime to faulty mediocrity. As great a genius as he was, he was allowed to drop down dead in London streets with hunger; nor had he a shirt upon his back when he died. He bequeathed his papers to Hartlib, who seems to have published but few of them.

1. Treatise of Husbandry. Lond. 1633. 4to.

2. Discourse of infinite Treasure, hidden since the World's beginning, in the way of Husbandry. Lond. 1639. 1653. 1656, 4to.

1640. *Anon.*

1. The Countryman's 'Recreation, or the art of Planting, Graffing, and Gardening, in three bookes. Lond. 1640. 4to. With a perfect Platforme of a Hop-Garden.

2. The expert Gardener, collected out of Dutch and French Authors. 1640. An edition with cuts in 1654.

1645. *Weston*, Sir *Richard*, of Sutton, in Surrey. He was ambassador from England to Frederick V. Elector Palatine, and king of Bohemia in 1619. He was present at the famous battle of Prague, and his curious relation of it in a letter is still preserved in MS. It is remarked in the Philosophical Transactions, that England has profited in agriculture to the amount of many millions in consequence of the Flanders Husbandry having been made known by Sir R. Weston's book.

A Discours of Husbandrie used in Brabant and Flanders; shewing the wonderful improvement of land there; and serving as a pattern for our practice in this Commonwealth. Lond. 1645, iv. 24 Pages.

1645. *Hall, Joseph.* This author lived at Shedley, in Yorkshire; an extract from his work may be seen in the Museum Rusticum.

An essay on Timber Trees.

1649. *Blith* or *Blythe, Walter*, an officer in Cromwell's army, who, with other English gentlemen, holding commissions at that time, was eminently useful in introducing improvements into Ireland and Scotland.

The English Improver Improved, or the Survey of Husbandry Surveyed, discovering the Improveableness of all Lands; by Wa. Blith, a lover of Ingenuity. Lond. 4to.

This is an original and incomparable work for the time.

1651. *Hartlib, Samuel*, an ingenious writer on Agriculture, and author of several Theological tracts, was the son of a Polish merchant, and came to England about 1640. He was a great promoter of Husbandry during the times of the Commonwealth, and was much esteemed by all ingenious men in those days. Milton addressed to him his Treatise on Education, and Sir William Petty inscribed two letters to him on the same subject. Cromwell allowed him a pension of a hundred pounds a year.

A Designe for Plentie, by an universall Planting of Fruit-trees; tendered by some Wel-wishers to the Publick. London, without date, but probably 1652. 4to. Published by Hartlib, who had the MS. from the Hon. Colonel John Barkstead Lieutenant of the Tower. The author was an aged minister of the Gospel, at Loving-land near Yarmouth.

1653. *Austen, Ra*, author of several works on Theology, all printed at Oxford, where he seems to have lived, and died probably about 1680.

1. A Treatise of Fruit-Trees. Shewing the manner of Grafting, Setting, Pruning, and Ordering of them in all respects; according to divers new and easy Rules of experience; gathered in the space of twenty yeares. Whereby the value of Lands may be much improved, in a short time, by small cost, and little labour. Also discovering some dangerous Errors, both in the Theory and Practice of the Art of Planting Fruit-trees. With the Alimentall and Physicall use of fruits. Togeather with the Spirituall use of an Orchard. Held forth in divers Similitudes betweene Naturall and Spirituall Fruit-trees; according to Scripture

and Experience. By Ra. Austen. Practiser in the Art of Planting. Oxford, 1653, 4to.

1656. ***Tradescant, John***, a Dutchman, but the period of his coming to England is unknown. He is said to have been some time in the service of Lord Treasurer Salisbury, and Lord Wooton. He travelled as far eastward as Russia; was in the fleet that was sent against the Algerines in 1620, on which occasion he collected plants in Barbary and the isles of the Mediterranean. About 1629 he obtained the title of Gardener to Charles I. When he founded his garden at Lambeth is not exactly known; but there he collected the first considerable collection of Natural History ever formed in this country. His museum was called Tradescant's Ark, and was much frequented by the great. He had a son of the same name, who took a voyage to Virginia, and brought home many new plants. Tradescant's spiderwort and aster are among the number of plants introduced by them. In what year the elder Tradescant died is uncertain, but he was an old man when his book was published. The son inherited the museum, and bequeathed it by a deed of gift to Elias Ashmole, Esq., who lodged in Tradescant's house. It afterwards became part of the Ashmolean museum, and the name of Tradescant was unjustly sunk in that of Ashmole. John, the son, died in 1662: his widow contested the will, and upon losing her cause, it is said she drowned herself. A curious account of the remains of the Lambeth garden, drawn up in the year 1749 by Sir W. Watson, is printed in the 46 vol. of the Philosophical Transactions; and of the family monument erected by Mrs. Ashmole in the 63 vol. of that work.

Catalogue of the plants in his garden.

1657. ***Beale, John***, a Herefordshire gentleman.

1. A Treatise on Fruit Trees, shewing their Manner of Grafting, Pruning, and Ordering: Of Cyder and Perry: Of Vineyards in England, &c. Oxf. 1653, 1657, 4to. 1665, 12mo.

2. The Hereford Orchards; a pattern for the whole of England. Lond. 1657, 12mo. 1724, 8vo.

3. Observations on some parts of Bacon's Natural History, as it concerns Fruit Trees, Fruits, and Flowers. Oxf. 1658, 4to. Printed along with the work entitled, A Treatise on Fruit Trees, 1665, 12mo.

4. General Advertisement concerning Cyder. — Letters about Improvement of Nurseries, Orchards, &c. Lond, 1677, 4to.

1658. ***Browne***, Sir ***Thomas***, M. D., an eminent physician and antiquary, was born in London, 1605, died 1682.

1. Hydriotaphia, or a Discourse of Sepulchral Urns lately found in Norfolk; together with the Garden of Cyrus, or the Quincuncial Lozenge, or Net-work Plantation of the Ancients, artificially, naturally, and mystically considered. Lond. 1658, 8vo.

2. Certain Miscellany Tracts in Scripture, of Gardens. Lond. 1684, 8vo.

1658. ***Evelyn, John***, F. R. S., an eminent natural philosopher and patriot, was born at Wotton, in Surrey, the seat of his father, Richard Evelyn, Esq.; the 31st of October, 1620: after he had finished his education at Oxford, his philosophic turn of mind induced him to quit his native country, rather than engage in the civil war then breaking out, and in 1644, he set out to make the tour of Europe. He wrote on a variety of subjects, philosophical, political, and literary, and died on the 27th of February 1705-6, in the 86th year of his age, and was interred at Wotton.

1. The French Gardener, instructing how to cultivate all sorts of Fruit Trees and Herbs for the Garden; together with directions to dry and conserve them in their natural state. Lond. 1658, 8vo.

2. Fumifugium; or the Inconvenience of the Air and Smoke of London dissipated; together with some Remedies humbly proposed. Lond. 1661, 12mo. This work was addressed to his Majesty King Charles II. and published by his express command. The author proposes the removal of such trades as require great fires, five or six miles out of London, towards Greenwich; also of slaughter-houses and chandlers; and to plant fragrant nurseries and gardens in the low grounds near the city. The lime trees in St. James's Park were planted in consequence of this suggestion.

3. Sylva; or a Discourse of Forest Trees, and the Propagation of Timber in his Majesty's Dominions. To which is annexed, Pomona; or an Appendix concerning Fruit Trees in relation to Cider, the making and several ways of ordering it. Lond. 1664, fol. Dr. Hunter, of York, published an elegant edition, with copious Notes and Engravings, in 1776, 2 vols. 4to.

4. Kalendarium Hortense; or the Gardener's Almanac, directing what he is to do monthly throughout the year, and what Fruits and Flowers are in their prime. Lond. 1664, 8vo.

5. Terra; a Philosophical Discourse of Earth, relating to the Culture and Improvement of it for vegetation and the propagation of Plants, as it was presented to the Royal Society, April 29. 1675. Lond. 1675, fol.

6. Pomona; a Discourse concerning Cider Lond. 1679, fol.

7. Monsieur de la Quintinye's Treatise of Orange Trees, with the raising of Melons, omitted in the French editions, made English by J. E. Lond. 1698.

8. Acetaria, or a Discourse of Sallets. Lond. 1699, 8vo.

In 1819, Memoirs of J. Evelyn, Esq., including his Diary, were published by William Bray, (in 2 vols. 4to,) a very interesting book, as affording a faithful picture of the times in which he lived, and a good idea of the gardens on the continent at the time he travelled, and of those of England at the end of the 17th century.

1660. ***Ray, John***, a celebrated naturalist, and particularly eminent in botany, was born at Black Notley, near Braintree, in Essex, Nov. 29. 1628. His father, though only a blacksmith, sent his son to the grammar-school at Braintree, and afterwards to Cambridge. There he became tutor to many gentlemen, and a sensible preacher and divine; was chosen mathematical lecturer and university reader. He took priest's orders; but after the passing of the Bartholomew act, was compelled to resign his fellowship; upon which he confined his studies more particularly to natural history and published many works on that and other subjects. He died in his 78th year, January 17. 1705, in his own house, at the place of his birth, where in the churchyard is a monument to his memory, erected at the expence of Dr. Compton, Bishop of London.

1. Catalogus Plantarum Angliæ et Insularum adjacentium, indigenas quam in agris passim cultas comprehendens; in qua, præter synonyma necessaria, facultates quoque summatim tradunter; una cum Observationibus et Experimentis novis, medicis, physicis; cum indice morborum et remediorum. Lond. 1670, 8vo.

2. On the tapping of trees, and ascent and descent of the sap. Philosoph. Trans. 1669.

1660. ***Sharrock, Robert***, LL. D. Prebendary of Winchester, born in Buckinghamshire in the 17th century, author of various judicial and theological works, died 1684.

1. The History of the Propagation and Improvement of Vegetables by the concurrence of Art and Nature. Written according to Observations made from Experience and Practice. Oxford, 1660, 8vo.

2. Improvements to the art of gardening; or, an exact treatise of plants. Lond. 1694. fol.

1662. ***Cowley, Abraham***, an eminent English poet, was born in London 1618; began to write poems at the age of fifteen; lived in terms of intimacy with Evelyn and other eminent men of his time; went to court; but at last, Spence informs us, he grew sick of going there, "took a house first at Battersea and then at Chertsey, always farther and farther from town, where he died in 1667. His death, Pope observes, was owing to a mere accident. He went with Dean Sprat, who afterwards published his life and writings, to dine at a neighbour's house, who, according to the fashion of the times, made them too welcome. They did not set out for their walk home till it was late, and had drank so deep that they lay out in the fields all night. This gave Cowley the fever, which carried him off." He disliked women, and was fond of retirement in idea, and pants after it in his poems; but, according to Dr. Johnson, was unhappy when he had attained his wishes.

Plantarum Herborum, Florum, et Sylvarum, Lond. 1662. 8vo.

1664. *Blake, Stephen.*

The complete Gardener's Practice, 4to. Lond.

1665. *Hughes, William.*

1. The Complete Vineyard; or, an excellent way for the planting of Vines, and ordering of Wines and Wine-presses, according to the German and French manner. Lond. 1670, 8vo.

2. The American Physician, or a Treatise of the Roots, Plants, Trees, &c., growing in the English Plantations; with a Discourse on the Cocoa Tree, and the ways of making Chocolate. Lond. 1672, 12mo.

3. The Flower Garden; how most Flowers are ordered, increased, &c. Lond. 1672, 12mo.

1665. *Rea, John,* Gent. He seems to have been a professional gardener, and to have given plans for laying out grounds.

Flora, or a complete Florilege, furnished with all requisites belonging to a Florist. Lond. 1665. fol. with cuts.

1666. *Beale,* Dr. *John,* an ingenious English divine and philosopher, was born in Herefordshire, 1603; died 1683.

1. Experiments and Observations on Vegetation and the Running of the Sap, &c. Phil. Trans. 1669. Abr. i. p. 304.

2. The Connection of certain Parts of the Tree with those of the Fruit. Ib. 1669. p. 334.

3. Remarks on the Vinetum Britannicum.

4. Agrestick Observations and Advertisements.

1666. *Rose, John,* gardener to Charles II. at St. James's.

The English Vineyard vindicated, and the way of making wine in France. Lond. 12mo. 1690, in 8vo. First printed with Evelyn's French Gardener, in 1690.

1668. *Worlidge, John,* Gent.

1. Systema Agriculturæ; the Mystery of Husbandry discovered. By J. W. (John Worlidge) Gent. Lond. 1668, fol.

2. The Art of Gardening. Lond. 1700, 8vo.

1672. *Drope, Francis,* B. D.; a native of Cumner in Berkshire, where his father was vicar, and his brother a physician. Francis died at Oxford, and this work was published after his death by his brother, and dedicated to Lord Windham, who is stated to have a fine orchard at Brackley.

A short and sure Guide to the Practice of Raising and Ordering of Fruit Trees. Oxford, 12mo.

1675. *Cotton, Charles,* Esq., an English poet, born in Staffordshire in 1630; author of a number of political works, memoirs, poems, &c., and editor of Walton's Angler; died 1687.

The Planter's Manual of Raising, Planting, and Cultivating all Sorts of Fruit Trees. Lond. 8vo.

1676. *Cooke, Moses,* gardener to the Earl of Essex at Cashiobury. Evelyn in his diary mentions him as a skilful artist in the mechanical part of gardening, not ignorant in mathematics, and with some pretensions to astrology. He afterwards became a partner with Lucre, Field, and London, in the Brompton Park Nursery.

1. The Manner of Raising, Ordering, and Improving Forest Trees. By Moses Cooke, Lond. 4to.

2. The Art of making Cyder, published in Evelyn's works.

1677. *Lawrence, Anthony.*

Nurseries, Orchards, Profitable Gardens, and Vineyards encouraged. Lond. 4to.

1681. *Langford, T.*

1. Plain and full instructions to raise all Sorts of Fruit Trees that prosper in England; with Directions for making Liquors of several Sorts of Fruit. Lond. 1681. 8vo.

2. The Practical Planter of Fruit Trees. Lond. 1681. 8vo.

3. Systemæ Agriculturæ; being the Mystery of Husbandry discovered. Lond. 1681. fol.

1682. *Meager, Leonard.*

1. English Gardener; or, a Sure Guide to Young Planters and Gardeners. Lond. 1683. 8vo.

2. New Art of Gardening; with the Gardener's Almanack. Lond. 1697. 8vo.

3. The Mystery of Husbandry. Lond. 1699. 12mo.

1683. *Gilbert, Samuel,* author of Fons Sanitatis; or the Healing Spring at Willowbridge in Staffordshire.

1. The Florist's Vade Mecum. Lond. 12mo.

2. The Gardener's Almanack. By Sam. Gilbert, Philerenus. In this small book is a particular description of the Roses cultivated in the English gardens at that period, and very accurately described.

1683. *Read, John,* gardener to Sir George Mackenzie of Rosehaugh in Aberdeenshire.

The Scots Gardener; whereunto is annexed, the Gardener's Kalendar. Edin. 1683, 4to.

1684. *Bobart, Jacob,* curator of the botanic garden at Oxford.

Effects of the Great Frost on Trees and other Plants. Phil. Trans. 1684. Abr. iii. pages 89.

1685. *Temple,* Sir *William,* a statesman of deserved eminence, and a miscellaneous writer, was born in London in 1628. He was ambassador for many years at the court of Holland, and there acquired his knowledge and taste in gardening. He introduced some good sorts of grapes and other fruits, and one variety of nectarine still bears his name; he had an excellent walled garden at Sheen in Surrey, in which his cotemporary Evelyn says his trees were most exactly trained. He had another seat at Moor Park near Farnham in Surrey, where he died in 1698, and his heart, by his desire, was buried in a silver urn under a sun-dial in the garden. He was warmly attached to gardening and retired leisure, and declares one of the greatest pleasures in life to be 'such a degree of liberty, as to be able to walk at ones own pace, and ones own way.'

Upon the Gardens of Epicurus; or, of Gardening, in the year 1685. In his works, Vol. I. Miscellanea.

1685. *Anon.*

The Complete Planter and Cyderist. 8vo.

1691. *Gibson, J.*

A short Account of several Gardens near London, as viewed in 1691. Published in the Archæologia Britannica, vol. xii. p. 181.

1699. *Facio, Nicholas,* of Duilbier, F.R.S., a mathematician, was born in Switserland in 1664. He studied at Geneva, after which he settled at Utrecht as a tutor, but was there suspected of Spinosism. In 1687 he came to England, where he taught mathematics, was tutor to the Marquis of Tavistock, and had a patent for jewel-watches; but when the French prophets made their appearance, he joined them in all their extravagancies, for which he stood in the pillory in 1707. He died at Worcester in 1753.

Some of his papers are in the British Museum.

Fruit Walls improved by inclining them to the Horizon; or a Way to build Walls for Fruit Trees, whereby they may receive more Sunshine and Heat than ordinary. By a Member of the Royal Society. Lond. 4to. With Plates by Gribelin.

This is a very ingenious and scientific work, in which the advantages of receiving the sun's rays at right angles are mathematically and optically demonstrated.

1699. *London* and *Wise*, nurserymen, and garden architects, and the most eminent in their line at the end of the seventeenth and beginning of the eighteenth century. George London was apprentice to Rose, the royal gardener, and sent by him to France to study the beauties of Versailles. On his return he was made head gardener to Dr. Compton, Bishop of London, and at the beginning of the revolution, superintendant of the royal gardens, at a salary of 200*l.* a-year, and page of the back stairs to Queen Mary (see 129.) Of Wise little is known, excepting that he laid out grounds; and in particular Blenheim. Switzer says, London was a man of singular activity; and when on a tour of the places at which he had concern, used to ride, at an average, sixty miles a day, which at last brought on a fever, that occasioned his decease after a fortnight's illness, in 1717.

The Complete Gardener: or Directions for Cultivating and right Ordering of Fruit Gardens and Kitchen Gardens. With the Gardener's Kalender, directing what is to be done every Month in the Year. By Monsieur de la Quintiney. Now compendiously abridged, and made of more use; with very considerable Improvements. By George London, and Henry Wise. To which is prefixed, an Address to the Nobility and Gentry. By J. Evelyn, Esq. Lond. 1717. 8vo.

1704. *Anon.*

Dictionarium Rusticum; or, a Dictionary of Husbandry, Gardening, Trade, and Commerce. 2 vols. 8vo. with Cuts.

1706. *Gentil.*

Solitary or Carthusian Gardener; being Dialogues between a Gentleman and Gardener. Lond. 8vo. Most probably a translation from the French.

1707. *Fleetwood, William*, successively Bishop of St. Asaph and Ely, and much admired as a popular preacher, was born in London in 1656, published a great number of sermons, and other works, and died in 1723.

Curiosities of Nature and Art in Husbandry and Gardening. Lond. 8vo.

1707. *Mortimer, John*, author of some tracts on religious education. His works on husbandry were translated into Swedish, and published in Stockholm in 1727.

The whole Art of Husbandry, in the way of managing and improving of Land.

1712. *Addison, Joseph*, was born at Milston in Wiltshire, 1672, educated at Salisbury, Litchfield, and Oxford; he addressed some verses to Dryden at the age of twenty-two; obtained a pension of 300*l.* a year in 1699; travelled on the Continent for three years; returned and assisted Steele in the Tatler and Spectator; married the Countess-Dowager of Warwick in 1716; became secretary of state; resigned on a pension of 1500*l.* a year, and died in 1719 at Holland-house, Kensington, leaving only one daughter, who died unmarried in 1797.

1. On the Causes of the Pleasures of the Imagination, arising from the Works of Nature, and their Superiority over those of Art: published in the Spectator, No. 144.
2. Description of a Garden in the Natural Style. Ibid. No. 477.

1714. *Lawrence*, or *Laurence*, *John*, M.A., an eminent naturalist, admitted of Clare-hall, Cambridge, B.A., 1688; presented to the rectory of Yelvertoft in Northamptonshire, in 1708; where in three years he improved a garden of thirty-two yards squares the soil a wet white clay, so that it produced some of the choicest fruits. In 1721 he was presented to the rectory of Bishops Wearmouth, County of Durham, where he died in 1732. He is described as of a hospitable and benevolent disposition, and taking great pleasure in presenting a rich desert of fruit to his friends. He was fond of gardening, and considered it as a recreation particularly suitable for a clergyman. "The most wholesome kind of exercise, being *ad ruborem, non ad sudorem;* such an exercise as studious men require; less violent than the sports of the field, and more so than fishing; in fine, the happy medium."

The Clergyman's Recreation: shewing the Pleasure and Profit of the Art of Gardening. Lond. fol.

1715. *Snow, T——*, author of Apopiroscopy.

Arts, Improvements: or Experiments in Building, Agriculture, Gardening, &c. Lond. 8vo.

1715. *Switzer, Stephen*, a seedsman and artist gardener. To be addressed "At the Flower-pot over against the Court of Common Pleas in Westminster Hall; or at his garden in Millbank, Westminster." He is said to have been brought up under London and Wise. He appears to have been well educated for the time in which he lived, and it is remarkable that so little is known of his history. He died in 1745.

1. Ichnographia; or the Nobleman, Gentleman, and Gardener's Recreation: Directions for the General Distribution of a Country Seat into rural and extensive Gardens, Parks, Paddocks, &c. with a general System of Agriculture, illustrated with a great variety of Copperplates, from the Author's Drawings. Lond. 1718. 3 vols. 8vo.
2. The Practical Fruit Gardener. Lond. 1724. 8vo.
3. Compendious Method of raising Kitchen Vegetables. Lond. 1729. 8vo.
4. An Introduction to a General System of Hydrostatics and Hydraulics. Lond. 1729. 2 vols. 4to.
5. Dissertation on the true Cytisus of the Ancients. Lond. 1731. 8vo.
6. Universal System of Water and Water-works, Philosophical and Practical; with Cuts. 1730. 2 vols. 4to. The Third Edition, made very perfect and complete, especially that part which relates to the burning of clay.

1716. *Bradley, Richard*, F.R.S., a popular writer of very considerable talent and indefatigable industry, author of various treatises in Natural History, Husbandry, &c., and Professor of Botany at Cambridge. He was chosen into that office November the 10th, 1724, by means of a pretended verbal recommendation from Dr. Sherard to Dr. Bentley, and pompous assurances that he would procure the University a public botanic garden by his own private purse and personal interest. The vanity of his promises was soon seen, and his total ignorance of the learned languages known. In 1731 it was in agitation to turn him out of his professorship; and he died in the latter end of 1732. It may seem strange to assert, that the Translator of Xenophon's Œconomicks did not understand Greek; it is, however, true. Mr. Bradley's being then a popular name, he was paid by the booksellers for permitting them to insert it in the title. He first made himself known to the publick in 1713, by two papers, printed in the twenty-ninth volume of the Philosophical Transactions; one "On the Motion of the Sap in Vegetables;" the other, "Microscopical Observations on Vegetation, and on the quick Growth of Mouldiness on Melons." From this time to his death he published two volumes in folio, four in quarto, and nearly twenty in octavo, on gardening, botany, and agriculture, besides other publications on natural history and the arts. Though Bradley's writings do not abound in new discoveries, yet they are not destitute of interesting knowledge, collected from contemporary gardeners, and from books. He was an advocate for the circulation of the sap, and made several new observations on the sexes of plants, in consequence of the production of hybrid species, by which he added strength to that doctrine. He wrote instructively on the germs of trees, on bulbs, on grafting, and particularly on the methods of producing variegated and double flowers; and, on the whole, his writings, coinciding with the growing taste for gardening, the introduction of exotics, and improvements in husbandry, contributed to excite a more philosophical view of these arts, and diffuse a general and popular knowledge of them throughout the kingdom.

1. The History of Succulent Plants, with their Descriptions and Manner of Culture, in five Decads; 1716.

2. New Improvement of Planting and Gardening, both Philosophical and Practical, 1717, 8vo.

3. A new Improvement of Planting and Gardening, both Philosophical and Practical, explaining the Motion of the Sap, and Generation of Plants; with other Discoveries never before made Public; for the Improvement of Forest-Trees, Flower-Gardens, or Parterres; with a New Invention, whereby more Designs of Garden Plats may be made in one Hour, than can be found in all the books now extant. Likewise several rare Secrets for the Improvement of Fruit Trees, Kitchen Gardens, and Green-house Plants. To which is now added, the Gentleman's and Gardener's Calendar. The whole illustrated with Copper Plates, 1720.

4. A Philosophical Account of the Works of Nature; endeavouring to set forth the several Gradations remarkable in the Mineral, Vegetable, and Animal Parts of the Creation, tending to the Composition of a Scale of Life. To which is added, an Account of the State of Gardening, as it is now in Great Britain and other Parts of Europe, together with several New Experiments relating to the Improvement of barren Ground, and the propagating of Timber-Trees, Fruit-Trees, &c. With many curious Cuts; 1721, 4to.

5. A Treatise on Husbandry and Gardening, 1721, 8vo.

6. The Monthly Register of New Experiments and Observations in Husbandry and Gardening; made for the months of April and May 1722; wherein is explained; 1. The Method of bringing Herbs, Flowers, and Fruits, to Perfection in the Winter; with an Account of a new invented wall, to forward the ripening of Fruit, &c. 2. An Account of transplanting Forest-Trees and Fruit-Trees, of any bigness, in the Summer season; so that gentlemen may make complete Plantations in a few days, as effectually as if they had been growing for many years. Also a new Method for the Improvement of Tulips. The second edition; to which is added, 3. An Answer to some Objections lately made against the Circulation of the Sap, mentioned in the Chapter of the Improvement of Tulips. 1723, 8vo.

7. A General Treatise of Husbandry and Gardening, containing such Observations and Experiments as are new and useful for the Improvement of Land; with an Account of such extraordinary Inventions and Natural Productions as may help the Ingenious in their Studies, and promote universal learning. With variety of curious cuts. 8vo. 1723. Dedicated to Sir Nicholas Carew, of Beddington, Surrey, Bart., "whose delightful gardens would alone be enough to draw upon him the admiration of that part of mankind who study the pleasures and tranquillity of life;" and whose "wonderful orange-trees, first made familiar to an English climate by his noble ancestors, and the agreeable structure raised for their preservation," are honorably noticed. The third and last part (for August, September,) and the remaining part of the second year, is inscribed to the Earl of Burlington, "whose palaces and gardens give an example of his distinguishing genius; and has in it, among many other interesting articles, "Observations concerning Vineyards and their Produce, with some Account of the Vineyards near Bath." This celebrated Vineyard, it is stated, contains six acres of ground; and in 1718 produced 66 hogsheads of wine, which was then worth 660*l*. We are told also that in 1722 there were still superior vines at Mr. Fairchild's at Hoxton, and at Mr. Warner's at Rotherhithe.

8. A Philosophical Treatise of Agriculture; or, a new Method of cultivating and increasing all sorts of Trees, Shrubs, and Flowers; being a very curious work, enriched with useful Secrets in Nature, for helping the Vegetation of all Sorts of Trees and Plants; and for fertilizing the most stubborn Soils. By G. A. Agricola, M. D. and Doctor in Philosophy at Rattisbonne. Translated from the German, with Remarks. Adorned with Cuts. The whole revised and compared with the Original; together with a Preface confirming this new Method, 1723.

9. Family Dictionary, containing the most approved Methods for improving Estates and Gardens, 1726, 2 vols. folio.

10. Practical Discourses concerning the Four Elements, as they relate to the Growth of Plants, 1727, 4to.

11. Botanical Dictionary, for the Use of the Curious in Husbandry and Gardening, 1728, 2 vols. This was, it is believed, the first attempt of the kind in England.

12. The 'Vineyard; being a Treatise showing, 1. The Nature and Method of Planting, Manuring, Cultivating, and Directing of Vines; 2. Proper Directions for Drawing, Pressing, Making, Keeping, Fining, and Curing all Defects in the Wine; 3. An easy and familiar Method of Planting and Raising Vines to the greatest Perfection; illustrated with several useful Examples, 1728." 8vo.

13. The Gentleman and Gardener's Kalendar, directing what is necessary to be done in every Month in the Year, in the Kitchen Garden, Fruit Garden, and Nursery; Management of Forest Trees, Green Houses, and Flower Garden, with Directions for the making and ordering Hop Grounds.

14. A general Treatise of Husbandry and Gardening; containing a new System of Vegetation; illustrated with many Observations and Experiments, formerly published Monthly, and now methodised and digested under proper Heads, with Additions, and Alterations; in Four Parts 2 vols. 8vo.

1716. *Stevenson*, the Rev. *Henry*, of East Retford, Nottinghamshire.

1. The Young Gardener's Director. Lond. 12mo.

2. The Gentleman Gardener Instructed. 8th edition. Lond. 1769. 12mo.

1717. *Collins*, *Samuel*, Esq., of Archerton in Northamptonshire.

Paradise Retrieved; demonstrating the most beneficial Method of managing Fruit-trees, with a Treatise on Melons and Cucumbers. Lond. 1717. 8vo.

1717. *Evelyn*, *Charles*, Esq., son of John Evelyn.

The Lady's Recreation; or the Third and Last Part of the Art of Gardening improved. Lond. 1717. 8vo.

1722. *Fairchild*, *Thomas*, commercial gardener at Hoxton, where he had an excellent vineyard, and was one of the principal nurserymen and florists of his time. He first made himself known by a paper in the Royal Society's Transactions (vol. xxxiii. p. 127.) on the "different and sometimes contrary motion of the sap in plants," and assisted in experiments on vegetable sexuality. He died in 1729, and left funds for a botanical sermon, which is delivered annually on Whitsun Tuesday, at St. Leonard's, Shoreditch; it was preached for many years by Dr. Colin Milne, by whom it was published in 1779, and has since been continued by the Rev. Mr. Ellis, of Merchant Taylors' school, who receives three guineas out of the funds left by Fairchild for each sermon.

The City Gardener; containing the Method of Cultivating such Plants as will be Ornamental, and thrive best in the London Gardens. 1722. 8vo.

1724. *Miller, Philip*, F.R.S., a celebrated botanist and gardener, author of the Gardener's Dictionary, and of several other works, was born 1692. His father, according to Professor Martyn, "was gardener to the Company of Apothecaries, and he succeeded his father in that office in 1722." We have been informed, however, by Watts, a nurseryman at Acton, one of the few surviving gardeners who worked under him, that Miller's father was a market-gardener, somewhere about Deptford or Greenwich, and that Miller himself was a commercial florist, and had a small garden near the situation of the present King's Bench Prison in Surrey. He was considered an ingenious florist, and was selected by the apothecaries as their gardener on the perpetual grant of the garden ground by Sir Hans Sloane in 1722. It appears also from Field's History of the Chelsea garden (pub. 1821) that there is no evidence that Miller succeeded his father. Miller "raised himself, by his merit, from a state of obscurity, to a degree of eminence, rarely, if ever before equalled, in the character of a gardener. He added to his knowledge of the theory and practice of gardening, that of the structure and characters of plants, and was practically versed in the methods of Ray, Tournefort, and Linnæus. He adopted the system of the latter in the seventh edition of his work with great reluctance; but was convinced at length by the arguments of Sir W. Watson and W. Hudson. He maintained a correspondence with the most eminent botanists on the continent; among others, with Linnæus, who said his Dictionary was not merely one of gardening, but of botany. *Non erit Lexicon Hortulanorum, sed Botanicorum.* By other foreigners he was emphatically styled *Hortulanorum Princeps*, the "Prince of Gardeners." To his superior skill the curious owe the culture and preservation of many fine plants, which would otherwise have been lost." His infirmity, Professor Martyn continues, "induced him to resign his office a little time before his decease, which took place in 1771, in his eightieth year." He was consulted by gentlemen on the subject of planting and laying out grounds, and particularly by the Dukes of Bedford, Northumberland, and Richmond. He had many pupils, among whom were the late Mr. Forsyth and W. Aiton. John Ellis, who seems to have had some pique at Miller, says, he was turned out of the garden for his obstinacy and impertinence to the apothecaries, but his salary continued. His vanity, he says, was so raised by his voluminous publications, that he considered no man to know any thing but himself; "though Gordon, Aiton, and Lee, have been long infinitely superior to him in the nicer and more delicate parts of gardening." According to Field's tract, he gave in his resignation in consequence of some altercation or misunderstanding with his employers. This happened in 1769, when he removed to a house close by that part of the Chelsea church-yard, where he was buried, and near which an obelisk was erected to his memory by the Horticultural Society in 1810. He was succeeded by the late William Forsyth, F.A.S.

1. The Gardener's and Florist's Dictionary, or a complete System of Horticulture. 2 vols. 8vo. Lond.

This work was recommended by the most famous gardeners and nurserymen of that time; by Thomas Fairchild at Hoxton, Robert Furber at Kensington, Robert Smith at Vauxhall, Samuel Driver at Lambeth, Moses James at Standgate, Obadiah Low at Battersea, Christopher Gray at Fulham, Benjamin Whitmill at Hoxton, Francis Hunt at Putney, and William Gray junior at Fulham. Weston says, these persons were united in a society for the improvement of gardening; that Miller acted as their secretary, and that this work was in some degree the produce of their joint efforts.

2. Seven years after this Miller published his Gardener's Dictionary in folio. This is commonly regarded as the first edition, and is entitled "The Gardener's Dictionary; containing the Methods of cultivating and improving the Kitchen, Fruit, and Flower Garden. As also, the Physic Garden, Wilderness, Conservatory, and Vineyard, according to the Practice of the most experienced Gardeners of the present age. Interspersed with the History of the Plants, the Characters of each Genus, and the Names of all the particular Species, in Latin and English; and an Explanation of all the Terms used in Botany and Gardening. Together with Accounts of the Nature and Use of Barometers, Thermometers, and Hygrometers proper for Gardeners; and of the Origin, Causes, and Nature of Meteors, and the particular Influences of Air, Earth, Fire, and Water upon Vegetation, according to the best Natural Philosophers. Adorned with Copper Plates. By Philip Miller, Gardener to the Botanic Garden at Chelsea, and F.R.S.

The seventh edition is entitled, "The Gardener's Dictionary: containing the best and newest Methods of cultivating and improving the Kitchen, Fruit, Flower Garden, and Nursery. As also for performing the practical Parts of Agriculture: Including the Management of Vineyards, with the Methods of Making and Preserving the Wine, according to the present Practice of the most skilful Vignerons in the several Wine Countries in Europe. Together with Directions for Propagating and Improving, from real Practice and Experience, all Sorts of Timber Trees.

The ninth or Professor Martyn's edition, is distinguished by the arrangement of the matter, and the completeness of the enumeration of species; all being included which are to be found in the fourteenth edition of Linneus's Systema Vegetabilium, with the exception of the minute tribes of mosses, algæ, or seaweeds, and fungi or mushrooms; of which the generic characters are commonly given, together with such species as are used in food, or in any of the arts. In all the former editions of the dictionary, the culture was generally mixed with the descriptions of the species, and was frequently repeated several times under the same genus, but here the scientific, popular and practical parts being kept separate, they may each be consulted with facility; and what was before confused, now becomes distinct and obvious.

This laborious work, Professor Martyn observes, is the result of the unwearied application of what talents he possesses, and time he could spare from the duties of his profession during twenty years; no attention or industry has been wanting on his part; and he has strained every nerve to render it as complete in its kind as the nature of so extensive an undertaking will allow.

3. On a Method of Raising some Exotic Seeds. Phil. Trans. Abr. vii. 250. 1728.

4. On the early Flowering of Tulips, and other Bulbous Plants, when placed in Bottles filled with Water. Ib. 467.

1726. *Whitmill, Benedict.*

The Gardener's Universal Calendar. Lond. 8vo.

1727. *I.—— S.——*

The Vineyard; being a Treatise, showing the Manner of Planting and Cultivating Vines, in Foreign Parts: Directions for making Wines: Method of Planting Vines in England. New Experiments in Grafting and Inoculating all Sorts of Fruits; the best Manner of raising several Sorts of compounded Fruits. 8vo.

1728. *Castell Robert*, a London architect and antiquary.

The villas of the ancients, illustrated with cuts. Lond. fol.

1728. *Langley, Batty*, an architect of houses and gardens; born 1696, at Twickenham, where he resided; author of several architectural works.

1. Practical Geometry, applied to the Arts of Building, Surveying, Gardening, and Mensuration. Lond. 1726.

2. The Sure Method of Improving an Estate by Plantations of Oak, Elm, Ash, Birch, and other Timber Trees. Lond. 1728, 4to.

3. Pomona, or the Fruit Garden Illustrated; being the Sure Method of Preserving the best Kinds of Fruit; with Directions for Pruning, Nailing, Thinning, &c. With Cuts. Lond 1729, fol.

4. New Principles of Gardening; or, the Laying out Pastures, Groves, Wildernesses, Labyrinths, Avenues, Parks, &c.

1729. *Cowell, John*, gardener at Hoxton.

1. Account of the Olive in Blossom, Torch Thistle, and Glastonbury Thorn. Lond. 8vo.

2. Curious and Profitable Gardener, containing the newest Methods for improving Land by Grain or Seed, also a Description of his Great Aloe, and other Exotics, with his Manner of preserving them in Winter, 8vo.

1729. *Triewald, Martin*, Director of Mechanics, Sweden, author of some papers in the transactions of the Royal Society. An account of tulips and such bulbous plants, blowing much sooner when their bulbs are placed upon bottles filled with water, than when planted in the ground. Phil. Trans. vol. xxxvii. 80, 81.

1730. *A Society of Gardeners.* This Society consisted of the most eminent florists and nurserymen of the time, who state in their preface, that finding great inconvenience from the unsettled and vague nomenclature of plants which then existed, they resolved to undertake this work for the public benefit. They published only one part, dedicated to Thomas Earl of Pembroke and Montgomery, and a preface enumerating the most eminent encouragers of gardening of the time. Weston and Martin conjecture that this work gave rise to the folio edition of Millers' Dictionary, which appeared in 1731, (the 8vo. in 1724.) Miller being Secretary to the Society.

1730. The Gardener's Catalogue.—Catologus Arborum Fruticumque tum Exoticarum tum Domesticarum &c. or, The Gardener's Catalogue of Trees and Shrubs, both Exotic and Domestick, which are hardy enough to endure the Cold of our Climate in the open Air, ranged in an Alphabetical Order, according to their most approved Latin Names; with an Index of the English Names referring to the Latin. To which is added the Characters of each Genus in English, and a short Account of the different Growths of each Tree or Shrub, illustrated with 21 Copper Plates, in which there are above 50 beautiful Plants which were designed by the famous Mynheer Van Huysum, and are represented in their proper Colours. Done by a Society of Gardeners, price 1*l.* 11*s.* 6*d.* stitched, in fol.

1732. *Anon.*

1. Essay concerning the best methods of Pruning Fruit-trees, also the Method of Pruning Timber Trees, and also a Discourse concerning the improvement of the Potatoe. London, 8vo.

2. The Flower Garden displayed, in above 400 representations of the most beautiful Flowers, with the description and history of each plant, and the method of their culture.

1732. *Furber, Robert*, of Kensington, Nurseryman, who published a number of separate prints of all the different kinds of fruits grown in this country. His nursery is now in the possession of Messrs. Malcolm and Co.

1. Fruits for every month in the year, in fol. 12 plates.

2. An introduction to Gardening, or Guide to Gentlemen and Ladies in furnishing their Gardens being several useful Catalogues of fruits and flowers. Lond. 8vo. 1733.

1732. *More*, Sir *Thomas*.

A Flower Garden for Gentlemen and Ladies, or the Art of raising Flowers to blow in the depth of winter, also the method of raising Sallicting, Cucumbers, &c. at any time of the year.

1732. *Murray*, Sir *Alexander*, of Stanhope, author of some political works relative to Scotland.

The nature and method of Planting, Manuring, and Dieting a Vineyard.

1735. *A Lady.*

Merlin: a Poem; humbly inscribed to her Majesty. To which is added, The Royal Hermitage, a Poem. Both by a Lady, with several curious representations both of the Cave and Hermitage, 1735, 8vo.

1735. *Anon.*

The Rarities of Richmond: being exact Descriptions of the Hermitage, and Merlin's Cave, in the Gardens there, 1735, 8vo. with his Life and Prophecies, 1736.

1738. *Ellis, William*, a farmer at Little Gaddesdon, near Hempstead in Hertfordshire, author of "Complete Husbandry," and other farming works.

The Timber Tree improved; or the best practical methods of improving different lands with proper timber. Lond. 8vo.

1738. *Anon.*

The Complete Seedsman's Monthly Calendar. Shewing the best and most easy Method for raising and cultivating every sort of Seed belonging to a Kitchen and Flower Garden: with necessary Instructions for sowing of Berries, Mast, and Seeds, of Evergreens, Forest Trees, and such as are proper for the improving of Land. Written at the command of a Person of Honour. Lond. 8vo.

1739. *Anon.*

An Essay upon Harmony; as it relates chiefly to Situation and Building, 8vo. 1739.

1739. *Trowel, Samuel.*

A new Treatise of Husbandry and Gardening.

1740. *Gray, Christopher*, a nursery man at Fulham; a correspondent with many of the eminent botanists of his time, and the first who received the Magnolia Grandiflora from America, and propagated it extensively.

A Catalogue of Trees and Shrubs which are prepared for sale by Christopher Gray, Nurseryman at Fulham.

1744. *Anon.*

Adam's Luxury and Eve's Cookery, or the Kitchen Garden displayed, 8vo.

2 Curious Experiments in Gardening; modes of Propagation, &c. illustrated by wood cuts, 12mo. 1750.

1744. *Watson, William*, M. D. F. R. S. was born in London, in 1715, educated at Merchant-taylors' school, and served his time to an apothecary. He made discoveries in electricity, for which he obtained the Copley Medal, and was honoured with the degree of doctor in physic by two German universities. He died May 10. 1787. Besides papers in the Philosophical Transactions and the London Medical Observations, he wrote, "An Account of Experiments on inoculating for the Small-Pox."

1. On the Culture of Mushrooms.

2. Account of the Remains of John Tradescant's Botanic Garden at Lambeth.

3. Account of the Bishop of London's Garden at Fulham.

1746. *Stephenson, David*, M. A. author of "A New Mechanical Practice of Physic."

Gentleman's Gardener's Director of Plants, Flowers, and Trees; with a Garden Kalendar. Lond. 1746. 8vo.

1747. *Anon.*

The Compleat Florist, 8vo. It consists of 100 copper-plates and flowers, coloured and plain.

1748. *Anon.*

A Dialogue upon the Gardens of Lord Viscount Cobham, at Stowe in Berks. 8vo.

1749. *Dickson, James* and Co., nurserymen and seedsmen, Edinburgh.

Catalogue of Hot-house, Green-house, Hardy, and Herbaceous Plants, Flowering and Evergreen

Shrubs, Fruit and Fruit Trees. Edinb. 8vo. An enlarged edition in 1796, enumerating in alphabetical order all the plants described in the Hortis Kewensis.

1750. *Bickham, George.*

The Beauties of Stowe, with cuts, 8vo.

1752. *Anon.*

An Account of the Emperor of China's Gardens at Pekin, 8vo.

1758. *Anon.*

The Kitchen and Flower Garden complete, in four sheets.

1753. *Coventry, Francis,* was born in Cambridgeshire, and educated at Magdalen-college, Cambridge, where he took his master's degree, in 1752, and entered into orders. He died in 1759, having just before been presented to the donative of Edgeware. He wrote Penshurst, a poem in Dodsley's collection, and a poetical epistle to the honourable Wilmot Vaughan.

Strictures on the Absurd Novelties introduced in Gardening, and a humourous Description of Squire Mushroom's villa. Published in "The World," a periodical work, No. XV. April 12. 1753.

1753. *Rocque, Bartholomew,* a florist of Walham Green; author of some agricultural works: a great advertizer of grasses; sowed mixtures in his grounds, and sold the turf at so much per square foot to propagate from; extolled the burnet and lucern, particularly the former: patronized by the Duke of Cumberland. Switzer says he had a vineyard planted in a common field-garden, from which he made wine for thirty years; and although the ground was flat, the wine was as good as that of Orleans or Auxerre.

A Treatise on the Hyacinth; containing the manner of cultivating that Flower, on the experience lately made by the most eminent Florists in Holland; translated from the Dutch. Lond. 1755, 8vo.

1754. *Justice, James,* Esq., F. R. S. One of the principal clerks of session, or civil court of law in Scotland. His father was a merchant, and dealing with the Dutch, imported flower roots, which it has been said first gave the subject of this memoir a taste for gardening. He had a villa and large garden at Crichton, about three miles from Edinburgh, where he finally spent his fortune, in gardening pursuits, and was obliged to dispose of the property. Here, he practised gardening for thirty years: went twice to Holland to study the culture of bulbs, and also visited Italy; and satisfied the most learned societies in Britain of his practice and knowledge of the culture of the nicest flowers, and of plants, both exotic and indigenous, which adorn our British gardens. "The Ananas," he says (1754) "though now in many gardens, were first brought to fruit in Scotland by me; I can with truth affirm, that no person in this country bestowed more liberally upon improvements in gardening than I did, for the truth of which I can appeal to many of my countrymen." He died about 1762 or 3.

1. The Scot's Gardener's Director, by James Justice. Edinb. 8vo.

2. A new edition entitled, The British Gardener's Director, chiefly adapted to the Climate of the Northern Counties: directing the necessary works in the Kitchen, Fruit, and Pleasure Gardens, and in the Nursery, Green-house, and Stove. By James Justice, F. R. S., one of the principal Clerks of Session, Edinburgh, 1764. 8vo. — The advertisement, dated September 1763, sets forth, that the first impression being sold off, the author set about correcting mistakes, and making additions; but that his death deprived the world of his after-labours, which the memorandums and notes left behind him gave room to think he intended to have laid before the public. — This is an original and truly valuable work, founded upon reflection and experience.

3. An edition in 1764, arranged as a Monthly Kalendar, and very different from any of the others.

1754. *R.—— S.* ——, Gentleman.

The Gardener's Pocket Book, or Country Gentleman's Recreation; being the Kitchen, Fruit, and Flower Garden, displayed in Alphabetical Order.

1755. *Hill, John,* M. D. a miscellaneous writer, was the son of a clergyman, and born about 1716. He served his time to an apothecary in Westminster, and in that situation studied botany, which procured him the patronage of the Duke of Richmond and Lord Petre, who employed him in their gardens. In 1746 he translated the tract of Theophrastus "On Gems;" which was followed by "A General Natural History," in 3 vols. folio. He next engaged in compiling a supplement to Chambers's Cyclopædia; and at the same time published a periodical paper called "The Inspector." Having obtained a doctor's degree from St. Andrew's, he endeavoured to get elected into the Royal Society; but, being disappointed, he attacked that learned body, first in a pamphlet, and next in a quarto volume, written with asperity and acuteness. His facility in writing was very great, and there was hardly a popular sebject on which he did not exercise his pen, so that in some years he is said to have realised fifteen hundred pounds. He also gained considerably by quack medicines, and was much encouraged by the Earl of Bute, under whose auspices he published "A System of Botany," in 26 vols. folio; for which he received the order of Vasa from the King of Sweden. He died Nov. 22. 1775. Besides the works already mentioned he wrote some novels and farces. Hill had a dispute with Garrick, and another with Woodward, the comedian; the former answered him in an epigram, and the latter in a pamphlet, with this motto from Shakspeare: "I do remember an apothecary culling of simples." This alluded to a story that Hill was excluded from some nobleman's gardens for having carried off several valuable plants.

A short Account of his Life, Writings, and Character was published at Edinburgh in 1779, and his widow, Lady Jane Hill, published "An Address to the Public, setting forth the Consequences of his Acquaintance with the Earl of Bute." 1788, 4to.

1. A Method of raising Trees from the Leaves. By John Hill, M.D. 8. 1758, under the name of Thomas Barnes.

2 Eden, or a compleat Body of Gardening. London, fol. Coloured plates. 60.

3. Compleat Body of Husbandry, with plates. fol.

4. The Gardener's New Kalendar. By John Hill, M. D. Lond. with plates.

5. An Idea of a botanical Garden in England, 1758.

6. An Account of a stone, which on being watered produces Mushrooms. London, 1758. 8. Plates 2.

7. A Method of producing Double Flowers from Single, by a regular Course of Culture, illustrated with Figures. Lond. 1758. Plates 7.

8. The Origin and Production of Proliferous Flowers, with the Culture at large for raising Double from Single, and Proliferous from the Double. London. 1759. 8. Plates 7.

9. The Practice of Gardening by T. Perfect, a pupil of Dr. Hill. London, 1759. 8.

10. Botanical Tracts. Lond. 1762. 8. — A title prefixed to pamphlets published at different times.

11. The Construction of Timber explained by the Microscope. 1770. 8vo.

1755. *Hitt, Thomas,* gardener to Lord Robert Manners, at Bloxholme in Lincolnshire, afterwards a nurseryman in Kent and a designer of gardens. He wrote on husbandry, and the improvement of barren lands in Aberdeenshire, of which county he seems to have been a native. He died about 1770, and his papers came into the possession of —— Meader, gardener to the Duke of Northumberland, who published from them the Universal Gardener.

A Treatise on Fruit Trees, Lond. 8vo. An original work, valuable for its mode of training trees.

1756. *Anon.*

On the Heat and Cold of Hothouses.

1757. *Chambers*, Sir *William*; an eminent architect, was born in Sweden 1726, but his ancestors were of Scottish origin. He was brought to England at the age of two years, and placed in a school at Rippon. His first entrance into public life was in the capacity of supercargo to a Swedish East India ship, in which he made one voyage to China. On his return he quitted the sea, and applied to architecture, under the patronage of Lord Bute, by whose interest he was appointed drawing master to the late king, then Prince of Wales. His first employment as an architect was in building a villa for Lord Besborough, at Roehampton, after which, he was engaged to lay out the royal gardens at Kew, where he introduced the Chinese ornaments. In 1771 he was honoured with the Swedish order of the Polar Star, and in 1775 appointed to conduct the building of Somerset House. He was at this time a fellow of the royal society, and a member of that of antiquaries; besides which he held the places of architect to the king, surveyor-general to the board of works, and treasurer of the royal academy. He died in 1796, aged 69.

1. Designs for Chinese Buildings, Furniture, Dresses, Machines, and Utensils, engraved from the originals drawn in China; to which is annexed, A Description of their Temples, Houses, Gardens, &c. Lond. 1757, max. fol.
2. Plans, Elevations, Sections, and Perspective Views of the Gardens and Buildings at Kew in Surrey, the seat of her royal Highness the Princess of Wales. Lond. 1763 fol. 1765, fol. 42s. A very splendid work.
3. Dissertations on Oriental Gardening. Lond. 1774, 4to. 5s

1757. *Baynes*, *John*, Esq.; born in 1758 at EmbassyKirk, inCraven, Yorkshire, educated at Cambridge, and practiced as a special pleader in London, till he was cut off, at the early age of twenty-eight. He wrote some political satires, published, like the following poem, without his name.

1. An Heroic Epistle to Sir Wm. Chambers, 4to.
2. An Heroic Postscript, 4to. 1758.

These poems are ranked among the most spirited satires of the age.

1757. *Thompson*, *John*, a commercial gardener at Newcastle upon Tyne.

1. The distinguishing Properties of a fine Auricula. Newcastle, 8vo.
2. The Dutch Florist, Newcastle, 12mo. 1758.

1758. *Hanbury*, the Rev. *William*, rector of Church Langton, Lancashire, died 1778.

1. An Essay on Planting, and a Scheme to make it conducive to the glory of God, and the advantage of Society. 8vo.
2. A complete Body of Planting and Gardening, containing the Natural History, Culture, and Management of Deciduous and Evergreen Forest-trees, &c.; the whole forming a complete History of Timber-trees, whether raised in Forests, Plantations or Nurseries; as well as a general System of the present Practice of the Flower, Fruit, and Kitchen Gardens. To be completed in about 140 sixpenny weekly numbers, from December 1769, in two volumes, folio.

1758. *Marsham*, *Robert*, Esq. F.R.S., of Stratton, in Norfolk.

1. Observations on the Growth of Trees. Phil. Trans. Abr. xi. 320. 1758.
2. On the Usefulness of Washing and Rubbing the Stems of trees to promote their Annual Increase. Ib. xiv. 124. 1776. The same. Ib. xv. 138. 1781.
3. Indications of Spring. Ib. xvi. 561. 1789.
4. On the Measures of Trees. Ib. xviii. 109. 1797.

1759. *Barnes*, *Thomas*, a fictitious name adopted by Sir John Hill for his first gardening publication. See *Hill*, *John*, 1755.

1759. *North*, ——, a nurseryman at Lambeth, on the grounds now occupied as a nursery by John Hay.

1. Treatise on Grasses, and the Norfolk Willow.
2. Gardener's Catalogue of Hardy Trees, Shrubs, Flowers, Seeds, &c. 8vo.

1759. *Perfect*, *Thomas*, *inventor of the new Chinese parterres*, a name adopted by Sir John Hill, and supposed to be that of a famous nurseryman at Pomfret in Yorkshire. See *Hill*, *John*, 1755.

1759. *Stillingfleet*, *Benjamin*, an ingenious naturalist and miscellaneous writer, born about 1702; died 1771.

His Literary Life and select Works, by William Cox. Lond. 1811. 3 vols. 8vo. They contain a Calendar of Flora, and some curious essays towards a history of husbandry.

1760. *Anon.*

The London Gardener. 8vo.

1760. *Haddington*, Earl of, a Scotch nobleman, whose residence was at Tynningham near Dunbar, where he made considerable plantations for the time and country; he was a general encourager of improvements; died about 1787.

A Treatise on Forest Trees. Edin. 8vo.

1760. *Lee*, *James*, of the firm of Messrs. Kennedy and Lee, nurserymen at the Vineyard, Hammersmith, a native of Scotland; some time under Miller at Chelsea, afterwards gardener to the Duke of Argyle at Whitton, and next he commenced the nursery with Mr. Kennedy, then gardener to Lord Bolton at Chiswick. Mr. Lee was a correspondent of Linneus, and most of the American botanists of the time, and is mentioned by John Ellis as one of the first gardeners. His elements of botany have contributed, perhaps, more than any other work to spread a knowledge of the Linnean system among gardeners. He died in 1795, and was succeeded by his son of the same name, an ardent lover and liberal promoter of gardening improvements. See 2132.

1. Introduction to Botany; containing an Explanation of the Theory of that Science, and an Interpretation of its Technical Terms, extracted from the Works of Linneus, &c.; with 12 plates. Lond. 8vo.
2. Catalogue of Plants and Seeds, sold by Kennedy and Lee, Nurserymen at the Vineyard, Hammersmith.

1760. *Pullein*, *Samuel*, M.A., author of different publications on the silk-worm, mulberry, and cotton plant.

Observations towards a Method of preserving the Seeds of Plants in a state of Vegetation, during long Voyages. Lond. 8vo.

1760 *to* 1780. *Various authors*. The following works contain some pleasing and valuable observations on modern gardening, and are generally considered as having contributed to spread a taste for that style.

1. Mr. Warton's Essay on the Writings and Genius of Pope. Vol. 2. from p. 236 to p. 248. and p. 262. 1762.
2. The first article in the 2d volume of the Antiquarian Repertory is a pleasing description of 'White Knights, the seat of Sir Henry Englefield, Bart. one of the first examples of the *ferme ornée*.' 1764.
3. Letters concerning the present state of England. 8vo. 1772. Letter 26.
4. A Tour to London, by Grosley; translated by Nugent. 8vo. 1772. Vol. 2. p. 115.

5. Knox's Essays. Vol. 2. 4th edit. No. 91. and No. 117.

6. Lælius and Hortensia. By Dr. Stedman. 8vo. 1782. Letters 5 and 6.

To these may be added from the poets: The Description of the Grotto of Calypso, and of the Garden of Alcinous in Pope's Odyssey; of the old Corycians Garden in Dryden's Virgil; of the Garden of Armida in Hoole's Tasso; various passages in Milton's Paradise Lost, Thompson's Seasons, and other poems.

Among prose writers may be referred to: The Description of the Vale of Tempe in Ælian's various History; of Vaucluse and Petrarch's Garden, from Mrs. Dobson's Life of Petrarch; Petrarch's Description of Silva Piana; Smollett's Travels through France and Italy, vol. 2. Letter 31. dated 1765; Gough's British Topography. p. 138. Oxfordshire; Critical Review for October, 177 p. 312. and August, 1783; and Girardin's Landscape. To these might be added, various papers in the Gentleman's, Universal, and other magazines, published about this time, and also to the tours and topographical works of the same date.

1760. *Anon.*

Adam armed: or an Essay endeavouring to prove the Advantages and Improvements the Kingdom may receive, and the Inconveniences and Impediments it may avoid and remedy, by the Means of a well-ordered and duly rectified Charter for Incorporating and Regulating the Professors of the Art of Gardening; humbly offered and presented by the Master and Company of the same. fol. no date; supposed about 1770.

1762. *Home, Henry,* commonly called Lord Kaimes, from his official legal situation; an eminent Scotch lawyer, philosopher, and critic, was born at Kaimes in Berwickshire, 1696; died 1782. He was originally bred a writer or attorney, but by assiduous application raised himself to be a judge. He farmed his own estate at Kaimes for several years; and afterwards resided at Blairdrummond in Stirlingshire, his wife's estate, where he displayed his taste in laying out grounds. His life has been written by Lord Woodhouselee.

Essay on Gardening; in the Elements of Criticism. Lond. 3 vols. 8vo. In this work he recommends a judicious use of both the ancient and modern styles.

1763. *Wheeler, James,* a nurseryman at Gloucester. After his death the nursery was carried on by his two daughters, who separated some years ago, and it is now carried on by one of them.

The Botanist's and Gardener's New Dictionary; containing the Names, Classes, Orders, Generic Characters, and Specific Distinctions of the several Plants cultivated in England, according to the System of Linneus: to which is prefixed, an Introduction to the Linnean System of Botany. Lond. 1763. 8vo.

1764. *Dodsley, Robert,* an ingenious English poet, miscellaneous writer, and bookseller; was born in Nottinghamshire, 1703.

A Description of the Leasowes, the seat of William Shenstone, Esq., accompanied by a Plan. Lond. 12mo.

1764. *Harte, Walter,* M. A., a poet, divine, and historian; Canon of Windsor, and Chaplain to the Earl of Chesterfield. He died Jan. 5. 1768, on the eve of his intended marriage with Mrs. Hopkins; a handsome monument is erected to their memory in St. Mary's Church, Abingdon.

Essays on Husbandry. Lond. 8vo. It contains, a list of writers on the subject; a general history and account of the present state of husbandry in Europe; and a strong recommendation of the larch tree and lucerne. It is a pleasing, classical, and ingenious work, and has passed through several editions.

1764. *Museum Rusticum,* a periodical work, containing various papers on planting and horticulture.

Museum Rusticum et Commerciale; or select Papers on Agriculture, Commerce, Arts, and Manufactures. Drawn from experience, and communicated by Gentlemen engaged in these Pursuits. Revised and digested by several Members of the Society for the Encouragement of Arts, Manufactures, and Commerce: in 6 vols. 8vo.

The Museum Rusticum was succeeded by a similar work in 1768, entitled *De re rustica*, completed in 2 vols. 8vo. in 1770.

1764. *Shenstone, William,* Esq., a poet and country gentleman, celebrated for his taste in landscape gardening; born in Shropshire 1714, died 1763.

Unconnected Thoughts on Landscape Gardening. In his works collected after his death, in 3 vols. 8vo. Lond.

1766. *Abercrombie, John,* son of John Abercrombie, who had a nursery and garden in the neighbourhood of Edinburgh; and was in the habit of supplying the markets of that city with vegetables.

John Abercrombie, our author, was born in 1726; and was educated at a grammar school, till he attained an age to be of service in his father's business, for which he had always a predilection. After he had arrived at manhood, on some trifling family difference occurring, he left his father, and came to London; in the vicinity of which he worked for some years as a journeyman gardener. To note the particulars of most interest, he was long employed in the Royal Gardens at Kew, and at Leicester House, now Leicester Fields; and in these situations he occasionally contributed to the boyish diversions of his present Majesty. He lived as principal gardener with several noblemen and persons of high rank and respectability, and particularly with that eminent botanist, Doctor Munro (father of the present celebrated physician), at Sunning Hill, near Windsor: here he continued several years, and was married while in the Doctor's service, to a young woman in the family of Sir James Douglas, where he had before lived. He afterwards had a garden and nursery at Hackney, whence he sent his goods to Spitalfields Market; and the profits of his business enabled him to support his increasing family with comfort and decency. At this crisis, some time about 1770, Mr. L. Davis, an eminent bookseller of London, accompanied by Dr. Oliver Goldsmith, having previously ordered a handsome entertainment at an inn in Hackney, surprised Abercrombie with an invitation to dine with them with a view to induce him, by encouraging overtures, to compose an original work on "Practical Gardening." Mr. Abercrombie consented, with reluctance, fearful it might call off his attention too much from his garden and nursery; and at last, only on the condition of his materials being revised, and the style improved by Dr. Goldsmith. This celebrated writer, however, did not perform his part of the undertaking: after the papers had been handed to him by the humble gardener, then an inexperienced writer, and anxious to have his luxuriances pruned, the Doctor said, as an apology to the bookseller for returning the MS. unrevised, that "Abercrombie's style was best suited to the subjects of which it treated." Abercrombie, however, frequently lamented, and the public possibly may do the same, that this very perspicuous and elegant writer did not fulfil his engagement.

Abercrombie's first work was entitled 'Every Man his own Gardener,' which had a rapid sale; and, from the temporary profits being considerable, he was induced to neglect, and soon after to give up, his nursery; and to enter upon a course of authorship on horticultural subjects.

On first publishing 'Every Man his own Gardener,' the diffidence of Abercrombie induced him to affix to the title-page the name of Mr. Mawe, who was gardener to the Duke of Leeds. After the publication of a second edition, he accepted of an invitation from the nominal author of his book, who had been much flattered by the compliment, to visit him in Yorkshire. When introduced to Mawe, whom he had never before seen, poor Abercrombie (as he used facetiously to narrate) encountered a gentleman so bepowdered, and so bedaubed with gold lace, that he thought he could be in the presence of no less a personage than the Duke himself. However, they soon came to a right understanding; for he continued his visit for more than a fortnight, and "fared sumptuously every day." He likewise received much information from Mr. Mawe, as the groundwork of improvements which he afterwards made, in his book, 'Every Man his own Gardener,' and in other publications. They subsequently maintained a friendly correspondence for years.

About the year 1774, Abercrombie took a tea garden at Hoxton, near the Shepherd and Shepherdess; and exhibited in the grounds his practical skill in raising exotics and choice fruit: his arbours there are, to this day, spoken of as rural curiosities. In different parts of the garden he was accustomed to fix pieces of his own humble poetry.

At length he left it, on the expiration of the lease, which he was unable to get renewed. Unfortunately, just before the lease had expired, the original proprietor of the grounds, under whom Abercrombie held, and who was disposed to do him the most friendly offices, died. This gentleman was an eminent goldsmith, and an alderman of the city of London: during his illness, his relations prevented Abercrombie from visiting him, or from access to the house. On his death, Abercrombie experienced another severe disappointment, in not being noticed in the Alderman's will; although he had been led, by professions of friendship and promises of assistance, to form the highest expectations from this quarter.

Previous to the year 1790, Abercrombie's family had grown up and had settled away from home. From this period to the time of his death, he chiefly depended for support on the occasional improvements which his several works required. From 1796 to the time of his decease, he resided at Charlton Street, Somers' Town, except when he was visiting a friend at Cambridge, or was engaged in any professional pursuit at a considerable distance from town. When out of business, he was a constant visitor, being a great walker, of the nursery grounds and botanic gardens around the metropolis, with the object of collecting horticultural and botanical information. He was also occasionally employed in planning new gardens and ornamental grounds, as an horticultural surveyor and improver; for which he was sometimes handsomely remunerated.

In the spring of 1806, being in his eightieth year, Mr. Abercrombie met with a severe fall, by which he broke the upper part of his thigh-bone. This accident, which happened to him on the 15th of April, terminated in his death. After lying, during the interval, in a very weak exhausted state, without much pain, he expired in the night between April and May, as St. Paul's clock struck twelve. He was lamented by all who knew him, as cheerful, harmless, and upright.

1. Every Man his own Gardener, being a New Gardener's Calendar, with complete Lists of Forest-trees, Flowering Shrubs, Fruit-trees, Evergreens, annual, biennial, and perennial Flowers: Hot-house, Green-house, and Kitchen-garden Plants, with the Varieties of each Sort cultivated in the English Gardens. Lond. 12.

Of this very useful and popular work the editions have been numerous. From 'a diffidence in the writer, it was first published as the production of Thomas Mawe, gardener to His Grace the Duke of Leeds, and other gardeners; but it was entirely written by Abercrombie, whose claim has since been, in some measure, asserted, by subjoining to the title-page the name of John Abercrombie, to the more popular one of Mr. Mawe.' It is to be lamented, Professor Martyn observes, that so respectable a performance should be accompanied by this deceit and book-craft.

2. The Universal Gardener and Botanist, or a General Dictionary of Gardening and Botany, exhibiting, in Botanical Arrangement, according to the Linnæan System, every Tree, Shrub, and Herbaceous Plant that merit Culture, &c. Lond. 1778, 4to.

3. The Garden Mushroom, its Nature and Cultivation, exhibiting full and plain Directions for producing this desirable Plant in Perfection and Plenty. Lond. 1779, 8vo.

4. The British Fruit Garden, and Art of Pruning; comprising the most approved Methods of planting and raising every useful Fruit Tree and Fruit-bearing Shrub. Lond. 1779, 8vo.

5. The Complete Forcing Gardener, for the thorough Practical Management of the Kitchen Garden, raising all early Crops in Hot-beds, and forcing early fruit, &c. Lond. 1781, 12mo.

6. The Complete Wall-tree Pruner, &c. Lond. 1783, 12mo.

7. The Propagation and Botanical Arrangement of Plants and Trees, useful and ornamental. Lond. 1785, 2 vols. 12mo.

8. The Gardener's Pocket Dictionary, or a Systematical Arrangement of Trees, Herbs, Flowers, and Fruits, agreeable to the Linnæan Method, with their Latin and English Names, their Uses, Propagation, Culture, &c. Lond. 1786, 3 vols. 12mo.

9. Daily Assistant in the Modern Practice of English Gardening for every Month in the Year, on an entire new plan. Lond. 1789, 12mo.

10. The Universal Gardener's Kalendar, and System of Practical Gardening. Lond. 1789, 12mo.

11. The Complete Kitchen Gardener and Hot-bed Forcer, with the thorough Practical Management of hot-houses, Fire-walls, &c. Lond. 1789, 12mo.

12. The Gardener's Vade-mecum, or Companion of General Gardening; a Descriptive Display of the Plants, Flowers, Shrubs, Trees, Fruits, and general Culture. Lond. 1789, 8vo.

13. The Hot-house Gardener, or the General Culture of the Pine Apple, and the Methods of forcing early Grapes, Peaches, Nectarines, and other choice Fruits in Hot-houses, Vineries, Fruit-houses, Hot-walls, with Directions for raising Melons and early Strawberries, &c. Plates. Lond. 1789, 8vo.

14. The Gardener's Pocket Journal and Annual Register, in a concise Monthly Display of all Practical Works of General Gardening throughout the year. Lond. 1791, 12mo.

15. A new edition of the Practical Gardener revised, with considerable additions, by Mr. James Mean, Head-gardener to Sir Abraham Hume, Bart. 12mo. 1816.

16. The Practical Gardener's Companion, or Horticultural Calendar, containing the latest Improvements in Horticultural Practice. To which is annexed, on a plan never before published, exhibited the Garden Seed and Plant Estimate; edited from an original Manuscript of J. Abercrombie, the whole revised by J. Mean,, Lond. 18mo. 1816

1766. *Jones, Henry*, a poetical and dramatic writer, a native of Drogheda in Ireland; died 1770.

Kew Garden, a Poem in two cantos. Lond. 4to.

1766. *Lightoler, J*——, a London architect.

The Gentleman and Farmer's Architecture, being Plans for Parsonage and Farm-houses, with Pineries, Green-houses, &c. on 25 plates, in fol.

1766. *Locke, John*, one of the greatest and most distinguished philosophers this country

has produced; born in Somersetshire 1632; author of numerous works; had a fine seat at Norbury Park in Surrey; died 1704.

Observations upon the Growth and Culture of Vines and Olives, the Production of Silk and the Preservation of Fruits. Written at the request of the Earl of Shaftesbury, to whom it is inscribed: now first printed from the original manuscript, in the possession of the present Earl of Shaftesbury. Lond. 8vo.

1767. *Anon.*

The Rise and Progress of the present Taste in planting Parks, Pleasure Grounds, Gardens, &c from Henry the Eighth to King George the Third. In a poetic Epistle to the Right Honourable Charles Lord Viscount Irvin. 4to.

Very scarce, and one of the few books enumerated in this section which we have not seen.

1767. *Giles, John*, gardener to Lady Boyd at Lewisham in Kent, and from 1777 foreman in the nursery of Messrs. Russel there. He died in 1797, in his seventy second year.

Ananas; or a Treatise on the Pine Apple, in which the whole Culture, Management, and perfecting this most excellent Fruit is laid down in a clear and explicit Manner. To which is added, the True Method of raising the finest Melons with the greatest success, &c. Lond. 8vo. 1 plate.

1767. *Mawe, Thomas*, gardener to the Duke of Leeds, the nominal author of the first publication of John Abercrombie entitled "Every man his own Gardener." Abercrombie wrote this work in prison, and being desirous of sending it into the world under a great name, applied to Mr. Mawe, then unknown to him. Mr. Mawe went to see Abercrombie, and feeling for his situation, permitted him to use his name. This Abercrombie told to Watts of Acton, who is our authority for inserting it.

1767. *Rutter, James*, gardener at Wandsworth, and Daniel Carter, gardener at Battersea; respectable market florists, the latter father of Thomas and Daniel Carter, esteemed flower cultivators at the present day.

Modern Eden; or, the Gardener's Universal Guide; containing plain instructions for performing every branch of Gardening, whether relating to ornament or utility; in which are laid down the best methods for raising all the products of the kitchen and flower-garden, and the training, pruning, and entire management of Fruit-trees, &c. Lond. 1767, 8vo.

1768. *Gibson, John*, M. D., a native of Scotland, surgeon in the royal navy, and author of some medical works.

The Fruit-Gardener, containing the method of raising Stocks for multiplying Fruit-trees, with directions for laying out and managing Fruit-gardens. 8vo.

1768. *Gilpin*, the Rev. *William*, M. A., an ingenious divine, born in Carlisle 1724, educated at Oxford; kept for many years a school at Cheam in Surrey, and afterwards became vicar of Boldre, in Hampshire, and prebendary of Salisbury, where he died in 1804. The whole of his tours and other works on the picturesque, well merit the study of the Landscape Gardener.

1. Observations on the River Wye, and several Parts of South Wales, &c., relative chiefly to Picturesque Beauty, made in the Summer of 1770. Lond. 1783, 8vo.

2. Observations relative chiefly to Picturesque Beauty, made in the year 1772, on several Parts of England; particularly the Mountains and Lakes of Cumberland and Westmoreland. Lond. 1787, 2 vols. 8vo.

3. Observations chiefly relative to Picturesque Beauty, made in the year 1776, in several parts of Great Britain; particularly the Highlands of Scotland. Lond. 1788, 2 vols 8vo.

4. Remarks on Forest Scenery, and other Woodland views, relative chiefly to Picturesque Beauty. Illustrated by Scenes of New Forest, in Hampshire; in 3 books. Lond. 1791, 2 vols. 8vo.

5 Three Essays: on Picturesque Beauty; on Picturesque Travel; on Sketching Landscape. To which is added; a Poem on Landscape Painting. Lond. 1792, 8vo.

6. Observations on the Western Parts of England, relative chiefly to Picturesque Beauty. To which are added, a few remarks on the Picturesque Beauties of the Isle of Wight; 18 Plates. Lond. 1798, 8vo.

7. Observations on the coasts of Hampshire, Sussex, and Kent, relative chiefly to Picturesque Beauty, made in the Summer of 1774. Lond. 1804, 8vo.

8. Two Essays; one on the Author's mode of executing Rough Sketches; the other on the principles on which they are composed. With 3 plates. By Sawrey Gilpin, Esq. R. A. Lond. 1805, 8vo.

9. Observations on several parts of the Counties of Cambridge, Norfolk, Suffolk, and Essex; also several parts of North Wales, relative chiefly to Picturesque Beauty; in two Tours, the former made in the year 1769, and the latter in 1773. Lond. 1809, 8vo.

1768. *Mason, George*, Esq.; a classical scholar and critic; author of an Appendix to Dr. Johnson's Dictionary, and of some other translations and philological works. He lived chiefly in London, and was connected with the Sun Fire Insurance Office.

1. An Essay on Design in Gardening, 8vo.

2. An Essay on Design in Gardening; first published in 1768, now greatly augmented. Also a Revisal of several Publications on the same Subject. Lond. 1795, 8vo. Two Appendices, 1798, 8vo.

1768. *Wildman.*

Treatise on the Culture of Pear-trees, to which is added a Treatise on the Management of Bees, 12mo Dublin.

1769. *Dicks, John*, gardener to His Grace the Duke of Kingston at Knightsbridge.

A New Gardener's Dictionary, or the whole Art of Gardening fully and accurately displayed; containing the most approved Methods of cultivating all kinds of Trees, Plants, and Flowers, in 60 numbers, small folio, completed in 1771.

1769. *Duncombe, John*, author of some works on antiquities, but chiefly known as the inventor of the dendrometer.

A Treatise upon the Dendrometer, a new invented Instrument for the more certain and ready Measurement of Standing Timber by Inspection only; for facilitating the practical operation of Engineering, Land-surveying, &c. Lond. 1769, 8vo.

1769. *Garton, James.*

The Practical Gardener, and Gentleman's Directory for every Month in the Year; with proper Directions for raising Mushrooms. To which is prefixed, an Essay upon Vegetation, Soil, Manure, and the nature and form of Stoves, Hot-beds, &c. With a Copperplate, exhibiting at one view the several Aspects for planting a Fruit-Garden. Lond. 1769, 12mo.

1769. *Powel, Anthony*, Esq., gardener, to George II.

The Royal Gardener; or, complete Calendar of Gardening for every Month in the Year, digested in regular order, and so contrived as to exhibit, in a clear and comprehensive manner, the business to be done in the Flower, Fruit, and Kitchen Garden at all Seasons. Likewise Directions, founded on experience, for Sowing, Planting, Pruning, Transplanting, Engrafting, and every other particular necessary to be known by such as desire to aim at a perfect knowledge of this most ancient, healthy, and agreeable of all sciences. Lond. 12mo.

1769. *Taylor, Adam*, gardener to J. Sutton, Esq. at New Park, near Devizes, in Wiltshire.

Treatise on the Ananas, or Pine-Apple, containing plain and easy Directions for raising this most excellent fruit without fire, and in much higher perfection than from the stove. To which are added, full Directions for raising Melons. Devizes, 8vo. One Plate.

1769. *Anon.*

Stowe: a Description of the magnificent House and Gardens, &c. 8vo. Cuts.

1770. *Dove, John*, author of a paper on Pumice-stones, printed in the Philosophical Transactions for 1728.

Strictures on Agriculture, wherein a Discovery of the Physical Cause of Vegetation, of the Food of Plants, and the Rudiments of Tillage, are attempted, 8vo.

1770. *Ellis, John*, Esq. a distinguished naturalist; a native of Ireland, celebrated for his discovery of the animal origin of corals. He wrote a variety of tracts, and numerous papers in the Transactions of the Royal Society; and died 1771.

1. Directions to Voyagers for bringing over Plants, &c. from the East Indies, and other distant Countries, in a state of Vegetation. Lond. 1770, 4to.
2. Some additional Observations on the Method of preserving Seeds, from foreign parts for the benefit of American Colonies. Lond. 1773, 4to.
3. Historical Account of Coffee; with an Engraving, and Botanical Description of the Tree. To which are added, many Papers relative to its culture and use as an article of diet and of conveniençe. Lond. 1774, 4to.
4. Description of the Mongostan and the Bread Fruit, the first esteemed the most delicious, and the other the most useful of all the Fruits in the East Indies. To which are added, Directions to Voyagers for bringing over them and other vegetable productions. Plates. Lond. 1775, 4to.

1770. *Hunter, Alexander*, M.D. F.R.S. was born at Edinburgh 1733; settled as a physician at Gainsborough, at Beverley, and finally at York; author of various agricultural and medical works, and of a cookery-book: died at York 1809.

1. Georgical Essays; in which the Food of Plants is particularly considered, several new Composts recommended, and other important articles of Husbandry explained upon the principles of Vegetation, (by a Society instituted in the North of England, for the Improvement of Agriculture.) Lond. 1770-74, 4 vols. 8vo.
2. New Edition of Evelyn's Sylva and Terra.

1770. *Ockenden*, ———, Esq.

Letters describing the Lake of Killarney and Rueness Gardens. Dublin. 8vo.

1770. *Weston, Richard*, Esq. an amateur gardener, who derived his information chiefly from inspecting the commercial gardens near London.

1. Tracts on Practical Agriculture and Gardening, in which the advantage of imitating the Garden Culture in the Field is fully proved by a seven years' Course of Experiments. To which is added, a Complete Chronological Catalogue of English Authors on Agriculture, Gardening, &c. Lond. 1769, 8vo.
2. The Universal Botanist and Nurseryman, containing Descriptions of the Species and Varieties of all the Trees, Shrubs, Herbs, Flowers, and Fruits, Natives and Exotics, at present cultivated in the European Nurseries, Greenhouses, and Stoves, as described by modern Botanists; arranged according to the Linnæan System, and their Names in English. To which are added, A copious Botanical Glossary, several useful Catalogues and Indexes. Plates. Lond. 1770-1774, 4 vols. 8vo.
3. The Gardener and Planter's Calendar; containing the Method of raising Timber Trees, Fruit Trees, and Quick for Hedges; with Directions for forming and managing a Garden every Month in the Year; also, many new Improvements in the Art of Gardening. Lond. 1773, 8vo.
4. Tracts on Alabaster, or Gypsum, describing its powerful effects as a very cheap Manure, &c. Lond. 1791, 8vo.

1770. *Whateley, Thomas*, Esq. of Nonsuch Park, Surrey, Secretary to the Earl of Suffolk. He had a brother who fought a duel with John Temple, Esq. in 1773 (Gilchrist's Trials by Ordeal, p. 107.), and another, a clergyman. He died about 1780; and some remarks on Shakspeare were published after his death, in a thin 12mo. tract. It is remarkable, that so little is known of a writer, the beauty of whose style, and the justness of whose taste is universally acknowledged.

Observations on Modern Gardening, illustrated by Descriptions. Lond. 1771, Pp. 257. An edition, in quarto, in 1798, with Walpole's History, inserted as notes, and an appendix, supposed by Parkyns, consisting of an Essay on the natural Situation of Gardens.

1771. *Meader, James*, gardener to the Duke of Northumberland at Zion-House, and afterwards to the Empress Catherine at Peterhoff, near Petersburgh. He was a very satirical person, and wrote verses both on his friends and enemies.

1. The Modern Gardener, or Universal Kalender; containing Monthly Directions for all the Operations of Gardening, to be done either in the Kitchen, Fruit, Flower, and Pleasure Gardens, as likewise in the Green-house and Stove; with the Method of performing the different works, according to the best practice of the most eminent Gardeners. Also an Appendix, giving full and ample Instructions for forcing Grapes, Vines, Peach, Nectarine Trees, &c. in a new manner: never before published; selected from the Diary Manuscripts of the late Mr. Hitt. Revised, corrected, and improved by J. M. Lond. 1771, 12mo.
2. The Planter's Guide, or Pleasure Gardener's Companion; giving plain Directions, with Observations for the proper Disposition and Management of the various Trees and Shrubs for a Pleasure-Garden Plantation. To which is added, a list of Hardy Trees and Shrubs for ornamenting such Gardens. Embellished with Copper-plates. Lond. 1779, oblong 4to.

1772. *Boutcher William*, a nurseryman at Comely Garden, near Edinburgh.

Treatise on Forest Trees; containing not only the best Methods of their Culture hitherto practised, but a variety of new and useful Discoveries, the result of many repeated Experiments. To which are added, Directions for the Disposition, Planting, and Culture of Hedges. Lond. 1772, 4to.

1772. *Mason, William*, a divine and celebrated lyric and descriptive poet; born in Yorkshire 1725; died 1797, precentor, and canon of York.

The English Garden; a Poem in four books. Lond. 1772-82, 4to. A new edit. corrected. To which are added, a Commentary and Notes, by W. Burgh, Esq. Lond. 1785, 8vo.

1772. *Pierre, Louis de St.*, a native of South Carolina, and proprietor of lands there.

The Art of Planting and Cultivating the Vine, &c. according to the most approved Methods in France. Lond. 12mo.

1774. *Anon.*

An Essay on the different Natural Situations of Gardens. 4to. 1s. 6d. 1774.

1775. *Pye*, Mrs. *Hampden*.

A Peep into the principal Seats and Gardens in and about Twickenham (the residence of the Muses) descriptive of their Beauties, internal and external, with a suitable Companion for those who wish to visit Windsor or Hampton-court. To which is added, a History of a little Kingdom on the Banks of the Thames, and its present Sovereign, &c. 8vo.

1776. *Ellis, Thomas*, gardener to the Lord Bishop of Lincoln.

The Gardener's Pocket Kalender. Lond. 12mo.

1777. *Anderson, James*, L.L.D. an agricultural writer of great versatility of genius, was born at Herdmanston, in the county of Edinburgh, 1730, on a farm which his parents had possessed for some generations, and which he was destined to inherit and to cultivate. He lost his parents at an early age, but his education was not neglected; he studied chemistry under Dr. Cullen, and soon leaving his farm near Edinburgh, took one in Aberdeenshire of 1300 acres, which, after improving and cultivating for twenty years he let, and enjoyed an annuity from it during his life. He settled after leaving Aberdeenshire in the neighbourhood of Edinburgh, where he published "The Bee," in weekly six-penny numbers, till it extended to eighteen volumes. In 1797 he removed to Isleworth, near London, where he published "Recreations in Agriculture," in six volumes, and his "Description of a Patent Hot-house." Here he enjoyed his garden, and died of a decline in 1808, aged 69. Besides the works which bear his name, he wrote the reviews of books on rural matters for the Monthly Review for many years.

1. Miscellaneous Thoughts on planting and training Timber-trees, by Agricola. Edin. 1777, 8vo.

2. Recreations in Agriculture, Natural History, Arts, and miscellaneous Literature. Lond. 1799. 1802. 6 vols. 8vo.

3. A Description of a Patent Hot-house, which operates chiefly by the heat of the Sun, and other subjects; without the aid of Flues, or Tan-bark, or Steam, for the purpose of heating it, &c. Lond. 1804, 12mo.

1777. *Bastard, William*, Esq. of Kitley in Devonshire.

On the Culture of Pine-Apples. An extract of a letter from William Bastard, Esq. of Kitley in Devonshire, to Samuel Musgrave, Esq. M.D. F.R.S. dated Kitley, March 15. 1779, communicated to the Society by Dr. Musgrave.

The writer states that he fruits his pines in pots set in pans of water, on a shelf close under the roof against the back wall; prefers a cistern over the flue in that situation; found a plant without roots grow well, and produce a fruit which weighed two pounds.

1777. *Heeley, Joseph*, Esq.

1. Letters on the Beauties of Hagley, Envil, and the Leasowes; with Critical Remarks and Observations on the Modern Taste in Gardening. Lond. 1777, 2 vols. 12mo.

2. Description of Hagley Park. 1777, 8vo.

1777. *Loddiges, Conrad, and Sons*, eminent botanical nurserymen at Hackney, where their grounds are remarkable for the magnitude, extent, and orderly arrangement of the hot-houses.

1. A Catalogue of Plants and Seeds, in English and German. 8vo.

2. The Botanical Cabinet, containing figures of new or rare Plants, with Directions for their Culture. 1817, 4to. in monthly parts: four volumes are published.

3. A Catalogue of Plants for Sale, 12mo. 1820.

1777. *Maurice*, the Rev. *Thomas*, M.A., chaplain to the 97th regiment, author of various poems and tracts on Indian history and antiquities.

1. Hagley; a Poem.

2. Grove Hill, the seat of Dr. Lettsom, a descriptive Poem; with an Ode to Mithra, and many plates. Lond. 1799, 4to.

1777. *Wilson, William*, a native of Scotland; worked some time under Miller, and was sent by him to Sir James Cockburn, Bart. at Petersham, afterwards gardener to the Earl of Glasgow, near Paisley.

A Treatise on the Forcing of early Fruits, and the Management of Hot-walls. Lond. 12mo.

This is a useful little treatise; he uses the heat of fermenting dung in his peach and vine-houses, as well as flues; and directs not to prune peach-trees to be early forced till the fires have been made for a fortnight, because "the sap, when it begins to ascend, will spring more regular after the knife than after a dry wound." p. 13.

1778. *Anon.*

The Practical Gardener, directing, in the most plain and easy manner, what is neccssary to be done in the Kitchen, Fruit, and Flower Garden, the Green-house, and Wilderness. Lond. 8vo.

1778. *Swinden, N———*, an ingenious gardener and seedsman at Brentford-End, Middlesex.

The Beauties of Flora displayed, or Gentleman and Lady's Pocket Companion to the Flower and and Kitchen Garden. Lond. 8vo. 1778.

1779. *Neale, Adam*, gardener to John Blackbourne, Esq. near Warrington, Lancashire.

A Catalogue of the Plants in the Garden of John Blackburne, Esq. alphabetically arranged according to the Linnæan System. Lond. 8vo.

1779. *Speechly, William*, gardener for many years to the Duke of Portland, at Welbeck in Nottinghamshire; afterwards a farmer; died at an advanced age in 1820.

1. A Treatise on the Culture of the Pine-Apple, and the Management of the Hot-house; together with a Description of every species of Insect that infests Hot-houses, with effectual Methods of destroying them. York, 1779, 8vo.

2. A Treatise on the Culture of the Vine, exhibiting new and advantageous methods of propagating, cultivating, and training that Plant, so as to render it abundantly fruitful. With new Hints on the Formation of Vineyards in England. York, 4to.

3. Practical Hints on Domestic and Rural Economy, relating partly to the utility, formation, and management of Fruit, Kitchen, and Cottage Gardens, and Orchards, &c. Lond. 8vo. 1820.

1780. *Walpole, Horace*, afterwards Earl of Orford, youngest son of Sir Robert Walpole, born in 1718; a man of taste and genius, author of the Castle of Otranto, several papers in the "World," &c.; he sat in parliament from 1741 to 1768, when he retired, and devoted his time to the improvement of his villa, Strawberry-hill, near Twickenham. In 1791 he succeeded his nephew as Earl of Orford, but never took his seat in the House of Lords. He died in 1797.

1. On Modern Gardening, published in the Anecdotes of Painting; in a later edition in 1782 are some additional notes.

Various Remarks on Gardening occur in his correspondence with Mr. Montague, published in 1818, in 4to.

1781. *Darwin, Erasmus*, M.D. F.R.S. an eminent physician and poet, born at Elton near Newark, in Nottinghamshire, in 1781. Completed his medical studies at Edinburgh, settled at Litchfield, where he resided the greater part of his life: but went to Derby in 1781, and died there in 1802. As a poet he is esteemed rather gaudy and fanciful; as a philosopher, he is apt to indulge in hypothesis; but he possesses the great quality of being totally exempt from every kind of prejudice.

1. Botanic Garden; a Poem, in two Parts. Part I. containing the Economy of Vegetation. Part II. the Loves of the Plants, with Philosophical Notes. Illustrated with 10 copper-plates. Lond. 1791, 2 vols. 4to.

2. Zoonomia, or the Laws of Organic Life. Lond. 1794-6, 2 vols. 4to.

3. Phytologia, or the Philosophy of Agriculture and Gardening, with the Theory of Draining Morasses, and with an improved construction of the Drill Plough. Lond. 1800, 4to.

1781. *Fulmer, Samuel.*

The Young Gardener's best Companion for the Kitchen and Fruit Garden. Lond. 12mo.

1781. *Lettsom, John Coakley*, M.D. F.R.S., an eminent physician in London, was born on a small isle called little Van Dyke, near Tortola, in 1744; died 1815.

1. Hortus Uptonensis; or a Catalogue of Stove and Greenhouse Plants in Dr. Fothergill's Garden, at his death. Lond. 1781, 8vo.

2. Grovehill; a Rural and Horticultural Sketch. Lond. 1804, 4to.

3. On the Beta Cicla, or Root of Scarcity. Caled. Hort. Mem. i. 420.

1783. *Anon.*

Some thoughts on Building and Planting, addressed to Sir James Lowther, Bart. published in Dodsley's collection of poems for this year.

1783. *Bryant, Charles*, of Norwich.

1. Flora Diætetica, or the History of Esculent Plants, both Domestic and Foreign, in which they are accurately described and reduced to their Linnæan, generic, and specific names, with their English names annexed. Lond. 1783, 8vo.

2. A Dictionary of the ornamental Trees, Shrubs, and Plants, most commonly cultivated in the Plantations, Gardens, and Stoves of Great Britain; arranged according to the Linnæan generic names, and containing full and accurate Descriptions of the Genera and Species, with the names properly accented. Norwich, 1790, 8vo.

1783. *Falconer, William*, M.D. F.R.S. physician to the general hospital Bath; author of a number of medical works, and of "Remarks on the influence of climate, situation, nature of country, population, nature of food, and way of life; on the disposition and temper, manner and behaviour, intellects, laws and customs, forms of government, and religion of mankind." A most interesting work.

1. An Historical View of the Taste for Gardening and Laying out Grounds among the Nations of Antiquity, 8vo. The principal parts of this tract were originally printed in the Literary and Philosophical Memoirs of the Manchester Society. 8vo.

2. An Essay on the Preservation of the Health of Persons employed in Agriculture; and on the Cure of Diseases incident to that way of life. Lond. 1789, 8vo.

3. Miscellaneous Tracts and Collections relating to Natural History; selected from the principal writers of antiquity on that subject. Lond. 1793, 4to.

1784. *Curtis, William*, a botanical writer, was born at Alton in Hampshire in 1746. He served his apprenticeship as an apothecary to his grandfather, and while in that situation cultivated botany with eagerness. At the age of twenty he came to London, and entered into the service of Mr. Talwin of Gracechurch-street, to whose business he succeeded. His love of botany, however, induced him to give up the shop, and he became a lecturer and demonstrator in his favorite science. His first garden was at Bermondsey, and afterwards he occupied a more extensive one at Lambeth, which he exchanged for another at Brompton. In 1771, he published "Instructions for Collecting and Preserving Insects;" and in the following year a translation of the Fundamenta Entomologiæ of Linnæus, with the title of an Introduction to the Knowledge of Insects. In 1777, appeared the first number of his Flora Londonensis, which was completed in six fasciculi of seventy-two plates each. This work was followed by the Botanical Magazine, in monthly numbers. In 1782 he published a History of the Brown-tailed Moth; besides which he wrote Practical Observations on the British Grasses, and some papers in the transactions of the Linnæan Society, of which he was a member. He died in 1799, and was buried at Battersea; after his death his lectures were published with coloured plates.

1. A Catalogue of British Medical, Culinary, and Agricultural Plants, cultivated in the London Botanical Garden. Lond. 1784, 12mo.

Mr. C. commenced the Botanical Magazine in 1787. A work which has met with great encouragement, and has done much to diffuse a general taste for Botany. It is still continued by Dr. Sims.

2. Observations on Aphides, chiefly intended to show that they are the principal cause of Blights in Plants, and the sole cause of the Honey Dew. Trans. Linn. Soc. xi. 75. 1802, posth.

1784. *Rodenhurst, T.*

A Description of Hawkstone, in Shropshire, the seat of Sir Richard Hill, Bart. in 1799, 12mo.

1785. *Anon.*

Miscellanies on Ancient and Modern Gardening, and on the Scenery of Nature. Lond. 8vo.

1785. *Kyle, Thomas*, gardener to the Hon. Baron Stewart of Moredun, near Edinburgh. One of the first gardeners in Scotland of his time.

Treatise on the Management of the Peach and Nectarine Trees, either in Forcing-houses or on hot and common Walls. Edin. 8vo.

1785. *Marshall, William*, Esq., a native of Yorkshire, brought up to trade; was some years in the West Indies, as a planter; returned about 1775, and took a farm in Surrey; went down into Norfolk as agent to Sir Harbord Harbord's estates in 1780; left this situation in 1784, and went and resided at Statfold, near the junction of the four counties of Leicester, Warwick, Stafford, and Derby, where he remained till 1786, occupied in collecting materials for his economical surveys, and in printing some of his works. From this time, till about 1808, he resided chiefly in Clement's Inn, London, in winter, and visited different parts of the country during summer. He spent one summer in Perthshire, chiefly on the Earl of Bredalbane's estates at Taymouth; and partly also on the Earl of Mansfield's at Scone. He proposed arrangements for the tenantable lands, and also the park and woody scenery on various estates; and finally retired to a small property he purchased in his native county, in the vale of Cleveland, in 1808, where he died, at an advanced age, in 1819. He was a man of little education, but of a strong and steady mind; and pursued, in the most consistent manner, from the year 1780 to his death, the plan he originally laid down; that of collecting and condensing the agricultural practices of the different counties of England, with a view to a general work on *Landed Property*, which he published; another on *Agriculture*, which he did not live to complete; and a *Rural Institute*, in which he was supplanted by the Board of Agriculture.

1. Planting and Rural Ornament, 1 vol. 8vo. A second edition in 2 vols. in 1796.

2. A Review of the Landscape, a didactic poem; also an Essay on the Picturesque; together with Practical Remarks on Rural Ornament. Lond. 1796.

1786. *Brocq, Philip le*, M.A., chaplain to the Duke of Gloucester. About the time he published his work on the Vine, he took out a patent for "training all sorts of fruit trees or vines near the ground," as suggested by Lord Bacon, and practised at the time the patent was taken out by F. X. Vispre, at Wimbledon, and subsequently at Chelsea. See Speechly, Treatise on the Vine, 8vo. edition, p. 205.

1. A Description of certain Methods of Planting, Training, and Managing all kinds of Fruit Trees, Vines, &c. Lond. 1786, 8vo.

2. Sketch of a Plan for making the Tract of Land called the New Forest, a real Forest, and for various other purposes of the first national importance. Stockdale, 1793, 8vo.

1786. *Browne, Robert*, gardener to Sir Harbord Harbord, Bart. at Gunton, in Norfolk.

A method to preserve Peach and Nectarine Trees from the Effects of the Mildew; and for destroying the red spider in melon frames, and other insects which infest plants in stoves, and trees, shrubs, &c. in the open garden. Lond. 12mo.

1786. *Vispre, Francis Xavier.*

A Dissertation on the Growth of Wine in England. Bath, 8vo.

1789. *Emmerich*, Lieutenant-colonel *A.*, a German gentleman, author of a tract on his own profession, and deputy-surveyor of the woods and forests under Mr. Robinson.

The Culture of Forests; with an Appendix, in which the state of the Royal Forests is considered, and a system proposed for their improvement. Lond. 1789, 8vo.

1789. *Græffer, John*, a native of Germany, who came to England about the middle of the eighteenth century, and after being some time under Miller, was gardener to James Vere, Esq. of Kensington-Gore. Afterwards he joined Thompson, a gardener, and Gordon, a seedsman, in establishing a nursery at Mile-end. When Gordon died, the nursery became the sole property of Thompson, the present proprietor; and Græffer, soon afterwards, received from Sir Joseph Banks the appointment of gardener to the King of Naples, at Caeserta. Here he laid out an English garden, and richly stocked it with exotics from the Hammersmith nursery. He was employed by Admiral Lord Nelson to look after his estate of Bronte, and by various native noblemen to lay out their grounds; he remained in his situation as gardener at Caeserta during Murat's reign, and died there, or was in part murdered when he fell from his gig, within a mile of his own house in 1816.

A Descriptive Catalogue of upwards of 1100 species and varieties of Herbaceous or Perennial Plants: divided into six columns, exhibiting, at one view, the names, magnitude, height and situation, time of flowering, color of the flowers, and native country of each species. With a List of Hardy Ferns, for the decoration of Northern Borders, and the most ornamental Annuals. Lond. 1789, 8vo.

1789. *Sowerby, James*, F. L. S. A botanical draftsman and engraver, to whom science is much indebted. He possesses a rich museum of botany and mineralogy, and has published different works on the latter subject.

1. Botanical Drawing-book, or an easy Introduction to Drawing Flowers according to Nature. Lond. 1789, 4to.
2. The Florist's Delight, containing six Coloured Figures, with the Botanical Descriptions. Lond. 1791, fol.
3. Figures of English Fungi, or Mushrooms. Lond. 1797-1803, 3 vols. fol.
4. Notice on the Effect of Watering Fruit Trees early in the Spring. Hort. Trans. ii. 271.

1790. *Brulles*, ——.

Hints for the Management of Hot-beds, and Directions for the Culture of early Cucumbers and Melons. To which are added, brief Instructions for Pruning Wall and Espalier Trees. Bath, 1790, 8vo.

1791. *Forsyth, William*, Esq. F.A.S., a native of Scotland, born at Old Meldrum in Aberdeenshire in 1737; came to England in 1763, and was some time employed under Miller at Chelsea. He was afterwards gardener at Zion-house, till Miller's removal in 1769, when he succeeded him as curator of the Chelsea garden; and at the death of the late Thomas Robinson, Esq. Royal gardener at Kensington, in 1784, he was appointed to that situation. Here, finding the fruit trees in an old worn-out state, he began a system of renovation by heading down and renewing the soil, in which he was highly successful; and for discovering the ingredients of a composition with which he covered over the wounds, received a parliamentary reward. His works procured him the published animadversions of T.A. Knight, James M'Phail, W. Pontey, and others. He died in 1804, and left a son an eminent London seedsman, and author of a botanical catalogue, &c.

1. Observations on the Diseases, Defects, and Injuries in all kinds of Fruit Trees; with an Account of a particular method of Cure, invented and practised by the Author. Lond. 1791, 8vo.
2. Treatise on the Culture and Management of Fruit Trees; in which a new method of pruning and training is fully described. With plates. Lond. 1802, 4to.

1791. *Linnæan Society.*

Transactions of the Linnæan Society, vol. i. 4to.: vol. xii. completed in 1820. These volumes contain some papers connected with gardening; such for example as: 1. Biographical Memoirs of several Norwich Botanists, vol. vii. 2. Notes relating to Botany, and collected from the manuscripts of the late Peter Collinson, Esq. F. R. S. and —— vol. x. 270. 3. On the supposed Effect of Ivy upon Trees, vol. xi. 27.

1791. *Salisbury, Richard Anthony*, Esq. F. R. S., a learned botanist, enthusiastically attached to that study, and to gardening. Mr. Salisbury was educated at North Bierly and the University of Edinburgh. He had a fine garden (now a public nursery) at Chapel Allerton, near Leeds, and afterwards possessed that of the late Peter Collinson, Esq., at Mill-hill, near London. He now resides in the metropolis, and is an active member and contributor to the Linnæan and Horticultural Societies.

1. Icones Stirpium variorum, Descriptionibus illustratæ. Lond. 1791, 8vo.
2. On the Cultivation of the Polianthes Tuberosa, or Tuberose; with its Botanical Description and Figure. Trans. Hortic. Soc. i. 41. 1812.
3. Observations on the different Species of Dahlia, and the best Method of cultivating them in Great Britain. Ib. 84.
4. A short Account of Nectarines and Peaches naturally produced on the same Branch. Ib. 103.
5. Some Account of the Red Doyenné Pear, with a Figure. Ib. 230.
6. Some Account of two New Varieties of Grape. Ib. 258.
7. On the Cultivation of Rare Plants. Ib. 261.
8. On the Cultivation of the Jamrosade (Eugenia Jambos. L.) in the National Garden at Paris. Ib. Append. 11.
9. On the Vegetation of High Mountains; translated from a Paper of M. Raymond's. Ib. 15.
10. Description of a Bank for Alpine Plants, by Mons. Thouin; abridged. Ib. 24.
11. On the Cultivation of the Monopsis Conspicua. Ib. ii. 37. 1815.
12. Some Account of the Chiogenes Serpyllifolia, or Snowberry, a fruit nearly allied to the Cranberry. Ib. 94.
13. Some Account of the Melidora Pellucida, a beautiful Evergreen Shrub from China. Ib. 156.
14. Description of Ord's Apple. Ib. 285. 1817.

1792. *Maddock, James*, originally from Warrington in Lancashire, a quaker, and commercial florist at Walworth, died about 1806.

Florist's Directory, and complete Treatise on the Culture and Management of Flowers, with a Supplementary Essay on Soils, Manure, &c.; with plates. Lond. 1792, 8vo. 10s.

1792. *Martyn, Thomas*, B. D. F. R. S. son of Dr. John Martyn, who read botanical lectures at Cambridge, before he was elected professor, on Bradley's neglecting to perform his office. He succeeded his father as Professor of Botany in 1761: is author of a Sermon; a Tour in Italy; some translations and commentaries, and various botanical works.

1. Flora Rustica: exhibiting accurate figures of such plants as are either useful or injurious in husbandry; drawn and engraved by F. P. Nodder, botanic painter to her Majesty; with Scientific Characters, Popular Descriptions, and Useful Observations. Lond. 4 vols. 8vo. Leaves and coloured plates, 144.
2. The Gardener's and Botanist's Dictionary of the late Philip Miller, corrected and newly arranged, with additions. Lond. 1803-1807, 4 vols. fol.

1792. *Smith*, Sir *James Edward*, M. D. F. R. S. P. L. S., a distinguished naturalist, founder and president of the Linnæan Society; author and editor of many botanical works, the principal of which are the Flora Britannica and Flora Græca.

1. Sketch of a Tour on the Continent, in the years 1786 and 1787. (Containing some account of the gardens of France and Italy.) Lond. 1783, 3 vols. 8vo.
2. Compendium Floræ Britannicæ. Lond. 8vo.
3. Tour to Hafod, in Cardiganshire, the Seat of Thomas Johnes, Esq. Lond. 1810, super fol.

4. Biographical Memoirs of several Norwich Botanists. Lin. Trans.

5. Directions for raising Ferns from Seed, as practised by Mr. Henry Shepherd of Liverpool. Hort. Trans. iii. p. 338.

1793. *Steele, Richard*, gardener at Thirsk in Yorkshire.

An Essay upon Gardening; containing a Catalogue of Exotic Plants for Stoves and Greenhouses of British Gardens; the best Method of planting the Hot-house Vine, &c.; with the History of Gardening, and a Contrast of the ancient with the modern taste. York, 1793, 4to.

This work is little more than a catalogue of trees and plants, but contains an elevation of the stove erected by R. A. Salisbury, Esq. at Chapel Allerton.

1793. *Trusler*, Rev. *John*, LL.D. a singular literary character and low popular compiler, was born in London in 1735. He was brought up to physic in a very humble line; but contrived to get into orders, and for some time officiated as a curate. At length, in 1771, he began to publish abridgments of popular sermons, printed in imitation of manuscript; and next he established a bookselling business upon an extensive scale. Having thus acquired a fortune, he purchased an estate at Englefield-green, where he died in 1820.

1. The Art of Gardening. Lond. 8vo.

2. The Lady's Gardener's Companion. Lond. 18mo. 1816.

1794. *Anon.*

Hints on Vegetation and Questions regarding the Nature and Privileges thereof. Lond. 4to.

1794. *Haworth, Adrian Hardy*, Esq. F.L. and H.S. of Cottenham near Beverley, Yorkshire, a botanist and horticultural amateur, author of a work on insects.

1. Observations on the Genus of Mesembryanthemum, in two parts; containing Scientific Descriptions of above 130 species, about 50 of which are new; Directions for their management, new arrangements of the Species, Reference to Authors, and a great variety of critical, philosophical, and explanatory Remarks. Lond. 1794, 8vo.

2. Synopsis Plantarum Succulentarum, cum Descriptionibus Synonymis, Locis, Observationibus Anglicanis Culturaque. Lond. 1812, 8vo.

3. A new Arrangement of the Genus Narcissus. Trans. Linn. Soc. 1799. vol. v.

4. A new Arrangement of the Genus Aloe. Ib. 1801. vol. vii. p. 1.

5. On the Cultivation of Crocuses, with a short account of the different Species known at present. Trans. Hort. vol. ii. p. 122. 1815.

1794. *Hayes, Samuel*, Esq. M.R.I.A. an Irish author.

A Practical Treatise on Planting. Dublin, 8vo.

1794. *Knight, Richard Payne*, Esq., a gentleman of great classical attainments, and of refined taste; proprietor of a fine demesne and park near Ludlow, on which he built an elegant mansion from his own designs. After residing there many years, he gave up the possession to his brother, the celebrated horticulturist, and now lives chiefly in London.

The Landscape, a didactic poem, 4to. two plates. This produced a Sketch from the Landscape, a poem in 4to. generally attributed to the poet Mason; and a Review, by W. Marshall; the latter a very virulent production.

1794. *M^cPhail, James*, a native of Aberdeenshire; gardener for twenty years to Lord Hawkesbury (now the Earl of Liverpool), at Addiscombe-Place, near Croydon. An excellent grower of pines and melons; author of some tracts on Agriculture and the Poor Laws.

1. Treatise on the Culture of the Cucumber; shewing a new and advantageous method of Cultivating that Plant, with full Directions for the Management thereof, and the degree of Heat it requires on every Day of the Year, &c. To which are added, Hints and Observations on the Improvement of Agriculture. Lond. 1794, 8vo.

2. The Gardener's Remembrancer throughout the Year, exhibiting the surest and most improved Methods of Manuring, Digging, Sowing, &c.; the Nature of Earth, Water, Heat, Air, and Climate, best adapted for the Culture of Plants, and Production of Fruits, Flowers, and esculent Vegetables, in the forcing way; the Causes and Symptoms of Disease and Barrenness in Trees of every kind, with means of Prevention and Cure. To which is prefixed a View of Mr. Forsyth's Treatise on Trees. Lond. 8vo.

1794. *Price, Uvedale*, Esq. of Foxley, near Hereford. A gentleman and scholar of great taste; enthusiastically fond of pictures, statues, and picturesque beauty in all objects and impressions; and who has greatly improved and beautified his own estate.

1. An Essay on the Picturesque, as compared with the Sublime and the Beautiful, and on the Use of Studying Pictures for the Purpose of improving Real Landscape. Lond. 1794, 8vo.

2. A Dialogue on the Distinct Characters of the Picturesque and the Beautiful, in Answer to the Objections of Mr. Knight. Lond. 1801, 8vo.

3. Letter to H. Repton, Esq. on the Application of the Practice, as well as the Principles of Landscape Painting to Landscape Gardening, intended as a Supplement to the Essay on the Picturesque; to which is prefixed Mr. Repton's letter to Mr. Price. Lond. 1795, 8vo.

1794. *Shaw, James*, author of a Tour in the Netherlands.

Plans, Elevations, Sections, Observations, and Explanations of Forcing-houses in Gardening. Whitby. Fol.

1795. *Knight, Thomas Andrew*, Esq. F.R.S. L.S. &c. president of the Horticultural Society. A distinguished vegetable physiologist and horticulturist; brother to R. P. Knight, Esq. See 1794.

1. A Treatise on the Culture of the Apple and Pear, and on the Manufacture of Cyder and Perry. Lond. 1797, 12mo.

2. Some Doubts relative to the Efficacy of Mr. Forsyth's Plaister, in renovating Trees. Lond. 1802, 4to.

3. Report of a Committee of the Horticultural Society of London. Lond. 1805, 4to.

4. Pomona Herefordiensis; or, a Descriptive Account of the old Cyder and Perry Fruits of Herefordshire. Lond. 1809, 4to.

5. Observations on the Grafting of Trees. Phil. Trans. Abr. xvii. 569, 1795.

6. Experiments on the Fecundation of Vegetables. Ib. xviii. 504. 1799.

7. Account of some Experiments on the Ascent of Sap in Trees. Ib. 333. 1801.

8. Account of some late Experiments on the Descent of the Sap in Trees. Ib. 277. 1803.

9. Experiments and Observations on the Motion of the Sap in Trees. Ib. 183. 1804.

10. Concerning the State in which the true Sap of Trees is deposited during Winter. Ib. 88. 1805.

11. On the Reproduction of Buds. Ib. 257.

12. On the Direction of the Radicle and Germen during the Vegetation of Seeds. Ib. 99. 1806.

13. On the inverted Action of the Alburnous Vessels of Trees. Ib. 292.

14. On the Formation of the Bark of Trees. Ib. 103. 107.

15. On the Economy of Bees. Ib. 234.

16. On the Inconvertibility of Bark into Alburnum. Ib. 103. 1808.

17. On the Origin and Office of the Alburnum of Trees. Ib. 313.

18. On the Origin and Formation of Roots. Ib. 169. 1809.

19. On the comparative Influence of Male and Female Parents on their Offspring. Ib. 392.

20. On the Parts of Trees primarily Impaired by Age. Ib. 178. 1810.

21. On the Causes which influence the Direction of the Growth of Roots. Ib. 209. 1811.

22. On the Motions of the Tendrils of Plants. Ib. 314. 1812.

23. On Ice found in the Bottoms of Rivers. Ib. 286. 1816.

24. On the Action of detached Leaves of Plants. Phil. Trans. 289.

25. Upon the Extent of the Expansion and Contraction of Timber in different Directions, relative to the Position of the Medulla of the Tree. Ib. 269. 1817.

26. Introductory Remarks relative to the Objects which the Horticultural Society have in view. Hort. Trans. i. 1. 1806.

27. Observations on a Method of producing new and early Fruits. Ib. 30.

28. On raising New and Early Varieties of the Potatoe. Ib. 57.

29. On the Advantages of Grafting Walnut, Mulberry, and Chesnut Trees. Ib. 60.

30. On a new Method of Training Fruit Trees. Ib. 79.

31. A Description of a Forcing-house for Grapes. Ib. 99.

32. On the proper Construction of Hot-bed Frames. Ib. 142.

33. A short Account of a new Apple called the Downton Pippin. Ib. 145.

34. On the Management of the Onion. Ib. 157.

35. An Improved Method of cultivating the Alpine Strawberry. Ib. 159.

36. On some Varieties of the Peach. Ib. 165.

37. On a new Variety of Pear. Ib. 178.

38 On Potatoes. Ib. 187.

39. A new and expeditious Mode of Budding. Ib. 194.

40. On the best Method of Constructing a Peach-house. Ib. 199.

41. On the Culture of the Potatoe in Hot-beds. Ib. 211.

42. View of the Theory of Vegetation. Ib. 217.

43. A short Account of some Apples and Pears, of which Grafts were presented to the Members of the Horticultural Society. Ib. 226.

44. A new Method of Grafting, with a figure of it. Ib. 239.

45. On the Advantages of employing Vegetable Matter as Manure in a fresh state. Ib. 248.

46. On some Early Varieties of the Potatoe. Ib. 244.

47. On facilitating the Emission of Roots from Layers. Ib. 255.

48. Some Account of Two new Varieties of Grape. Ib. 258.

49. Some Account of the Elton Pear, with a figure. Ib. ii. 1.

50. On the Transplantation of Blossom-Buds. Ib. 7.

51. On an early Variety of Grape from Amiens. Ib. 10.

52. On the proper Stock for the Moor Park Apricot. Ib. 19.

53. On inarching leafless Branches of Peach Trees. Ib. 35.

54. On the Prevention of the Disease called the Curl in the Potatoe. Ib. 64.

55. On the Culture of the Mulberry. Ib. 68.

56. On the early Puberty of the Peach Tree. Ib. 70.

57. On the Culture of the Pear Tree. Ib. 78.

58. On the Prevention of Mildew in particular Cases. Ib. 82.

59. On the Culture of the Shallot, and some other bulbous-rooted Plants. Ib. 97.

60. On the Propagation of the Mulberry Tree by Cuttings. Ib. 114.

61. On the beneficial Results of planting Potatoes, which have grown late in the preceding year. Ib 125.

62. On the Application of Manure in a liquid form to Plants in Pots. Ib. 127.

63. On the ill Effects of Excessive Heat in Forcing Houses during the Night. Ib. 130.

64. An Account of Two Varieties of Cherry, raised at Downton. Ib. 137.

65. An Account of a new Variety of the Peach. Ib. 140.

66. On the Want of Permanence of Character in Varieties of Fruit, when propagated by Grafts and Buds. Ib. 160.

67. On the Mode of Propagation of the Lycoperdon cancellatum, a Species of Fungus, which destroys the Leaves and Branches of the Pear Tree. Ib. 178.

68. On the Preservation of Fruits during Winter and Spring. Ib. 193.

69. On the Effects of different Kinds of Stocks in grafting. Ib. 199.

70. Some Account of Three new Cherries, the Elton, Black Eagle, and Waterloo. Hort. Trans. ii. 208.

71. An Account of Three new Peaches, in a Letter to Joseph Sabine, Esq. Ib. 214.

72. On the Culture of the Peach and Apricot as Espalier Trees. Ib. 219.

73. On the Ventilation of Forcing-houses. Ib. 224.

74. Upon the Advantages of Propagating from the Roots of old ungrafted Fruit Trees. Ib. 252.

75. On the Means of Preserving Brocoli in Winter. Ib. 304.

76. Observations on Mr. Brown's Account of his Steaming Apparatus, with some Suggestions for the Improvement thereof. Ib. 324.

77. Observations on the Verdelho Grape. Ib. 327.

78. Suggestions for the Improvement of Sir George Stuart Mackenzie's Plan for Forcing-houses. Ib. 350.

79. Upon the proper Mode of Pruning the Peach Tree, in cold and late Situations. Ib. 364.

80. Observations on the proper Management of Fruit Trees, which are intended to be forced very early in the ensuing Season. Ib. 368.

81. An Account of a Peach Tree, produced from the Seed of the Almond Tree, with some Observations on the Origin of the Peach Tree. Ib. iii. 1.

82. On the best Mode of Pruning and Training the Mulberry Tree, when trained to a wall in a cold Climate. Ib. 63.

83. Upon the Variations of the Red Currant (Ribes rubrum) when propagated by Seed. Ib. 86.

84. Upon the Propagation of Varieties of the Walnut Tree, by budding. Ib. 133.

85. On a Method of Forcing Rhubarb in Pots. Ib. 154.

86. Upon the Pruning and Management of Transplanted Standard Trees. Ib. 157.

87. Upon the Variations of the Scarlet Strawberry (Fragaria Virginiana) when propagated by Seeds. Ib. 207.

88. Description and Account of a New Early Black Cherry. Ib. 211.

89. Description of a New Seedling Plum. Ib. 214.

90. Upon the Preservation of Fruits from Wasps. Ib. 259.

91. On Training the Fig Tree. Ib. 307.

92. On the superior Healthfulness of Scions taken from the Trunks of Apple Trees, to those cut from the Extremities of the Branches. Ib. 387.

93. Observations upon the most advantageous Forms of Garden Pots. Ib. 389.

94. Upon the Culture of the Guernsey Lily. Ib. 399.

95. Upon the different Qualities of the Alburnum of Spring and Winter felled Trees. Phil. Trans. 1820.

96. Upon the Means of giving Strength to the Stems of Plants growing under Glass. Hort. Trans. iv. 1.

97. Upon the Culture of the Pine-Apple without Bark, or other Hot-bed. Ib. 72.

98. On the most economical Method of employing Fuel in heating the Flues of Forcing-houses. Ib. 156.

99. Physiological Observations upon the Effects of partial Decortication, or Ringing the Stems or Branches of Fruit Trees. Ib. 159.

100. Further Particulars of the Downton Strawberry. Ib. 197.

101. Upon the Culture of the Fig-Tree, in the Stove. Ib. 200.

102. On the Cultivation of the Cockscomb. Ib. 321.

103. Observations on Hybrids. Ib. 367.

104. Directions for preserving Buds of Fruit Trees in a vegetative State, when sent to considerable Distances. Ib. 403.

105. On the Management of Fruit Trees in Pots. Ib. 439.

106. An Account of an improved Method of raising Early Potatoes. Ib. 447.

107. On Grafting the Vine. Ib. 495.

1795. *Repton, Humphrey*, Esq. a distinguished landscape-gardener, was born at Bury St. Edmund's, in Suffolk, in 1752. He accompanied Mr. Wyndham to Ireland in 1783, and for a short time held a lucrative situation in the castle of Dublin; but when his friend quitted that kingdom, Repton also returned to England. He now directed his attention to drawing, architecture, and particularly landscape-gardening; in which last line be obtained considerable employment. He died in 1818, leaving several sons, one of whom married a daughter of Lord Eldon. Mr. Repton published some books on miscellaneous subjects; but his principal works are on landscape-gardening.

1. Letter to Uvedale Price, Esq. on Landscape-Gardening. 1794, 4to.

2. Sketches and Hints on Landscape-Gardening; collected from designs and observations now in the possession of the different noblemen and gentlemen for whose use they were originally made; the whole tending to establish fixed principles in the art of laying out grounds: 16 coloured plates. Lond. 1795, folio.

3. Observations on the Theory and Practice of Landscape-Gardening, including some Remarks on Grecian and Gothic Architecture, collected from various MSS. in the possession of different noblemen and gentlemen; the whole tending to establish fixed principles in the respective arts, with many plates. Lond. 1803, 4to.

4. Observations on the Changes in Landscape-Gardening. 1806, 8vo.

5. On the Introduction of Indian Architecture and Gardening. 1808, folio.

6. On the supposed Effect of Ivy upon Trees. Linn. Trans. 1810, vol. xi. p. 27.

1796. ***Anon.*** Generally attributed to Mason the poet, author of the English Garden. See 1772.

A Sketch from "The Landscape," a Poem, by R. P. Knight, Esq. Lond. 4to.

1796. ***Donn, James,*** F.L.S. H.S. Curator of the botanic garden at Cambridge: died in 1817.

Hortus Cantabrigiensis; or, a Catalogue of Plants, indigenous and foreign, cultivated in the Walkerian botanic Garden, Cambridge. Camb. 8vo.

The ninth Edition, edited and accented by Frederick Pursh, in 1819.

This Catalogue has long been in general use among gardeners, but is now superseded by the more general and complete work of Sweet. See 1818.

1796. ***Lindley, George,*** nurseryman at Norwich.

1. The Plan of an Orchard; exhibiting at one View a select quantity of Trees, sufficient for Planting an Acre and half of Land, properly averaged according to their usual size of growth and hardiness of bearing, &c. Lond. 1796, a folio sheet.

2. An Account of some of the best Varieties of Apples peculiar to, or cultivated in, the County of Norfolk. Hort. Trans. iv. 65.

1796. ***Marshall,*** the Rev. ***Charles,*** vicar of Brixton, Northamptonshire.

Introduction to the Knowledge and Practice of Gardening; with Hints on Fish Ponds. Lond. 1796, 12mo.

1797. ***Astley, Francis Duckenfield,*** Esq. of Duckenfield Hall, near Aston in Lancashire, member of the Manchester Agricultural Society; now resident on the continent.

2. A few Minutes Advice to Gentlemen of Landed Property, and the Admirers of Forest Scenery; with Directions for Sowing, Raising, Planting, and the Management of Forest-trees. To which is added a Catalogue of Forest Trees, Fruit Trees, and Flowering Shrubs, with their usual prices, as sold by the Nurserymen and Seedsmen. Chester, 12mo.

1. Hints to Planters, collected from various authors of esteemed authority. Manchester, 1807, 8vo.

1797. ***Busch, Peter,*** father to Joseph Busch, gardener to the Emperor of Russia.

Method to destroy or drive away Earth Worms, and various other Insects hurtful to Fields or Gardens. Phil. Mag. i. 169.

1797. ***Bucknal, Thomas Skip Dyot,*** Esq.

The Orchardist, or a System of close Pruning and Medication for establishing the Science of Orcharding, &c. Extracted from the xi. xii. xiii. and xiv. vols. of the Society's Transactions for the Encouragement of Arts, &c. with additions. Lond. 1797, 8vo.

1797. ***Salisbury, William,*** nurseryman and botanist, botanic garden, Brompton; formerly of Sloane-square.

1. Hortus Paddingtonensis; or, a Catalogue of Plants cultivated in the Garden of J. Symmons, Esq. Paddington-House. Lond. 1797, 8vo.

2. Method of packing Plants and Trees intended for Exportation, so as to preserve the Vegetative Powers for many Months. Nicholson's Journal, xxx. 339. 1811.

3. The Botanist's Companion, or an Introduction to the Knowledge of Practical Botany, and the Uses of Plants, either growing wild in Great Britain, or cultivated for the Purposes of Agriculture, Medicine, Rural Economy, or the Arts. Lond. 2 vols. 12mo. 1816.

4. Hints to the Proprietors of Orchards. 1817. 12mo.

5. The Cottager's Companion, or a complete System of Cottage Gardening; intended to instruct the Industrious Poor of the United Kingdom of Great Britain. To which is added a descriptive List of Plants growing wild, which are useful for Culinary Purposes. Lond. 12mo. 1818.

1798. ***Andrews, Henry,*** botanical painter and engraver in London.

1. Engravings of Ericas, or Heaths, with Botanical Descriptions. Lond. 1796, folio.

2. The Botanist's Repository, with Coloured Figures of such Plants as have not appeared in any similar publication. Lond. 1797-99, 2 vols. 4to.

3. A Review of Plants hitherto figured in the Botanist's Repository. Lond. 1801, 4to.

4. The Heathery, or Monograph of the Genus Erica. (Published in monthly numbers.) vols. i. to vi. 1804 to 1812.

1798. ***Archer, Clement,*** Esq. M.R.I.A.

Miscellaneous Observations on the Effect of Oxygen on the Animal and Vegetable Systems; and an Attempt to prove why some Plants are Evergreen and others Deciduous. Part I. 8vo. Bath.

1798. ***Nicol, Walter,*** a Scotch horticultural architect and author of merit; son of the gardener who planned and executed the gardens and pleasure-grounds of Raith in Fifeshire. After receiving the rudiments of his horticultural education at Raith, he went to England, and soon afterwards became head-gardener to the Marquis of Townshend at Rainham Hall, in Suffolk. He afterwards returned to Scotland, and became head-gardener to General Wemyss, at Wemyss Castle in Fifeshire. About 1797 he left his situation, settled in Edinburgh, and commenced his career as horticultural architect. In the year 1810 he undertook an extensive journey through England, for the purpose of visiting the principal seats and plantations, with a view, on his return, to compose the Planter's Calendar. This work had scarcely commenced when he was seized with an illness which carried him off suddenly in March 1811.

1. The Scotch Forcing Gardener; together with Instructions on the Management of the Green-house, Hot-walls, &c. Illustrated with Plates. Edin. 1798, 8vo.

2. The Practical Planter; or, a Treatise on Forest Planting: comprehending the Culture and Management of Planted and Natural Timber; also the Management of Hedges, Fences, and the Construction of Stone Walls, &c. Edin. 1799, 8vo.

3. The Villa Garden Directory; or Monthly Index of Work to be done in the Town and Villa Gardens, Shrubberies, Parterres, &c. Edin. 1809, 8vo.

4. The Gardener's Kalendar, or Monthly Directory of Operations in every Branch of Horticulture. Edin. 1810.

5. The Planter's Kalendar; or, the Nurseryman and Forester's Guide in the operations of the Nursery, the Forest, and the Grove. Completed by Sang. Edin. 1812, 8vo.

1798. *Robinson*, ———, a London architect, nephew to Thomas Robinson, Esq. gardener to Geo. III. at Kensington.

Forms of Stoves used for Forcing-houses. Lond. oblong 4to.

1800. *Hill, Daniel*, M.D. F.H.S.

1. Practical Observations on the Use of Oxygen, or Vital Air, in the Cure of Diseases; to which are added, a few Experiments on Plants. Part i. Lond. 1800. 4to.
2. On the Use of Oxygen Air, in promoting Vegetation. Hort. Trans. i. 233. 1815.

1800. *Pontey, William*, planter and forest pruner to the Duke of Bedford, and ornamental gardener; resident at Huddersfield, where his brother is a respectable nurseryman.

1. The Profitable Planter; a Treatise on the Cultivation of the Larch and Scotch Fir Timber, shewing that their excellent quality, especially that of the former, will render them so essentially useful, as greatly to promote the interests of the country. Huddersfield, 1800. 8vo.
2. The Forest Pruner, or Timber Owner's Assistant; being a Treatise on the Training or Management of British Timber Trees, whether intended for use, ornament, or shelter; including an explanation of the causes of their general diseases and defects, with means of prevention, and remedies, where practicable; also, an examination of the properties of English Fir Timber, with remarks on the defects of the old, and the outlines of a new system for the management of Oak Woods. With eight explanatory plates. Lond. 1805. 8vo.

1802. *Society of Practical Gardeners*, evidently, however, a compilation by a hackney writer who knew little of the subject.

Rural Recreations, or the Gardener's Instructor; exhibiting in a clear and perspicuous manner all the Operations necessary in the Kitchen, Flower, and Fruit Gardens, &c. for every Month in the Year; with a Treatise on the Management of Bees, &c. and Catalogues of Plants. Lond. 8vo.

1803. *Loudon, John Claudius*, landscape-gardener; born in Lanarkshire in 1782, began to practise in 1803; to farm extensively in Oxfordshire in 1809, and in Middlesex 1810; travelling on the continent in 1813-14-15, again in 1819, now residing at Bayswater.

1. Observations on laying out the public Squares of London. Literary Journal, 1803.
2. Observations on the Formation and Management of Useful and Ornamental Plantations; on the Theory and Practice of Landscape Gardening, and on gaining and embanking Land from Rivers, or the Sea. Edin. 1804, 8vo.
3. A short Treatise on some Improvements lately made in Hot-houses. Edin. 1805, 8vo.
4. A Treatise on forming, improving, and managing Country Residences, and on the choice of Situations appropriate to every class of Purchasers. With an Appendix, containing an Enquiry into the utility and merits of Mr. Repton's Mode of showing Effects by Slides and Sketches, and Strictures on his Opinions and Practice in Landscape Gardening. Illustrated by Descriptions of Scenery and Buildings, by references to Country Seats, and passages of Country in most parts of Great Britain, and by 32 engravings. Lond. 1806, 2 vols. 4to.
5. Hints on the Formation of Gardens and Pleasure-Grounds, &c. 4to. plates, 1812.
6. Remarks on the Construction of Hot-houses; pointing out the most advantageous Forms, Materials, and Contrivances to be used in their Construction; with a Review of the various Methods of building them in foreign countries, as well as in England; with 10 plates, from etchings on stone. 1817, 4to.
7. Sketches of Curvilinear Hot-houses; with a Description of the various purposes in Horticultural and General Architecture, to which a solid Iron Sash-Bar, lately invented, is applicable. 1818.
8. A comparative View of the common and curvilinear Mode of roofing Hot-houses. Lond. folio, 1818.

1803. *Moriarty*, Mrs. *Henrietta Maria*, author of several novels.

Viridarium; or, Green-house Plants; containing fifty plates, drawn and colored from Nature. 1803, 8vo.

1804. *Amos, William*, formerly a gardener and bailiff to a nobleman, and afterwards a farmer at Brothertoft, Lincolnshire, author of some works on the drill husbandry.

Minutes of Agriculture and Planting, &c. Lond. 1804, 4to.

1805. *Banks*, Sir *Joseph*, Bart., president of the Royal Society, was the son of William Banks, Esq. of Revesby-abbey in Lincolnshire, and born there in 1743. He received his education first at Eton, and next at Oxford, but left the university on the death of his father in 1761; and two years afterwards made a voyage to Labrador and Newfoundland. In 1768, he and Dr. Solander went with Lieutenant Cook to Otaheite; in which voyage Mr. Banks narrowly escaped perishing by the frost, on the island of Terra del Fuego. After his return he received the degree of doctor of laws at Oxford; and in 1772 undertook a voyage to Iceland and the Western Isles of Scotland. In 1778 he received the Order of the Bath, and was elected president of the Royal Society. In 1781 he was created a baronet; but about two years afterwards his conduct in the Royal Society gave such offence to the scientific members as had nearly produced a schism: this tempest, however, was dispersed, and the president retained his seat without any farther opposition to the end of his life. Sir Joseph, though afflicted for many years with the gout, continued his exertions for the improvement of agriculture and the extension of natural history to the very last of his long and useful life. He died May 9. 1820. He has some papers in the Philosophical Transactions, and published besides a tract on the Rust on Wheat.

1. An Attempt to ascertain the Time when the Potatoe (Solanum Tuberorum) was first introduced into the United Kingdom, with some Account of the Hill Wheat of India. Trans. Hort. i. 8.
2. Some Hints respecting the inuring Tender Plants to our Climate. Ib. 21.
3. On the Revival of an obsolete Mode of managing Strawberries. Ib. 54.
4. An Account of the Method of Cultivating the American Cranberry at Spring Grove. Ib. 75.
5. On the Horticultural Management of the Sweet or Spanish Chestnut Tree. Ib. 140.
6. On the Forcing-Houses of the Romans, with a list of Fruits cultivated by them now in our Gardens. Ib. 147.
7. On some Exotics which endure the open Air in Devonshire, in a Letter to him, by A. Hawkins. Ib. 175.
8. A short Account of a Colored Figure of a new Apple, called the Spring-Grove Codling. Ib. 197.
9. On Ripening the Second Crop of Figs that grow on the new Shoots. Ib. 252.
10. Some Horticultural Observations, selected from French Authors. Ib. 4. Appendix.
11. Notice from a work of Monsieur Lelieur, on the Hereditary Diseases of Fruit-Trees. Ib. 27. Appendix.
12. Notes relative to the first appearance of the Aphis Lanigera, or the Apple Tree Insect in this Country. Ib. vol. ii. 162.
13. On the Advantages of turning the Branches of Fruit-Trees over the Walls against which they are planted.

1805. *Dickson*, Mr. *James*, F.L.S. V.P. H.S. of the respectable and long established firm of Messrs. Dickson and Anderson, seedsmen and herbalists in Covent-Garden, London. As a botanist, Mr. Dickson is distinguished for his knowledge of cryptogamous plants.

1. On a Variety of the Brassica Napus, or Rape, which has long been cultivated upon the Continent. Trans. Hort. i. 26.

2. Observations on, and an Account of the Tubers of the Lathyrus tuberosus, with Instructions for the Cultivation of the Plant in a Garden. Ib. ii. 359. 1817.

3. On the Cultivation of the Rampion. Ib. iii 19. 1818.

1805. *Macdonald, Alexander*, a fictitious name adopted by R. W. Dickson, M.D. formerly of Hendon, Middlesex, author of "Practical Agriculture," and other works on Farming.

A complete Dictionary of Practical Gardening, 2 vols. 4to. plates. The plates of flowers from paintings by the late Sydenham Edwards.

1805. *Parkyns, G. J.*, author of Monastic Remains; and generally reputed the author of an Essay on Gardens, 4to. 1774; and of the Six Designs for laying-out Grounds, 1793, published with Soane's Designs for Villas.

Architectural Sketches, folio, No. 1. These contain plans for laying out grounds, according to the different natural situations, with descriptions: among others, a plan of Gen. Washington's grounds at Vermont.

1805. *Williams, John*, Esq. of Pitmaston, near Worcester.

1. An Account of the Method of hastening the Maturation of Grapes. Hort. Trans. i. 107. 1815.

2. Remarks on the Verdelho Grape of Madeira, with a colored figure. Ib. ii. 106.

3. On the Cultivation of the Vine in Forcing-houses. Ib. 108.

4. On promoting the early puberty of Apple and Pear Trees. Ib. 33. 1817.

5. On the Fences most eligible for Gardens and Orchards. Ib. 354.

1806. *Anon.* A lady, author of some elementary botanical tracts.

The Florist's Manual. Lond. 12mo.

1807. *Biggs*, Mr. *Arthur*, F.H.S. curator of the botanic garden at Cambridge: formerly gardener to Isaac Swainson, Esq. near London.

An Account of some new Apples, which, with many others that have been long cultivated, were exhibited before the Horticultural Society. Hort. Trans. i. 63.

1807. *Ellis, Daniel*, Esq. of Edinburgh.

1. An Inquiry into the Changes induced on Atmospheric Air by the Germination of Seeds, the Vegetation of Plants, and the Respiration of Animals. Edin. 1807, 8vo.

2. Further Inquiries into the Changes induced on Atmospheric Air by the Germination of Seeds, the Vegetation of Plants, and the Respiration of Animals. Edin. 1811, 8vo.

1807. *Shaw, William.*

The Practical Gardener. Lond. 8vo.

1808. *Dunbar, John*, gardener to Thomas Fairfax, Esq.

On the Cultivation of the Common Flax, (Linum Usitatissimum of Linné), as an ornamental Plant in the Flower Garden. Hort. Trans. i. 71.

1808. *Griffin, William*, formerly gardener to John Manners Sutton, Esq. at Kelham Hall near Nottingham, and now to Samuel Smith, Esq. at Wood Hall, in Hertfordshire.

1. A Treatise on the Culture of the Pine Apple. Newark, 8vo.

2. On the Management of Grapes in Vineries. Hort. Trans. i. 96.

1808. *Shepherd, John*, curator of the botanical garden at Liverpool.

A Catalogue of Plants in the Botanic Garden at Liverpool. Liverpool, 8vo.

1809. *Hawkins, Abraham*, Esq. of Alston, near Kingsbridge in Devonshire, author of a History of Turkey, and of some translations.

On some Exotics which endure the open Air, in Devonshire. Hort. Trans. i. 175. 1815.

1809. *Knight, Joseph*, F.H.S. a nurseryman in the King's-road, Chelsea; formerly gardener to —— Hibbert, Esq. of Clapton, whose collection of plants he now possesses.

1. An Essay on the Cultivation of the Plants belonging to the Order of the Proteræ. Lond. 1809, 4to.

2. On the Cultivation of Horse-Radish. Hort. Trans. i. 207. 1810.

The first of these works is understood to have been written by R. A. Salisbury, Esq.

1810. *Aiton, William Townsend*, Esq. gardener to the King at Kew and Kensington. To the first situation he succeeded on the death of his father, William Aiton, in 1793, and to the other on the death of William Forsyth, Esq. in 1804.

1. Hortus Kewensis, or a Catalogue of Plants cultivated in the Royal Garden at Kew; by the late Mr. W. Aiton; a new edition enlarged. Lond. 1810-13, 5 vols. 8vo.

2. An Epitome of the 2d edit. of Hortus Kewensis, for the use of Practical Gardeners; to which is added, a Selection of Esculent Vegetables and Fruits cultivated in the Royal Garden at Kew. Lond. 1814, 8vo.

3. Brief Practical Observations on the Cultivation of the Cucumber in the Royal Gardens at Kew, during the Autumn and Winter Months. Hort. Trans. vol. ii.

1810. *Dean, R.* and *W.*, printers, Manchester.

1. An Account of the different Gooseberry Shews used in Lancashire, Cheshire, &c. in the year 1810. To which is added, a Statement exhibiting at one view the number of Prizes won by each sort of Berry at the several Meetings. Manchester, 12mo. continued annually.

2. An Account of the Flower Shews in Lancashire, Cheshire, &c. for 1817, continued annually. Manchester, 12mo.

1810. *Dickson*, Mr. *Thomas*, of the firm of Messrs. Dickson and Co. nurserymen, Leith Walk, Edinburgh, died in 1816.

Observations on the Disease in the Potatoe, generally called the Curl; pointing out the most probable method of preventing it; with an account of the results of a few experiments made on the subject. Cal. Mem. i. 49.

1810. *Don*, Mr. *George*, of Forfar, a practical botanist, distinguished for his knowledge of Scotch plants, of which he discovered several new species. He had a small botanic garden of his own at Forfar, which was filled with British plants; and he was for some time curator of the Botanic Garden at Edinburgh. He wrote some valuable papers on grasses, and on the Scotch fir, published in the Transactions of the Highland Society of Scotland. He died in 1817, leaving three sons, one of whom is librarian to A. B. Lambert, Esq. in London, and is a botanist of great promise.

On the Varieties of the Pinus Silvestris, or Scots Fir. Cal. Mem. i. 121.

1810. *Gibb*, Mr. *John*, gardener, Linton.

Account of the Caterpillars that infest Gooseberry Bushes, and the best method of destroying them. Cal. Mem. i. 100.

1810. *Henderson*, Mr. *John*, formerly gardener at Brechin Castle, now nurseryman at Brechin.

1. Directions for covering the Soil in Hot-beds, Pineries, &c.; and Observations on the sowing of early small Seeds. Cal. Mem. i. 117.

2. Observations on a Method of preparing a Soporific Medicine from the Common Garden Lettuce. Ib. 259.

3. A Method of stowing Vegetables for Summer use. Ib. 264.

4. Observations on the Improvement of Hot-houses. Gen. Rep. Scot. App. i. 452.

1810. *Lorimer, Charles*, Esq. collector of the customs at Dunbar.

An Account of an Improvement in the Construction of the Flues of Hot-houses, by employing Earthenware Tubes, in place of Bricks or Tiles. Cal. Mem. i. 65.

1810. *Macdonald*, Mr. *James*, C. M. H. S. one of the fraternity of Adam's Lodge, London, gardener to the Duke of Buccleugh, at Dalkeith Park, Edinburghshire.

1. Observations on the Culture of Onions, and particularly on the advantages to be derived by transplanting them from a Seed-bed into regular rows at a proper distance from each other. Cal. Mem. i. 111.

2. Some Observations on the Treatment of the Currant-bush during the ripening of the Fruit. Ib. 218.

3. List of Table Apples, Pears, and other Tree Fruits, for use in succession from July to July again, as generally furnished from his Grace the Duke of Buccleugh's garden at Dalkeith. Gen. Rep. Scot. App. i. 453.

1810. *Macmurray*, Mr. *John*, nurseryman at Stranraer, in Wigtonshire.

On Gooseberry Caterpillars, and on the Maggots that infest Onions. Cal. Mem. i. 95.

1810. *Sang*, Mr. *Edward*, nurseryman, Kircaldy, Fifeshire; editor of Nicol's Planter's Kalendar, a highly respectable man, and scientific gardener.

1. A short Account of the State of the Fruit-trees on the Garden-Walls at Loanwells, near Kirkcaldy, from the time of their being planted in 1792, to the 1st June, 1810; intended to illustrate a method of destroying Caterpillars infesting Fruit-trees. Cal. Mem. i. 104.

2. On the Origin of Canker in Fruit-trees. Ib. 336.

3. On the Advantages of the Shallow Planting of Fruit-trees. Ib. iii. 140.

1810. *Smith*, Mr. *James*, gardener to the Earl of Kintore, Keith Hall, Aberdeenshire.

1. On a new Method of planting Asparagus. Cal. Mem. i. 71.

2. On preventing the Worms in Carrots; and on preserving Cauliflower through a great part of the Winter. Cal. Mem. i. 128.

1810. *Smith*, Mr. *James*, gardener to the Earl of Hopetoun, at Ormiston Hall, East Lothian.

1. An Essay on the Cultivation of French Pears in Scotland, and on the best means of bringing into a bearing state full grown Fruit-trees, especially some of the finer sorts of French Pears. Cal. Mem. i. 74.

2. On Canker in Fruit-trees. Ib. 221.

3. Account of a small Economical Orchard near Tranent, in East Lothian. Ib. 300.

4. On the Cultivation of Figs in Scotland. Ib. ii. 69.

5. Observations on the Cultivation of Fruit-trees. Ib. 224.

6. On the Cultivation of Currants, published in Sir John Sinclair's Gen. Rep. of Scot. App. i. 449.

1810. *Stevenson, Robert*, Esq. F. R. S. E. civil engineer, in Scotland, author of some papers in the Supplement to the Encyclopædia Britannica, &c.

Remarks on the Construction of Hot-house Flues. Cal. Mem. i. 143.

1810. *Shirreff, John*, Esq. a farmer at Captain Head, in East Lothian, where he grew basket-willows to great perfection; and afterwards steward to a nobleman in Stirlingshire; author of the Agricultural Survey of the Orkney Islands, and of various papers in the Farmer's Magazine, and other periodical works.

On the Curled Disorder in Potatoes. Cal. Mem. i. 60.

1810. *Turner*, Mr. *John*, F. H. S. a respectable seedsman in Bond-street, London.

Some Account of the Ipomœa Tuberosa, recommending its Cultivation; with a Figure of it. Hort. Trans. i. 148. 1815.

1810. *The Caledonian Horticultural Society.* Founded in 1809, chiefly through the exertions of Dr. Andrew Duncan, Senior Professor of the Institutes of Medicine in the University of Edinburgh. It is a prosperous, well-conducted, and most useful society.

Memoirs of the Caledonian Horticultural Society. Edin. 2 vols. and 2 Nos. 8vo. 1810, to Jan. 1822.

The papers of the different writers are arranged in this section according to their dates and the names of the authors.

1810. *Weighton*, Mr. *David*, gardener to the Earl of Leven and Melville, at Melville House, Fifeshire.

1. On destroying Insects, and removing Mildew and Canker in Fruit-trees. Cal. Mem. i. 131.

2. Observations on the superiority of Composts to simple Dungs. Ib. 305.

1811. *Barnet*, Mr. *Peter*, gardener to Lady Elcho, at Aimsfield, Haddingtonshire.

An easy Method of destroying the Blue Insect that breeds on the Bark of Wall-trees, and causes them to canker and die. Cal. Mem. i. 182.

1811. *Beattie*, Mr. *William*, C.M.H.S. gardener to the Earl of Mansfield, at Scone, Perthshire.

1. On destroying the Green-fly, &c. and on bringing Peach-trees into a bearing state. Cal. Mem. i. 196.

2. On promoting the Fruitfulness of Fruit-trees, by cutting their Roots. Ib. ii. 268.

1811. *Duncan, Andrew*, sen. M.D. President of the Caledonian Horticultural Society, a Professor in the University of Edinburgh, and author of a variety of medical works.

1. Observations on the preparation of Soporific Medicines from common Garden Lettuce. Cal. Mem. i. 160.

2. Observations on the Propagation, by Cuttings, of the Original, the Mother, the Oslin, or the Burknot Apple-tree. Ib. 237.

3. A Report respecting Can-flues in Hot-houses. Ib. 353.

4. On the Brown Apple of Burntisland. Ib. ii. 309.

5. Discourse read to the Caledonian Horticultural Society, 4th Dec. 1815. Ib. 329.

6. Ditto, 3d Dec. 1816. Ib. 344.

1811. *Haynes, Thomas*, nurseryman, at Oundle, Northamptonshire.

1. Improved System of Nursery Gardening. Lond. 1811, roy. 8vo.

2. Interesting Discoveries in Horticulture; being an easy, rational, and efficacious System of propagating all hardy American and Bog Soil Plants, with Ornamental Trees and Shrubs of general Description, Green-house Plants, including Botany Bay and Cape Plants; Herbaceous Plants, affording favorable Shoots and Fruit-trees in every variety, by planting Cuttings, chiefly in the warm months, without artificial heat. Lond. 1811. roy. 8vo.

3. Treatise on the Improved Culture of the Strawberry, Raspberry, and Gooseberry. Lond. 1812, 8vo.

4. On collecting Soils and Composts and preparing them for use, &c. Lond. 12mo. 1821.

1811. *Henderson*, Mr. *William*, gardener to Sir Alexander Muir Mackenzie, Bart. at Delvine.

On preventing the Maggot infesting the Roots of Shallots, &c. Cal. Mem. i. 199.

1811. *Hunter, Alexander Gibson*, Esq. of Blackness, Linlithgowshire.

An Account of the State of certain Fruits found growing in some Parts of the Highlands of Scotland. Cal. Mem. i. 172.

1811. *Hooker, William*, Esq. F.L.S. H.S. horticultural draughtsman and engraver.

1. Pomona Londinensis; containing representations of the best Fruits cultivated in British Gardens; with Descriptions. 1813, 4to. To be completed in about 18 numbers.
2. Account of a new Pear, (with a figure,) called Williams' Bon Crétien. Trans. Hortic. Soc. ii. 250. 1817.
3. An Account of some Specimens of Apples imported from Rouen in Normandy. Ib. p. 298.
4. Account and Description of Wilmot's New Early Orleans Plum. Ib. iii. 392.
5. Description of a Mode of Cultivating Pines, as practised in the Garden of Mr. Thomas Jenkins, F.H.S. at the Portman Nursery, New Road, St. Marylebone. Ib. vol. iii.

1811. *Ingram*, Mr. *Robert*, gardener in Fifeshire.

On the means of bringing Fruit-trees into a bearing state, and on preserving Fruit. Cal. Mem. i. 149.

1811. *Kyle*, Mr. *John*, gardener to James Drummond, Esq. at Blairdrummond, Stirlingshire.

On Destroying Caterpillars, removing Mildew, &c. Cal. Mem. i. 192.

1811. *Mitchell*, Mr. *John*, gardener at Moncrieff-House, Perthshire.

On destroying Wasps. Cal. Mem. i. 194.

1811. *Muirhead*, Mr. *Alexander*, gardener to Sir John Belshes of Invermay.

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Fine Double Hyacinth and other curious Flower Roots, Plants, Fruit-trees, Shrubs, and Seeds, imported chiefly from Holland, the Cape of Good Hope, America, Italy, Botany Bay, &c. 12mo.

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1. On transplanting large Fruit-trees, whether Wall-trees, Espaliers, or Standards. Cal. Mem. i. 202.
2. Method of preserving Apples and Pears. Ib. 207.

1811. *Thomson*, Mr. *Thomas*, gardener to General Wemyss, at Wemyss-Castle, in Fifeshire.

Observations on the Transplanting of Fruit-trees at an advanced age, especially Pear-trees: on the cause of Barrenness in Pear-trees; and on the best method of rendering them productive. Cal. Mem. i. 185.

1811. *Wade*, *Walter*, M.D. Professor of Botany to the Dublin Institution.

1. Salices, or an Essay towards a General History of Sallows, Willows, and Osiers. Dublin, 8vo.
2. Prospectus of the Arrangement in the Dublin Society's Botanical and Agricultural Garden at Glasnevin. Dublin, 1818, 12mo.

1812. *Cushing*, ——, a native of Ireland, late foreman of the hot-house department to Messrs. Lee and Kennedy, at the Hammersmith nursery.

The Exotic Gardener, &c. London, 8vo.

1812. *Elliot*, Mr. *Robert*, gardener to Sir Thomas Gibson Carmichael, Bart. at Castlecraig.

1. Directions for destroying Caterpillars on Gooseberry-bushes and Fruit-trees. Cal. Mem. i. 266.
2. On protecting Trees and Shrubs from the attacks of Hares. Ib. ii. 119.

1812. *Gorrie*, Mr. *Archibald*, gardener and farm-bailiff at Rait, in Perthshire.

1. On preventing the Depredations of the Turnip-fly. Cal. Mem. i. 252.
2. On preserving or retarding the Blossoms of Fruit-trees. Ib. 276.
3. Observations respecting the Lactucarium. Ib. 347.
4. An Address to Mr. Neill, by the Rubus Chamæmorus. Cal. Mem. i. 383.
5. On the Increase and Application of Manure. Ib. ii. 285.
6. Observations on the Cottage Gardens in the Carse of Gowrie. Gen. Rep. Scot. App. i. 428.

1812. *Hogg*, *Thomas*, master of an academy at Paddington, Middlesex, and a very successful grower of the carnation.

1. A concise and practical Treatise on the Growth and Culture of the Carnation, Pink, Auricula, Polyanthus, Ranunculus, Tulip, &c. Lond. 12mo. 1 plate.
2. On the Cultivation of Pinks. Hort. Trans. iv.

1812. *Hepburn*, the Hon. Baron, of Smeaton in Haddingtonshire, one of the Barons of the Exchequer in Scotland.

On Pruning of Fruit-trees. Cal. Mem. i. 255.

1812. *Mackray*, Mr. *John*, gardener at Errol House.

1. On the Gooseberry Caterpillar, and on the Worms which infest Carrots and Onions. Cal. Mem. i. 272.
2. An Account of the Orchards in the Carse of Gowrie. Ib. 317.
3. On Wire-grates, as a means of preventing Wasps from entering Hot-houses. Ib. ii. 64.

1812. *Scougal*, Mr. *James*, commercial gardener, Edinburgh.

On the Utility of Clay-paint, in destroying various Insects on Fruit-trees, curing Mildew, &c. Cal. Mem. i. 248.

1812. *Todd*, *George*, surveyor and hot-house builder, employed by W. T. Aiton, Esq., the late Sir Joseph Banks, and other eminent horticulturists.

Plans, Elevations, and Sections of Hot-houses and Greenhouses, an Aquarium, Conservatories, &c. recently built in different parts of England for various Noblemen and Gentlemen, &c. Lond. fol.

1813. *Carlisle*, *Anthony*, Esq. F.R.S., surgeon to the Westminster Hospital, author of various works on medical subjects.

1. An Account of a Walnut-tree, which bore Fruit at an early period, from Seed. Hort. Trans. ii. 3.
2. On the Connection between the Leaves and Fruit of Vegetables, with other physiological Observations in a Letter to the Secretary. Ib. 184.

1813. *Cumming*, *Robert*, M.D. a physician at Dalkeith, Edinburghshire.

Observations on a new kind of Ground Onion, introduced into Scotland by Mr. John Burn, of the royal navy. Cal. Mem. i. 343.

1813. *Dick*, Mr. *John*, gardener at Ballendean.

1. On Excluding Wasps from Hot-houses. Cal. Mem. i. 356.
2. On the advantage of Grafting the Ribston Pippin on other more healthy Apple-trees. Ib. iii. 161.

1813. *Hawkins*, Sir *Christopher*, Bart. F.A.S. Recorder of Grampound and St. Ives, in Cornwall; author of Observations on the Free Trade of the Ancients.

On two Apples cultivated in Cornwall. Hort. Trans. ii. 74.

1813. *Kelly*, Mr. *Thomas*, gardener to Sir Robert Abercrombie, at Airthrie Castle, Stirlingshire.

Account of a successful rotation of Cropping, followed in the Garden at Airthrie Castle. Cal. Mem. i. 297.

1813. *Kirk*, Mr. *James*, gardener to the Hon. Mr. Baron Hepburn, at Smeaton, Haddingtonshire.

1. On preventing the Mildew on Peach-trees. Cal. Mem. i. 363.
2. On the Soil best suited to Peach-trees, and on the injurious effects of Dungs. Ib. iii. 159.

1813. *Laird*, Mr. *James*, gardener at Portmore.

1. On the preserving of the Blossom of Fruit-trees, by means of Straw or Hay Ropes. Cal. Mem. i. 340.

2. On the Use of Straw Ropes in protecting Fruit-tree Blossoms, &c. from late frosts. Ib. ii. 92.

1813. *Lyon*, *Peter*, an apothecary and physic gardener at Comely-garden, Edinburgh.

1. Observations on the Barrenness of Fruit Trees; the Means of Prevention and Cure. Edin. 1813. 8vo.

2. A Treatise on the Physiology and Pathology of Trees; with Observations on the Barrenness and Canker of Fruit Trees; the means of Prevention and Cure. 1816. 8vo. Edin.

1813. *Macculloch*, *John*, M.D. F.L.S., author of a Treatise on Wine-making, and of various Essays on geological subjects.

1. An account of some Delicate Plants cultivated in the Open Air, in the Island of Guernsey; with Hints on the means of naturalizing Tender Exotics. Cal. Mem. i. 284.
2. On the Cultivation of the Parsnip, as it is practised in Guernsey. Ib. 405.
3. On the Cultivation of the Guernsey Lily, as practised in the Island of Guernsey. Ib. ii. 60.
4. Method of Cultivating Asparagus, practised in France. Ib. 247.

1813. *Nicol*, Mr. *George*, foreman in the Meadowbank nursery, near Edinburgh, brother to Walter Nicol, horticultural architect.

On the Allium Canadense, or Tree Onion. Cal. Mem. i. 349.

1813. *Sinclair*, Sir *John*, Bart. of Ulbster, in Caithness, a distinguished patriot and voluminous agricultural writer; founder of the Board of Agriculture.

1. Information regarding the Carlisle and Keswick Codlin Apples. Cal. Hort. Soc. i. 374.
2. Account of some Experiments to promote the Improvement of Fruit Trees, by peeling the Bark. Lond. 1815. 8vo. These experiments were made by P. Lyon, of Edinburgh. See Lyon, 1813.

1813. *Smeall*, Mr. *Joseph*, gardener to Sir Robert Liston, Bart. at Milburn-town, near Edinburgh.

On preventing Hares and Rabbits from attacking the Bark of Trees. Cal. Mem. i. 361.

1813. *Smith*, Mr. *James*, gardener, Glasgow.

On the causes of Canker in Fruit-trees. Cal. Mem. i. 333.

1813. *Tweedie*, Mr. *John*, gardener to —— Hamilton, Esq. at Sundrum.

A method of destroying one sort of the Gooseberry Caterpillar. Cal. Mem. i. 309.

1814. *Barton*, Mr. *Thomas*, gardener to Lord Douglass, at Bothwell Castle, in Lanarkshire.

On the Management of Sea-Cale. Cal. Mem. ii. 98.

1814. *Bishop*, Mr. *Thomas*, gardener at Methven Castle.

1. On increasing the Quantity of Manure. Cal. Mem. i. 442.
2. On using a solution of Quicklime for destroying Mosses, Lichens, and Insects for Fruit-trees, and otherwise promoting their Health and Growth. Ib. ii. 240.

1814. *Booth*, Mr. *David*, gardener at Newburgh, Fifeshire.

Account of the Orchards in the Neighbourhood of Newburgh, Fifeshire. Cal. Mem. ii. 81.

1814. *Crawford*, Mr. *William*, gardener at North Park.

On the Culture of the Carnation. Cal. Mem. i. 401.

1814. *Crighton*, Mr. *Daniel*, gardener at Minto, in Roxburghshire.

Experiments and Observations on the Potatoe. Cal. Mem. i. 436.

1814. *Dow*, the Rev. *Anthony*, minister at Kilspindie.

New method of preserving Potatoes. Cal. Mem. i. 423.

1814. *Gibbs*, Mr. *William*, nursery and seedsman, Inverness, a scientific gardener of sound judgment, and great experience; author of some papers in the Farmer's Magazine and other Edinburgh periodical works.

On the Forcing of Sea-cale. Cal. Mem. i. 388.

1814. *Graham*, Dr. *Patrick*, minister of Aberfoyle.

On the Woods and Plantations of Scotland, published in Sir John Sinclair's General Report of Scotland, vol. ii. p. 197.

1814. *Howison*, *James*, M.D. of Hillend, near Edinburgh, and Crossburn House, Kircudbrightshire.

On the Management of Bees, with an account of some curious Facts in their History. Cal. Mem. ii. 121.
2. On the Varieties of Melon, called the Ionian and the Egyptian. Ibid. i. 209.

1814. *Hay*, Mr. *Alexander*, gardener, at Newliston.

On the Renovation of old Peach-trees in Hot-houses; and on destroying the Blue Insect on Apple-trees. Cal. Mem. i. 391.

1814. *Keens*, Mr. *Michael*, F.H.S. an eminent fruit-gardener at Isleworth, in Middlesex, who has raised several new fruits.

1. Account of a new Strawberry, with a coloured Figure. Hort. Trans. ii. 101.
2. On the Cultivation of Strawberries in the open Ground. Ib. ii. 392.

1814. *Kinment*, Mr. *John*, gardener, at Murie.

On the cause of Blotches on the Shoots of the Peach-tree. Cal. Mem. ii. 77.

1814. *Menzies*, Mr. *William*, gardener, at Mecklowr.

Account of a new Pruning Instrument. Cal. Mem. i. 499.

1814. *Mitchell*, Mr. *John*, gardener at Moncreiff House, Perthshire.

On the Cultivation of the Carnation. Cal. Mem. i. 397.

1814. *Middleton*, Mr. *John*, gardener, at Tillychewan.

On Cast-Iron Espalier Rails, with a plate. Cal. Mem. i. 433.

1814. *Naismith*, Mr. *John*, gardener, at Culloden-House.

On destroying Insects on Peach, Nectarine, and Cherry-trees: and on the Treatment of Gooseberry-Bushes. Cal. Mem. ii. 88.

1814. *Phillips*, *Leonard*, jun. an extensive grower of hardy fruit-trees for sale at Lambeth.

1. Catalogue of Fruit Trees for Sale. Lond. fol.
2. Transactions in the Fruit-tree Nursery at Vauxhall. Lond. 1815. 8vo.

1814. *Sanderson*, Mr. *William*, gardener, at Alderstone, Haddingtonshire.

Description of a Melon-Pit. Cal. Mem. ii. 217.

1814. *Sinclair*, Mr. *George*, gardener to his Grace the Duke of Bedford, at Woburn Abbey, in Bedfordshire; author of an account of some experiments on grasses, published in the appendix to Sir H. Davy's Agricultural Chemistry.

On the Prevention of the Blight in Fruit-trees Cal. Mem. i. 450.

1814. *Stewart*, Mr. *Alexander*, gardener to Sir Robt. Preston, Bart. at Valleyfield, in Perthshire.

Observations on the Pruning and Training of Pear-trees. Cal. Mem. i. 457.

1814. *Speirs*, Colonel, of Craigsanquhar.

Remarks on French Pears. Cal. Mem. ii. 104.

1814. *Swinburne*, Sir *John Edward*, Bart. F.R.S. of Capheaton, near Newcastle upon Tyne.

An Account of a successful Method of raising Onions, by Mr. Fuller, Nurseryman, of Newcastle. Hort. Trans. ii. 121.

1814. *Trotter*, Mr. *David*, gardener, at Alva, in Stirlingshire.

On the Utility of Hot-Walls. Cal. Mem. ii. 111.

1814. *Underwood*, Mr. *Walter*, gardener to the Earl of Eglinton, at Eglinton Castle, Ayrshire.

On the Management of Cherry-trees. Cal. Mem. i. 427.

1814. *Weeks*, Mr. *Edward*, late gardener to Viscount Kirkwall, in Wales, patentee of a forcing frame (625); and now hot-house builder at the Horticultural Repository, King's-road, London.

The Forcer's Assistant; a Treatise with useful Hints on Forcing, by a new device for the application of Frames to the Culture of Melons, Pines, and other choice Fruit from Dwarf Plants; and of the early Esculents usually in demand for the first tables; including a few plain Directions for Forcing the Grape, Cherry, and Peach in Houses; with an Appendix describing the Patent Forcing Frame, and exhibiting some of its advantages; to which is prefixed an introduction, connecting the principal parts of the theory of Vegetation, with the practice of Horticulture. Chipping Norton, 8vo. 84 pages.

1814. *Young*, Mr. *John*, gardener, Belmont Castle, Perthshire.

On pruning Old worn out Apple and Pear Trees upon walls, so as to bring them to a bearing state again. Cal. Mem. i. 378.

1814. *Yule*, *John*, M.D. F.R.S. an eminent physician in Edinburgh, author of a tract on contagious fever, and some other essays in periodical works.

Report of the Committee for Experiments on the Naturalization of Useful and Ornamental Plants, under the Climate of Scotland; with Prefatory Remarks on the Character and Economical Uses of Forest Trees already introduced; and an Enumeration of certain Exotic Plants, which have lately withstood the Winter of North Britain. Cal. Mem. ii. 355.

1815. *Mackenzie*, Sir *George*, Bart. F.R.S. &c. of Coul, in Rosshire, author of Travels in Iceland, and various agricultural, philosophical, and literary works.

1. Observations on the Cultivation of Sea Kale. Cal. Mem. i. 313.
2. Description of an Economical Hot-house. Ib. ii. 55.
3. On the Form which the Glass of a Forcing-house ought to have, in order to receive the greatest possible quantity of Rays from the Sun. Hort. Trans. ii. 171.
4. An Account of a new Seedling Apple. Ib. ii. 95.
5. Horticultural Gleanings. Ib. ii. 252.
6. On Forcing-Houses, and on the practicability of employing Radiant Heat. Ib. ii. 273.
7. On the Effects of Anointing the Stems and Branches of Fruit Trees with Oil, and on the means of Destroying Insects. Ib. ii. 320.
8. Horticultural Gleanings. Ib. iii. 193.

1815. *Maher*, Mr. *John*, F.H.S. formerly gardener to Daniel Beale, Esq. at Edmonton, Middlesex.

1. On the Cultivation of the Crambe Maritima of Linnæus, or Sea Kale. Hort. Trans. i. 13. 1815; and Nicholson's Journal, xviii. 10. 1807.
2. Hints relative to the Culture of the Early Purple Brocoli. Ib. i. 116.
3. Some Remarks on Pruning and Training Standard Apple and Pear Trees. Ib. i. 236.
4. A Plan of a Fruit Room. Ib. ii. 76.
5. Some Remarks on Pruning Gooseberry Trees. Ib. ii. 146.
6. On a Remarkable Property of the Hoya Carnosa. Ib. ii. 197. 1816.
7. On the Cultivation of the Underground Onion. Ib. iv. 305.
8. On the Treatment of the Standard Fig Trees in the Gardens at Arundel Castle. Ib. iv. 185.

1815. *Robertson*, Mr. *Duncan*, gardener, at Megginch Castle.

On propagating the Double Rocket by Cuttings. Cal. Mem. ii. 245.

1815. *Sherbrook*, ——, Esq. of Oxton, Nottinghamshire.

On raising Young Potatoes in the Winter Months. Hort. Trans. i. 225. 1815.

1815. *Simpson*, Rev. *John*, curate of Chesham, Hertfordshire; author of a sermon.

An Account of the Burknot Apple. Hort. Trans. i. 120. 1815.

1815. *The London Horticultural Society*, commenced by a few individuals in 1804, and established by charter in 1809. It is perhaps one of the most flourishing and best conducted societies of the kind in existence.

Transactions of the London Horticultural Society. Lond. 4 vols. 4to. many plates, 1815 to 1822. The papers of the first writers are dated 1805, and are arranged in this section according to their dates, and the names of the authors.

1815. *Van Mons*, *Jean Baptiste*, M.D. Professor of Chemistry and general Economy in the University of Louvain, author of some chemical and philosophical tracts, published at Brussels.

1. On the Cultivation of Lobelia Fulgens, in Belgium. Hort. Trans. ii. 153.
2. Substance of a Memoir on the Cultivation and Variation of Brussels Sprouts. Ib iii. 197.

1815. *Wedgewood*, *John*, Esq. F.L.S. of Betley, Staffordshire, brother of the celebrated natural philosopher and potter, Josiah Wedgewood, Esq.

1. Observations on the Culture of the Dahlias, in the Northern Parts of Great Britain, &c. Hort. Trans. i. 113. 1815.
2. On the Cultivation of the Underground and some other Onions. Ib. iv. 403.

1815. *Wilmot*, Mr. *John*, F.H.S. one of the most extensive fruit gardeners near London, whose grounds are at Isleworth.

1. Remarks on the present mode of Budding and Grafting Fruit Trees. Hort. Trans. i. 215.
2. On Destroying Slugs in Gardens. Ib. ii. 22.

1815. *Wilkinson*, the Rev. *Thomas*, M.A. author of some theological works.

Observations on the Form of Hothouses. Hort. Trans. i. 161.

1815. *Wood*, Mr. *William*, gardener, at New Gardens, near Queensferry, Linlithgowshire.

On the Cultivation of Broccoli. Cal. Mem. ii. 265.

1816. *Anderson*, *William*, F.L.S. H.S. curator of the Botanic Garden at Chelsea, a man of an independent turn of mind, and full of curious anecdotes and stories.

On the Introduction and Cultivation of a Variety of Azalea Indica. Hort. Trans. ii. 259.

1816. *Boothby*, Sir *Brooke*, author of a Letter to Mr. Burke, and of some Political and Belles Lettres Tracts.

On some Improvements in Gardening. Hort. Trans. ii. 22.

1816. *Emmerton*, *Isaac*, formerly a nurseryman and florist at Barnet, and an enthusiastic cultivator of the auricula.

A Plain and Practical Treatise on the Culture and Management of the Auricula, &c. Lond. 12mo.

1816. *Jeeves*, Mr. *Stephen*, C.M.H.S. gardener to the Lord Dacre, at the Hoo, near Welwyn, Hertfordshire.

1. An Account of a Method of growing Mushroom under Glass. Hort. Trans. iii.
2. On a new Method of training Gooseberry Bushes. Hort. Trans. iv.

1816. *Judd*, Mr. *Daniel*, F.H.S. gardener to Charles Campbell, Esq. of Edmonton.

1. On the Cultivation of Asparagus. Hort. Trans. ii. 234.

2. On the Cultivation of Celery. Ib. iii. 45.

3. On a Method of Forcing Garden Rhubarb. Ib. 143.

4. Account of an approved Method of planting Vines for Forcing. Ib. iv. 4.

1816. *Mean*, Mr. *James*, C.M.H.S. gardener to Sir Abraham Hume, Bart. at Wormleybury, in Hertfordshire; editor of a new edition of Abercrombie's Practical Gardener.

1. On the Preservation of Fig Trees in the Winter. Hort. Trans. ii. 228.

2. On the Management of Orange, Lemon, and Citron Trees at Wormleybury, Herts. Ib. 295.

1816. *Morgan*, Mr. *William*, F.H.S. gardener to Henry Brown, Esq. of North Mims Place, Hertfordshire.

1. Description of the different Plants grown in the Gardens, under the denomination of Winter Greens, with an account of their Qualities, of the Seasons in which they are to be used, and of their Cultivation. Hort. Trans. ii. 307.

2. On the Cultivation of Strawberries in Forcing-houses, during the Winter and Spring Months. Ib. 376.

3. Account of the Species and Varieties of the Beet, cultivated for Use. Ib. iii. 272.

1816. *Oldacre*, Mr. *Isaac*, F.H.S. formerly gardener to the Emperor of Russia, near Petersburg, now gardener to Lady Banks, at Spring Grove, Middlesex.

1. Account of the Method of growing Mushrooms in Houses. Hort. Trans. ii. 336.

2. On the Cultivation of Succory, or Wild Endive. Ib. iii. 138.

3. On the Treatment of the Neapolitan Violets, so as to make them produce a Succession of Flowers through the Winter. Ib. iv. 109.

4. On the Management of the Roseberry Strawberry, in order to make it produce Fruit through the late Summer, Autumn, and Winter Months. Ib. 234.

1816 *Sabine*, *Joseph*, Esq. F.R.S. L.S. secretary to the Horticultural Society, and inspector general of taxes. A man of a singularly acute and orderly mind, who devotes great part of his time, and directs his most powerful energies to the advancement of the Horticultural Society, whose affairs he administers with distinguished success.

1. Observations on the Peaches described in Mr. Knight's Letter. Hort. Trans. ii. 217.

2. An Account, with a Figure, of the Florence Cherry. Ib. ii. 229.

3. A Description, and Account, of the Cultivation of a Variety of the Gourd called Vegetable Marrow, with a Figure. Ib. ii. 255.

4. An Account of seven double herbaceous Pæonies, now cultivated in England, with a Figure of Pæonia albiflora fragrans. Ib. ii. 273.

5. Further Particulars of the Elton, the Black Eagle, and the Waterloo Cherries, with a Figure of the latter. Ib. ii. 301.

6. Account of a Method of Forcing Asparagus practised by Mr. William Ross, gardener to Edward Ellice, Esq. at Wyck House, near Brentford, with some Suggestions for the Improvement of the general Practice in this particular. Ib. ii. 361.

7. Account and Description, with a Figure, of a new Strawberry, called the Roseberry, or Rose Strawberry. Ib. ii. 380.

8. Account of a new Method of Cultivating the Lobelia Fulgens, practised by Mr. William Hedges, gardener to the Earl of Mansfield, at Kenwood, Hampstead. Ib. ii. 398.

9. Description of a Stove used for Tropical Plants, in the Garden of Sir Abraham Hume, Bart. at Wormleybury, Herts. Appendix. Ib. ii. 4.

10. Account of a Method of conveying Water to Plants, in Houses, invented by Mr. George Loddiges of Hackney. Ib. iii. 14.

11. Some Observations on Celeriac, with Directions for its Cultivation. Ib. iii. 71.

12. Some Account, with a Figure, of the Purple-fruited Passion Flower, of late cultivated in England, and of the other known Species, which bear edible Fruit; with Observations on the Passiflora incarnata of Linnæus, and on the first Plant of the Genus, which was introduced into Europe. Hort. Trans. iii. 99.

13. Observations on, and Account of the Cultivation of, the Tree Mignonette. Ib. iii. 178.

14. Notes on, and Description of, Varieties of the Magnolia glauca. Ib. iii. 201.

15. Observations on, and Account of, the Species and Varieties of the Genus Dahlia; with Instructions for their Cultivation and Treatment. Ib. iii. 217.

16. Observations on the Formation of a select Collection of Apple Trees, with an Account and Description of four new Seedling Dessert Apples. Ib. iii. 263.

17. On the Love Apple, or Tomato, and an Account of its Cultivation; with a Description of several Varieties, and some Observations on the different Species of the Genus Lycopersicum. Ib. iii. 342.

18. Account and Description of the Downton Strawberry: a new Variety, raised by Thomas Andrew Knight, Esq. Ib. iii. 396.

19. On the Cultivation of Figs on the back Walls of Vineries. Ib. iii. 409.

20. Observations on the Glazing of Hot-houses, &c. Ib. iv. 84.

21. Observations on, and Details of, some Experiments in Ringing the Bark of Fruit and other Trees and Plants. Ib. 121.

22. Account of the Rosa Banksia, or Lady Banks's Rose. Ib. iv. 170.

23. Account of a newly produced Hybrid Passiflora. Ib. iv. 258.

24. Account and Description of the Varieties of Double Scotch Roses, cultivated in the Gardens of England. Ib. iv. 281.

25. Account and Description of the Varieties of Chinese Chrysanthemums which at present are cultivated in England; with Observations on the Difference between the Chrysanthemum Indicum of Linnæus and those Plants. Ib. iv. 326.

26. On the Ayrshire Rose. Ib. iv. 456.

27. Account of some Standard Fig Trees in a Garden at Sompting. Ib. iv. 504.

1816. *Salter*, *J*——, nurseryman, seedsman, and florist, Well's-road Nursery, Bath.

A Treatise upon Bulbous Roots, Green-house Plants, Flower Gardens, Fruit Trees, the Culture of the Sea Kale, Destruction of Insects, &c. 12mo. Bath, 1816.

The author in an advertisement, "humbly requests that those who purchase his book will not give the rules therein laid down to others, as it will materially injure the sale thereof."

1816. *Thomson*, Mr. *Thomas*, formerly gardener to the Earl of Haddington, nerr Dunbar, now gardener at Smyllum Park.

On the Scale on Fruit-trees. Cal. Mem. ii. 301.

1816. *Venables*, the Rev. *James*, of Buckland Newton, Dorsetshire.

On enriching the Soil of Gardens by fresh Vegetable Manure. Hort. Trans. ii. 189.

1816. *Walker*, Mr. *John*, gardener to Thomas Walker, Esq. at Langford.

Account of a method of cultivating Celery. Cal. Mem. ii. 295.

1817. *Anderson*, *George*, Esq. F.L.S. son of the late eminent agricultural writer, died in 1818.

Monograph of the Genus Pœonia. Lond. 4to.

1817. *Braddick*, *John*, F.H.S. of Thames Ditton, a curious amateur horticulturist.

1. An Account of a most excellent new Peach, from North America, with a coloured Figure. Hort. Trans. ii. 205. 1817.

2. On the Cultivation of true Samphire or Crithmum Maritimum. Ib. 232.

3. On the Treatment of Cactus Opuntia, or Prickly Pear, under which it will perfectly mature its Fruit in the open Air of England. Ib. 238.

1817. *Brown*, Mr. *James*, gardener to the late Richard Shawe, Esq. at the Casino, Dulwich, Surrey.

On the Application of Steam, with a Plan of the Apparatus, and its salutary Effects in Forcing, but particularly as applied to the Pine Apple. Hort. Trans. ii. 320.

1817. *Brookshaw, George*, a teacher of flower-painting.

1. Pomona Britannica, or a Collection of the most established Fruits at present cultivated in Great Britain; selected from the royal gardens at Hampton Court, and from the most celebrated gardens round London, accurately drawn, and coloured from nature.
2. The Horticultural Repository, containing Delineations of the best Varieties of the different Species of English Fruits; to which are added the blossoms and leaves, in those instances in which they are considered necessary, accompanied with full descriptions of their various properties, time of ripening, and directions for planting them, so as to insure a longer succession of fruit; such being pointed out as are particularly calculated for forcing. Part I. 8vo. 1821.

1817. *Carr, John*, Esq. of St. Anne's near Leeds, a clothier.

On the Management of Fruit Trees on the Walls of the Garden at St. Anne's, near Leeds, and particularly on the Retardation of Blossom. Caled. Mem. iii. 110.

1817. *Hare, Thomas*, Esq. F.L.S. author of an esteemed work on the stomach and intestines.

1. Account of an original Plant of the Moss Rose de Meaux, with Physiological Observations. Hort. Trans. ii. 241.
2. On the Advantages of Blanching Garden Rhubarb for culinary Purposes. Ib. 258.

1817. *Kent, William*, Esq. F.L.S. of Clapton, remarkable for his success in cultivating exotic aquatics.

Account of some Improvements in the Construction of a Stove for Plants, by which bottom Heat is imparted to their Roots, without the use of Tan. Hort. Trans. ii. 389.

2. An Account of the Management of Aquatic Plants, with Descriptions of several Species now cultivated in England. Ib. iii. 24.
3. Some further Account of the Management of a Stove for Tropical Plants, in which the use of Tan is laid aside: with Directions for the Destruction of Insects in a Hot-house. Ib. 287.

1817. *Rishon*, Mr. *George*, F.H.S. Holloway Nursery, Middlesex.

Account of the Method of raising Mignonette in Pots, in succession through the Year, as practised in the Vicinity of London. Hort. Trans. ii. 374.

1817. *Seton, Alexander*, Esq. F.H.S. Hanger's-lane, Stamford-hill, Middlesex.

1. Description of a Method of numbering Marks or Tallies for Plants. Hort. Trans. ii. 347.
2. Description of a peculiar Method of Training Vines under Glass, in a House; with a Statement of the Advantages which result from it. Ib. iii. 9.
3. Note on Sir Oswald Mosley's Paper, on the Aphis Lanigera. Ib. 62.
4. On Coverings for Cucumber Frames. Ib. 296.
5. An Account of Mr. Walker's improved Construction of Hot-house Flues. Ib. iv. 237.

1817. *Wood*, Mr. *William*, gardener to Col. Duff, at Fetteresso Castle.

An easy and sure Method of raising Mushrooms, either with Dung or without it. Cal. Mem. ii. 431.

1818. *Aiton, J. T.* Esq. gardener to the king at Windsor, brother to W. T. Aiton, Esq.

4. Some Account of the Esperione Grape. Hort. Trans. iii. 93.

1818. *Arkwright, Richard*, Esq. F.H.S. of Willersley, near Worksworth, Derbyshire.

On a Method of retarding the Ripening of Grapes in Hot-houses, so as to obtain a Supply of Fruit in the Winter Season. Hort. Trans. iii. 95.

1818. *Baldwin, Thomas*, gardener to the Marquis of Hertford, at Ragley, in Warwickshire.

1. Short Practical Directions for the Culture of the Ananas, or Pine Apple. 8vo. Warwick.
2. Plan for Forcing Sea Kale, without covering the Crowns of the Plants with Dung or Litter. Hort. Trans. iv. 63.

1818. *Blaikie, Francis*, steward to T. W. Coke, Esq. of Holkham, in Norfolk, author of some tracts on agricultural subjects, and of various papers in the Farmer's Journal.

A Treatise on Hedges and Hedgerow Timber. 12mo.

1818. *Drummond*, Mr. *James*, C.M.H.S. curator of the Botanic Garden at Cork.

Account of an Experiment made to ascertain the relative Produce of the Red-Apple-Potatoe, when cultivated in single or double Drills, or in Beds. Hort. Trans. iii. 194.

1818. *Gowen, James Robert*, Esq. at the Earl of Caernarvon's, Highclere, near Newbury in Berkshire.

1. Observations upon the Glazing of Hot-houses and Conservatories. Hort. Trans. iii. 244.
2. Account of a Method of Constructing Flues for Hot-houses. Ib. 252.
3. On the Production of a new Hybrid Amaryllis. Ib. iv. 18.

1818. *Hayward*, Mr. *Joseph*, Gent. an amateur gardener, formerly a Yorkshire clothier, now residing at Plumstead in Kent.

1. The Science of Horticulture. Lond. 1818. 8vo.
2. On a Mode of Training Vines. Hort. Trans. i. 171. 1815.
3. An Account of a Steam Apparatus. Ib. iv. 434.

1818. *Hedges*, Mr. *William*, C.M.H.S. gardener to the Earl of Mansfield, at Kenwood, Hampstead, Middlesex.

Account of Experiments on the production of Blue instead of Red Flowers on the Hydrangea Hortensis; with some Notes on the propagation and management of the Plant. Hort. Trans. iii. 173.

1818. *Herbert*, the Hon. and Rev. *William*, D.C.L. Spofforth, near Wetherby, Yorkshire.

1. Instructions for the Treatment of the Amaryllis longifolia, as a hardy Aquatic, with some observations on the production of Hybrid Plants, and the treatment of the Bulbs of the Genera Crinum and Amaryllis. Hort. Trans. iii. 187.
2. On the production of Hybrid Vegetables; with the Result of many Experiments made in the Investigation of the Subject. Ibid. iv. 15.
3. On the Culture of the African Gladioli, and other Cape Bulbs, in the open Borders. Ibid. 153.
4. On the Culture of Hyacinths. Ibid. 163.
5. On the Culture of the Guernsey Lily, and other Bulbs of the Genera Nerine, Coburgia, and Brunsvigia, heretofore united under Amaryllis. Ibid. 176.
6. On the Treatment of the Dendrobia, Aerides, and other parasitical Plants. Ibid. 241.

1818. *Hosack, David*, M.D. F.R.S. L.S. Professor of Medicine in the University of the state of New York; author of various botanical works.

Some Account of the Seckle Pear, a new Seedling raised in the neighbourhood of Philadelphia. Hort. Trans. iii. 256.

1818. *Livingston, John*, Esq. of Bath.

1. Account of a Method of ripening Seeds in a wet Season; with some Notices of the Cultivation of certain Vegetables and Plants in China. Hort. Trans. iii. 183.
2. Observations on the Difficulties which have existed in the Transportation of Plants from China to England, and Suggestions for obviating them. Ib. 412.

1818. *Mills*, Mr. *George*, F. H S. gardener to Mrs. Dare, Cranbrook House, near Ilford, in Essex.

Account of a Method of growing Cucumbers on Heat. Hort. Trans. iii. 146.

1818. *Mosley*, Sir *Oswald*, Bart. F.H.S. of Rolleston Hall, near Burton-upon-Trent, Staffordshire.

1. On the Aphis Lanigera, or American Blight,

with an account of various Experiments, for the Destruction of the Insect on Apple Trees. Hort. Trans. iii. 54.

2. Description of, and Observations on, the Coccus Laricis, or Mealy Insect, which infests the Larch. Hort. Trans. iii. 170.

1818. *Macwilliam, Robert*, a native of Aberdeen, and surveyor in London.

An Essay on the Origin and Operation of the Dry Rot; to which are annexed, Suggestions for the Cultivation of Forest-trees, and an Abstract of the Forest Laws. 1818, 4to.

1818. *Nairn*, Mr. *John*, F. H. S. gardener to Thomas Forbes Reynolds, Esq. Hackbridge, Surrey.

1. Account of a Method of Grafting Oranges and Lemons, so as to produce Dwarf Fruit-bearing Trees. Hort. Trans. iii. 91.

2. Account of a newly-constructed Frame, with rising Lights, for growing Melons, Cucumbers, &c. Ib. 130.

1818. *Page*, Mr. *William Bridgewater*, C. M. H. S. nurseryman, at Southampton, and son-in-law of Mr. Kennedy, late of the Hammersmith nursery, who is the reputed author of Page's Catalogue.

Page's Prodromus; as a general nomenclature of all the plants, indigenous and exotic, cultivated in the Southampton botanic gardens; arranged alphabetically, as they are considered hardy or tender to the climate of Britain, under their different characters of trees and shrubs, herbaceous, &c. The generic and specific names after the Linnæan system; with the English names, propagation, soil, height, time of flowering, native country, &c.; also, occasional hints for their cultivation. An Appendix, containing selected lists of annuals; all the choicest kinds of fruits, now in circulation, with their characters, &c. and a short tract on the sexual system, from the Philosophica Botanica of Linnæus. London, 8vo.

This, when the errors with which it abounds in every page, are corrected in a new edition, will be the best Gardener's Catalogue that has hitherto been published; that of Sweet is much more correct and extensive as a botanical work, but this is more instructive in what relates to culture. No gardener ought to be without both works.

1818. *Sweet, Robert*, F. L. S. an excellent practical botanist, and experienced cultivator; brother to John Sweet, an eminent Bristol nurseryman.

1. Hortus suburbanus Londinensis; or, a Catalogue of Plants cultivated in the neighbourhood of London, arranged according to the Linnæan system; with the addition of the natural orders to which they belong, reference to books where they are described, their native places of growth, when introduced, time of flowering, and references to figures. London, 8vo.

2. Geraniæ; or, Natural Order of Geraniums. 8vo. London, 1820. in numbers.

3. The Botanical Cultivator. Lond. 8vo. 1820.

1818. *Sweet*, Mr. *John*, C. M. H. S. of the long-established and respectable firm of Miller and Sweet, nurserymen, Bristol.

On the proper Treatment of the Gloriosa superba. Hort. Trans. iii. 21.

1819. *Bagot*, Lord *William*, F. H. S. of Blythfield, near Abbots Bromley, in Staffordshire.

An Account of the Cultivation of the Mespilus Japonica, or Lo-quat, as a Fruit-bearing Tree, at Blythfield, in Staffordshire. Hort. Trans. iii. 299.

1819. *Baxter*, Mr. *William*, A. L. S., curator of the botanic garden, Oxford.

An Account of the Fig Tree, which was planted in 1648, and is now growing in the garden at Christ Church, Oxford. Hort. Trans. iii. 433.

1819. *Dawes*, Mr. *Henry*, of Slough, near Windsor.

Observations on the Blacking of Garden Walls, as it affects the ripening of Fruits. Hort. Trans. iii. 330.

1819. *Elliot, John*, Esq. F. R. S. V. P. H. S. of Pimlico Lodge, Pimlico.

Description of a moveable Frame for the training of Vines in a House, to protect them from Frost, and to facilitate the Operation of Pruning. Hort. Trans. iii. 355.

1819. *Fairweather*, Mr. *John*, C. M. H. S. gardener to the Earl of Oxford, at Woollerton, in Norfolk.

On the Cultivation of the Impatiens Balsamina, or Balsam. Hort. Trans. iii. 406.

1819. *Fischer, Frederick Ernest Lewis*, M.D. inspector of the botanic garden at Gorinka, near Moscow; an active and skilful botanist, who maintains an extensive correspondence in every part of the world.

Account of Count Zubow's Steam-Pits, at St. Petersburgh. Hort. Trans. iii. 430.

1819. *Howison, William*, M. D. a native of Scotland, many years a physician in Petersburg.

1. An account of the Russian Chiccory Plant, and of the Artificial Coffee. Cal. Mem. iii. 132.

2. An account of several of the most important Culinary Vegetables of the interior of the Russian Empire; with remarks upon their cultivation, their application to the purposes of life, and the manner in which they are preserved during the severity of the winter in the northern parts of that country. Ibid. iii. 77.

1819. *Jenkins, Thomas*, F. H. S. nurseryman, at Mary-le-Bone and the Regent's Park, London.

Hortus Marybonensis; or, a catalogue of hardy herbaceous plants, deciduous and evergreen shrubs, forest and fruit-trees, systematically arranged; and now growing in the botanical gardens and nurseries of New Road and Regent's Park. London, 12mo.

1819. *Lowe*, Mr. *George*, gardener to Chas. Welstead, Esq. at Valentines House, near Ilford, in Essex.

Some Account of the Vines at Valentines House, near Ilford, in Essex, the Seat of Charles Welstead, Esq. F. H. S. with some practical Suggestions for the Treatment of Vines. Hort. Trans. iii. 334.

1819. *Masters*, Mr. *William*, jun. F. H. S. of Canterbury.

Instructions for Raising Varieties of the Iris Xiphioides, or English Iris. Hort. Trans. iii. 412.

1819. *Milne*, Mr. *Thomas*, A.L.S. & F.H.S. of the firm of Whitley, Brames, and Milne, nurserymen, at Fulham.

Description of the Hollow Leek, supposed to be the true Welch Onion; with Notices respecting some other Varieties of the Genus Allium, grown in South Wales; and Observations on Cottage Gardens. Hort. Trans. iii. 416.

1819. *Monteith*, Mr. ———, timber valuer at Stirling, inventor of a composition, which he sells for destroying all manner of insects.

The Forester's Guide, &c. Stirling, 12mo. plates.

1819. *Parkes, Samuel*, F. L. S. &c. a manufacturing chemist, in London; author of a chemical catechism, and other useful essays relating to his profession.

On the employment of common Salt for the purposes of Horticulture. Caled. Hort. Mem. iii. 43.

1819. *Saxe-Weimar, Charles Augustus*, Grand Duke of, F.H.S. a patron of botany and horticulture.

Account of a Species of Casuarina, growing in the Gardens of Belvidere, near Weimar. Hort. Trans. iii. 392.

1819. *Strachan*, Mr. *Charles*, formerly head gardener to the Horticultural Society.

1. Account and Description of the different Varieties of the Onion. Hort. Trans. iii. p. 369.

1819. *Turner*, Mr. *John*, F.L.S. assistant secretary to the Horticultural Society.

1. Some Account of the Collections of Apples exhibited at the Meetings of the Horticultural Society, during the season 1818; with Observations on their Qualities and Names, and a List of the

most approved Sorts for the Dessert and Kitchen. Hort. Trans. iii. 310.

2. Description of some Varieties of Pears and Apples received by the Society in the same Season of 1818 and 1819, from Mr. Louis Stoffels, of Mechlin, in Flanders, corresponding Member of the Horticultural Society. Hort. Trans. iv. 274.

1819. ***Winch, Nathaniel John,*** F.L.S. an able practical botanist.

Essay on the Geographical Distribution of Plants through the Counties of Northumberland, Cumberland, and Durham. Newcastle, 8vo.

1820. ***Anderson,*** Mr. ***David,*** F.H.S. gardener to the Lord Montagu at Ditton Park, near Windsor.

Account of a new Melon, with a Description of the Method by which it was obtained. Hort. Trans. iv. 318.

1820. ***Ayres,*** Mr. ***Richard,*** C.M.H.S. gardener to Edward Miller Mundy, Esq. at Shipley Hall, in Derbyshire.

On the Management of the Plants belonging to Genus Citrus, in the Garden of Edward Miller Mundy, Esq. Hort. Trans. iv. 306.

1820. ***Bull, William,*** gardener at Rossie Priory.

On saving the Bark of Young Trees from the Attacks of Hares, and on preserving Cauliflower Plants during winter. Cal. Mem. iii. 189.

1820. ***Cattley, William,*** Esq. F.L.S. H.S. of Barnet, Hertfordshire, an amateur and liberal promoter of botany and gardening.

Account of a new Psidium. Hort. Trans. iv. 315.

1820. ***Cullum,*** the Rev. ***Thomas Gery,*** A.M. F.H.S. Hardwick House, Bury St. Edmunds, Suffolk, an eminent horticultural amateur.

On the Construction of Piers and Copings of Garden Walls. Hort. Trans. iv. 269.

1820. ***Chapman,*** Mr. ***Robert,*** F.L.S. gardener to the Earl of Harewood, at Harewood Hall, near Leeds, Yorkshire.

On the Cultivation of the Granadilla, or Passiflora Quadrangularis. Hort. Trans. iv. 60.

1820. ***Christie,*** Mr. ***William,*** under-gardener to the Horticultural Society.

1. Account and Description of the Varieties of Autumn and Winter Radishes. Hort. Trans. iv. 10.

2. Description and Account of the different Varieties of the Garden Carrot. Ib. iv. 333.

1820. ***Flanagan,*** Mr. ***Patrick,*** C.M.H.S. gardener to Sir Thomas Hare, Bart. at Stow Hall, in Norfolk.

A Practical Account of the Culture of Melons. Hort. Trans. iv. 187.

1820. ***Frankland,*** Sir ***Thomas,*** Bart. F.R.S. of Thirkleby Hall, near Thirsk, Yorkshire.

On the Means of destroying Wasps. Hort. Trans. iv. 107.

1820. ***Field, Henry,*** member of the Society of Apothecaries.

Memoirs Historical and Illustrative, of the Botanic Garden at Chelsea; belonging to the Society of Apothecaries of London. Lond. 8vo.

1820. ***Harrison,*** Mr. ***Charles,*** F.H.S. gardener to James Stuart Wortley, Esq. Wortley Hall, near Sheffield, Yorkshire.

An Account of the Produce of the Peach Trees in the Garden at Wortley Hall, since the year 1808 inclusive. Hort. Trans. iv. 79.

1820. ***Holden, Robert,*** Esq. Nuttal Temple, near Nottingham.

Description of a Screen for protecting Wall Trees. Hort. Trans. iv. 93.

1820. ***Hofland,*** Mrs., formerly Mrs. Hoole, now the wife of an eminent landscape painter, author of various novels and some poetry.

An Historical Description of White Knights, a seat of the Duke of Marlborough, near Reading. Lond. Imp. fol.

The literary part is by Mrs. H. and the engravings by her husband.

1820. ***Hay,*** Mr. ***John,*** horticultural architect, Edinburgh.

On the application of Steam to the Heating of Forcing-Houses, and other kinds of Hot-Houses and Frames. Cal. Mem. iii. 117.

1820. ***Hope, Thomas,*** Esq. of Deepeden, near Godstone, in Surrey, a gentleman of highly cultivated taste, author of a splendid work on Household Furniture, and of Anastasius, a novel, displaying much genius.

An Essay on Gardening, published in the Description of White Knights, by Mrs. Hofland.

1820. ***Keith, Alex.*** Esq., of Ravelstone, near Edinburgh.

Account of a Mode of Ventilating Hot-beds, with Air moderately heated. Cal. Mem. iii. 185.

1820. ***Livingstone, John,*** Esq. surgeon to the British factory at Maccao, China; foreign corresponding member of the Horticultural Society.

Account of the Method of Dwarfing Trees and Shrubs, as practised by the Chinese, including their Plan of Propagation from Branches. Hort. Trans. iv. 224.

1820. ***Mearns,*** Mr. ***John,*** C. M. H. S., gardener to William Hanbury, Esq. of Shobden Court, Herefordshire.

Account of a Method of managing Vines in a Common Grapery. Hort. Trans. iv. 246.

1820. ***Melross,*** Mr. ***Adam,*** gardener at Ardgowen, in Perthshire.

On Forcing Sea-Kale and Asparagus in the Vinery. Cal. Mem. iii. 164.

1820. ***Murray, John,*** Esq., lecturer on chemistry, generally considered the real editor of the late editions of Abercrombie's Practical Gardener, said to be edited by Mr. James Mean.

1. Suggested Improvements for the Regulation of the Conservatory, &c. Cal. Mem. iii. 165.

2. Various Horticultural Notices. Ib. 174.

1820. ***Phillips,*** Mr. ***Henry,*** master of an academy at Bayswater.

1. Pomarium Britannicum, an Historical and Botanical Account of Fruits known in Great Britain. 8vo.

2. The History of cultivated Vegetables. Lond. 1822, 2 vols. 8vo.

1820. ***Pigott, Richard,*** florist, Dutch Villa, Sherdington, near Cheltenham.

A short, plain Treatise on Carnations and Pinks. 8vo.

1820. ***Silverlock,*** Mr. ***Henry,*** nurseryman at Chichester, in Sussex.

Account and Description of a Hollow Wall, erected in the garden of the Earl of Arran, F. H. S. at Bognor, in Sussex. Hort. Trans. iv. 244.

1820. ***Torbron,*** Mr. ***Thomas,*** C. M. H. S., gardener to the Earl of Bridgewater, at Asbridge Park, Hertfordshire.

Instructions for Forcing Cherries. Hort. Trans. iv. 116.

1820. ***West,*** Mr. ***John,*** C. M. H. S., gardener to the Marquis of Northampton, at Castle Ashby, in Northamptonshire.

Description of an Improved Forcing Pit. Hort. Trans. iv. 220.

1821. ***Anderson,*** Mr. ***John,*** C. M. H. S., gardener to the Earl of Essex, at Cashiobury Park.

Account of a New Esculent Vegetable, called Tetragonia, or New Zealand Spinach. Hort. Trans. iv. 488.

1821. ***Blake,*** Mr. ***Thomas,*** gardener to James Vere, Esq. at Kensington Gore.

The Method of propagating Choice Dahlias, by Grafting. Hort. Trans. iv. 476.

1821. ***Busch,*** Mr. ***Joseph,*** C.M.H.S., gardener to his Imperial Majesty the Emperor of Russia, at Tzarskojeselo, near Petersburg.

Observations on a Method of Training Apple, Cherry, and Plum-trees, in Russia, to preserve them from Frost during the Winter. Hort. Trans. iv. 405.

1821. *Brookes*, Mr. *Samuel*.

Notice relative to the Flowering of the Lilium Japonicum. Hort. Trans. iv. 551.

1821. *Cobbett*, *William*, a well known political writer, son of a farmer, born at or near Farnham, in Surrey, 1776; in 1783 he went to London, and was employed in an attorney's office; in 1784, he entered into a regiment sent to America, went to France in 1792, returned the same year to America, and was engaged in literary pursuits till his return to England in 1801, went to America again in 1816, (?) and returned in 1820, and now resides in Kensington.

The American Gardener; or a Treatise on the Situation, Soil, Fencing, and Laying out of Gardens, on the Making and Managing of Hot-beds and Green-houses, and on the Propagation and Cultivation of the several Sorts of Vegetables, Herbs, Fruits, and Flowers. London, 12mo.

Though the author shows great ignorance of botany and physiology, he has contrived by his style, by many shrewd remarks, and by curious and bold assertions at variance with facts, to make an interesting book, from which it may be gathered, that horticulture in America is but in its infancy, and from the climate must ever have great obstacles to contend with.

1821. *Correa*, *de Serra Joseph*, formerly an Abbe, ambassador from the King of Portugal to the United States of North America, a profound botanist, author of many papers in the Annales du Musée.

Notice respecting Vegetables used as Esculents in North America. Hort. Trans. iv. 44. 3.

1821. *Call*, Mr. *Martin Miller*, C. M. H. S. gardener to the Emperor of Russia, at the Taurida Palace Gardens, Petersburgh.

Description of the Steam-pits, in the Imperial Gardens of Taurida, at St. Petersburgh. Hort. Trans. iv. 468.

1821. *Garner*, Mr. *Thomas*.

Observations on the Cultivation of Strawberries. Hort. Trans. iv. 479.

1821. *Hallett*, *Robert*, Esq.

On the Cultivation of the American Cranberry in Dry Beds. Hort. Trans. iv. 483.

1821. *Johnson*, *Cuthbert William*.

An Essay on the Uses of Salt for Agricultural Purposes, and in Horticulture. Lond. 8vo.

1821. *Ker*, *Henry Bellenden*, Esq. son of John Bellenden Ker, editor of the Botanical Register, a spirited and profound botanist who has studied the liliaceæ, with more success than had been done before.

Account of the Cultivation of the Water Cress. Hort. Trans. iv. 537.

1821. *Marsland*, *Peter*, Esq. F.H.S. of Woodbank, near Stockport in Cheshire, one of the first gentlemen who introduced steam extensively, as a medium of heating hot-houses.

Account of the Mode of treating Pine Plants, so as to make them produce Fruit within the Year. Hort. Trans. iv. 392.

1821. *Neil*, *Patrick*, Esq. A.M. F.L.S. secretary to the Natural History Society of Edinburgh, and to the Caledonian Horticultural Society, author of a tour through the Orkney and Shetland islands, published in 1806; and of various essays and papers on natural history in the Scotch Encyclopædias: a most benevolent and intelligent man, and a skilful horticultural connoisseur.

1. Notice of Mr. Knight's Doctrines regarding Fruit Trees. Cal. Mem. iii. 218.
2. The articles Horticulture in the Edinburgh Encyclopædia, and in the Appendix to the Encyclopædia Britannica.
3. On the Gardens and Orchards of Scotland, printed in Sir John Sinclair's General Report of Scotland, 1814. vol. ii. p. 45.
4. Report to the Highland Society concerning early Potatoes. Gen. Rep. of Scotland. App. vol. i. 419.

1821. *Rogers*, Mr. *Thomas*.

Account of the Cultivation of Mushrooms. Hort. Trans. iv. 473.

1821. *Robertson*, the Rev. *J. M.* minister of Livingstone, in Linlithgowshire.

On the Cultivation of the Potatoe-Onion. Cal. Mem. iii. 216.

1821. *Schrank*, the Chevalier *Francis de Paula*, F.M.H.S. director of the botanic garden at Munich.

Account of a successful Method of managing Aquatic and Bog Plants, as practised in the Royal Botanic Garden at Munich. Hort. Trans. iv. 395.

1821. *Swaine*, the Rev. *George*, M.A. of Dyrham, near Bath: author of *Gramina pascina*, and some papers in the Journal of the Royal Institution, and other periodical works.

On the Management of the Fig Tree in the Open Air. Hort. Trans. iv. 423.

1821. *Vachell*, Mr. *Richard*.

On a Method of raising Early Cucumbers.

1821. *Wells*, Mr. *Joseph*.

On the Cultivation of Chinese Chrysanthemums. Hort. Trans. iv. 571.

Sect. II. *Of the Literature of Gardening in other Countries.*

Italy having been the country in which the revival of arts and literature took place, was the first to produce books on agriculture and gardening: that of Cressentius is well known. The adjoining countries of France and Germany produced the next books; and those of Belon, Etienne, and Heresbachius, may be cited as among the best of the 16th century. Commelin is among the earliest Dutch authors on gardening; Rudbeck, his cotemporary, one of the first who wrote in Sweden: both published after the middle of the 17th century. Herrera, one of the few Spanish writers on agricultural subjects, wrote about the end of the 16th century. The other countries of Continental Europe have produced little worthy of notice; and but few gardening books have hitherto appeared in America. Of such as are most generally known in this country, or apparently most interesting as illustrating the state of gardening at the time of their production, we give the titles in the following subsections.

Subsect. 1. *Books on Gardening published in France, exclusive of Translations.*

2284. Of these we have given a more copious list than those of the books of Germany, because the French language is more generally known, and the books not difficult to obtain. Many of them are in the libraries of the British Museum, the Horticultural Society, or in the Banksian collection. One of the best books on the state of culture in France is, the Nouveau Cours d'Agricultur, 13 vols. 8vo. 1810.

1533. *Champier, Symphorien*, a physician, a native of Lyons, who distinguished himself in the battle of Aignadel in 1509, and was made chevalier of the two giltspurs; he wrote several works, and died in 1532 or 1540.

Campus Elysius Galliæ amœnitate refertus, in quo quidquid apud Indos, Arabes et Pœnos reperitur, apud Gallos demonstratur posse reperiri. Lugduni, 8vo.

1535. *Etienne, Charles*, a physician of Paris, who wrote several tracts on gardening and agriculture, and first united them in one work in 1529, under the title of "Prædium Rusticum." Having married his daughter to Jean Leibault, also a physician, he produced, with his son in law, the Maison Rustique in 1570.

1. De Re Hortensi. Par. 1535, 8vo.
2. Seminarium et Plantarium, Fructiferarium, &c. Par. 1536, 8vo.
3. Vinetum, in quo varia Vitium, Uvarum, &c. Par. 1537, 8vo.
4. Arbustum, Fonticulus Spinetum, &c. Par. 1538, 8vo.
5. Sylva Fruticum Collis. Par. 1538, 8vo.
6. Pratum, Lacus Arundinacum. Par. 1543, 8vo.

All these were united in Prædium Rusticum. Par. 1554.

7. L'Agriculture et Maison Rustique, &c. Par. 1570, 4to.

This work has gone through upwards of 30 editions, the last entitled, "La Maison Rustique, ou Cours complet d'Agricultur, d'économie rurale et domestique, édition entièrement refondue." Paris, chez Lecrivain, 2 vols. 8vo.

8. Columella de Hortis. 8vo. 1542.

1546. *Cognatus*, the name adopted by *Gilbert Cousin*, a chanon of Nozerai, who died in 1567 in the prison of Besançon, where he was shut up on account of his religious opinions.

De Hortorum laudibus. Basil, 1546.

1552. *Brossard, Davy* or *David*, a Benedictine monk at Mons, belonging to a family which still exists in the Maine.

L'Art et Manière de semer Pepins, faire Pépinières et Sauvageons; enter en toutes sortes d'arbres, et faire vergers; avec un autre Traité de la manière de semer Grains en Jardins, le tems, et la saison de planter, replanter, recueillir graines, et cultiver toutes sortes d'herbes, &c. Mons. 8vo.

1558. *Belon, Peter*, a French physician, was born in the province of Maine about the year 1518. He travelled into Palestine, Greece, and Arabia, and published an account of those countries in 1555, 4to. He was assassinated at Paris in 1564.

1. De Arboribus coniferis, resiniferis, aliisque semper virentibus: de Cedrino, Cedrio, Agarico, Resinis, etc. Paris, 4to. fig.
2. Les Remonstrances sur le Default du Labour et Culture des Plantes, et de la cognoissance d'icelles, contenant la manière d'affranchir et apprivoiser les Arbres sauvages. Paris, 1558, 8vo.

1560. *Cornus, Georges*, or *Gorgole de Corne*, according to some writers a native of Florence.

1. Manière d'Enter, Planter, et Nourir les Arbres et Jardins, avec quelques autres traités d'Agriculture. Paris, 8vo.
2. De la Manière de Planter, Arracher, Labourer, Semer et Emonder les Arbres Sauvages, Bois Haut et Bois Taillis. Paris, 8vo.

1560. *Davy, P* ——, that is, *Pere David*, or *David Brossard*. See *Brossard*, 1552.

1563. *Palissy, Bernard de*, born at Agen in 1524, was a potter, according to some, and a China-ware manufacturer, according to others. He cultivated chemistry and the arts, and went beyond his age; he wrote various pieces, which have been collected and published in several volumes. Those which relate to agriculture and rural economy, are entituled, *Moyen de devenir riche*. He died between 1602 and 1604.

Recepte veritable par laquelle tous les hommes de la France pourront apprendre à augmenter leurs Trésors, avec le Dessin d'un Jardin délectable et utile. Rochelle, 4to. 1563.

1564. *Mizauld*, ——, born at Montluçon, in 1575; died at Paris at an advanced age. He studied mathematics and medicine with reputation; but his love of novelty, singularity, and astrology, made him lose in succession the little glory which he had acquired, his fortune, and his life. He published many works, chiefly in Latin, the first of which, on gardening, appeared in 1564; and all those which relate to the subject have been collected and published by Caille, a physician, under the following title.

Le Jardinage de Mizauld. Paris, 1578.

1570. *Leibault, Jean*, a physician, born at Dijon, died at Paris in 1596; author of various works on medicine, and jointly with his father-in-law, Etienne, of the *Maison Rustique*. See *Etienne*, 1535.

1580. *Lundrie*, ——.

Avertissement et manière d'enter assurément les Arbres en toutes saisons, &c. Bourdeaux, in 8vo.

1586. *J. P.* D. M. that is, *Jacques Pous*, Doctor of Medicine.

Sommaire traité des Melons. Lyon de Tournes, 8vo.

1631. *Garnier, Claude.*

La manière d'enter, planter, et semer, avec les remèdes contre les moucherons, limaçons, et autres bêtes qui gatent les herbes et jardins. Troyes, 16mo.

1638. *Boyceau, Jacques*, ecuyer; sieur de la Baraudière, intendant of the gardens of Louis XIII.

1. Traité du Jardinage selon les Raisons de la Nature et de l'Art, ensemble divers desseins de parterres, pelouses, bosquets, et autres ornements servant a l'embellissement des Jardins. Paris, folio, 1638. Several times reprinted.
2. Traité du Jardinage qui enseigne les Ouvrages qu'il faut faire pour avoir un Jardin dans sa perfection, et la manière de faire des pépinières, de greffer, enter, &c. 12mo. 1639.

1647. *L* ——, *B* ——.

Le Jardinage des Œillets. Paris, 12mo.

1651. *Mollet, André*, a relation and cotemporary of Claude Mollet, who was gardener to Henry IV., and Louis XIII. of France, as the other is said to have been to James I. of England.

1. Le Jardin de Plaisir, contenant plusieurs Dessins de Jardinage, tant Parterres en Broderie, Compartimens de Gazon, que Bosquets et autres, avec un Abrégé de l'Agriculture touchant ce qui peut être le plus utile et nécessaire à la construction et accompagnement du dit Jardin de Plaisir, par André Mollet, intendant des Jardins du roi d'Angleterre. Stockholm, folio.
2. Manière pour élever les Melons. Paris, 12mo. 1659.

1652. *Le Gendre*, an assumed name; that of the real author being, according to Quintinie, Robert Arnauld d'Andilly, a clergyman, born at Paris in 1589, author of various theological works and memoirs of his own life, who died in 1674. But the compilers of the Bibliographie Agronomique, consider that the Abbé of Pont-château, a monk of Portugal, was the real author. Baillet, a noted French bibliographer, ascribes it to M. M. Guillaume de la Moignon, et Olivier Leféyre d'Ormesson: Rapin ascribes it to La Moignon; and Grégoire is of the same opinion as Quintinie. All agree in the excellence of the work.

De la Manière de cultiver les Arbres Fruitiers, par le Sieur Le Gendre, curé de Henonville. Paris, 1652.

An English translation appeared in 1660, entitled "The right Manner of ordering Fruit-trees, &c." translated from the French of Le Gendre. London, 8vo.

1652. *Mollet, Claude,* head gardener to Henri IV., and of Louis XIII.; he created in France, in 1582, the Parterres à Compartimens; in 1595, he planted the garden of Saint Germain-en-Laye, of Monceau, and of Fontainbleau; in 1607, he had planted at Fontainbleau 7000 fruit-trees; he had, in 1608, made fine plantations of cypresses in the gardens of the Thuilleries, which were killed by the rigorous winter of 1608. On the whole, he effected a great deal for the time in which he lived, and his name and memory has been too much forgotten. His relation, Andrew Mollet, was gardener to James I. in England. See *Mollet André*, 1651.

Théâtre des Plans et Jardinages, contenant des Secrets et Inventions inconnus à tous ceux qui jusqu' à present se sont mêlés d'écrire sur cette matière; avec un Traité d'Astrologie, propres pour toutes sortes de Personnes, et particulierement pour ceux qui s'occupent à la Culture des Jardins. Paris, 4to. 22 plates. The designs invented by André, Jacques, and Noel, sons of the author.

Several editions of this work have been printed at Paris, but none lately.

1658. *Bornefond,* ——, author of a letter on the agriculture of Italy.

Jardinier Français et Délices de la Campagne. Paris, 2 vols. 12mo.

1653. *Triquet, R.* ——, prior of St. Mark.

Instruction pour les Arbres Fruitiers.

A third edition, with a Treatise on the Management of Oranges, Pomgranates, Olives, and Spanish Jessamine, in 1658.

1654. *Chesnée, Monstereuil, Charles de la.*

Le Fleuriste Français, traitant de l'Origine des Tulipes; avec un Catalogue des noms des Tulipes. Caen.

This appears to be the first treatise written on Tulips; the second was by d'Ardenne in 1660. A plagiarism from Chesnée's work appeared in 1678, entitled "Traité des Tulipes."

1655. *Anon.*

Les Delices de la Compagne, suite du Jardinier François, où on enseigne à préparer pour l'Usage de la Vie tout ce qui croit sur la terre et dans les eaux, &c. Amsterdam, 18mo.

1658. *Morin, Pierre,* a florist at Paris, mentioned by Evelyn; he devoted 40 years of his life to the culture of flowers, and was, the French authors say, the Vilmorin of his time.

1. Remarques nécessaires pour la Culture des Fleurs.

2. Instruction facile pour connoitre toutes sortes d'Orangers, et de Citronniers; qui enseigne aussi la manière de les cultiver, semer, &c. Paris, 12mo. 1680.

1658. *Stephanus, Morinus,* a protestant divine, born at Caen in 1625, where he was settled as a clergyman, and afterwards as a professor of the Oriental languages at Amsterdam; he published various theological works, and died in 1700.

Observationes circa Culturam Plantarum.

1660. *Saint Etienne, Claude de,* a Bernardin monk.

1. Instruction pour connaitre les bons Fruits et les Arbres Fruitiers, selon le mois de l'année et la façon de les cultiver. Paris, 12mo.

Several editions, with the title somewhat varied, as, "Nouvelle Instruction pour connaitre," &c. 1667.

2. Traité de la Connaissance des bons Fruits, par M. M. Merlet et Saint Etienne, 4th edit. 1782.

1665. *Rapin, Rene,* or *Renatus,* a Jesuit, was born at Tours in 1621. He taught polite literature, with great reputation, in the colleges of his order; and died at Paris in 1687.

1. Renati Rapini de Hortorum, libr i4. 1665. item Ultraj. 1672. 8. præter ejus libellum de Cultura Hortensi, et Meursii arboretum sacrum.

2. Nemus; translated into English verse by Evelyn junior, printed with the Sylva. Rapin's 4 books translated by him were published separately, 1673. 8vo. Lond.

1671. *Anon.*

Le Jardinier Royal, qui enseigne la Manière de Planter, Cultiver et Dresser, toutes sortes d'Arbres. Paris, 12mo.

1675. *Laurent, Jean.*

Abrégé pour les Arbres nains, et autres, &c. Paris, 4to.

This author believes in the influence of the moon, and enjoins many curious superstitious practices to secure successful culture.

1675. *Merlet, Jean,* of St. Stephen.

Abrégé des bons Fruits avec la manière de les connaitre, &c. Paris, 12mo.

1676. *L——, C—— B—— M——.*

Nouveaux Traité des Œillets, la façon la plus utile et facile de les bien cultiver; leur noms, leurs couleurs et leur beauté, avec la liste des plus nouveaux. Paris, 12mo.

1677. *Aristote,* Jardinier de Puteaux, considered by the French bibliographers as an assumed name, and designation.

1. Observations sur le Livre du Curé d'Henonville, ou de l'Abbé de Pont-château de Cambout de Coislin, Jardinier de Port Royal. 12mo. 1677.

2. L'Art de cultiver toutes sortes de Fleurs; avec Instructions pour cultiver et greffer les Arbres Fruitiers. Paris, 12mo.

3. Instructions pour le Jardin Potager, avec l'Art de cultiver les Fleurs et les Arbres Fruitiers. Paris, 12mo. 1678.

1677. *Anon.*

L'Art de cultiver les Fleurs. 12mo.

1682. *Anon.*

Traité pour la Culture des Fleurs. Paris, 8vo.

1683. *Anon.*

L'Art de tailler les Arbres Fruitiers, avec un Dictionnaire des mots dont se servent les Jardiniers en parlant des arbres; un traité de l'usage des Fruits des Arbres, pour se conserver en santé ou pour se guérir, et une liste des fruits fondans pendant toute l'année. Paris, 8vo.

1683. *R. D. C. D. W. D.*

Le Jardinier Français, qui enseigne à cultiver les Arbres et les Herbes Potagères, avec la Manière de conserver les Fruits: dedié aux Dames. Rouen, 12mo.

This work has come through a great many editions in France, and was translated by Evelyn in 1658, under the title of the French Gardener.

1689. *Anon.*

Traité de la Manière de Semer dans toutes les Saisons de l'Année toutes sortes de Graines, de Plantes, et de Fleurs. Paris, 12mo.

1692. *Chataigneraye, le Sieur de.*

La parfaite Connaissance des Arbres Fruitiers, &c. Paris, 12mo.

1692. *Anon.*

Nouvelle Instruction facile pour la Culture des Figuiers, où l'on apprend la Manière de les élever, multiplier et conserver, tant en caisses qu'autrement: avec un Traité de la Culture des Fleurs. Paris, 12mo.

1692. *Anon.*

Nouveau Traité des Orangers et des Citroniers, contenant la manière de les connaitre, les façons, qu'il leur faut faire pour les bien cultiver et la vraie Méthode qu'on doit garder pour les conserver. Paris, 12mo.

1696. *Dahuron, René,* gardener to the Duke of Brunswick, at Luneburg.

Nouveau Traité de la Taille des Arbres Fruitiers, contenant plusieurs figures, qui marquent les manières de les bien tailler. Paris, 12mo.

1696. *Quintinie, Jean de la,* born in 1626, at Chabanois, near Angouleme, died in 1700. He was destined for the bar, but a passion for gardening determined him to that pursuit. He became tutor to a young gentleman, Mr. Tambonneau, and made the tour of Italy with him, where his passion for his favourite study increased. At his return, the father of his pupil submitted his gardens to his direction. Here he acquired experience and reputation. The great Condé used to take pleasure in conversing with him, and Charles II. of England invited him to superintend his gardens, with a considerable pension. Louis XIV. created for him the office of director of the royal fruit and kitchen gardens. It is uncertain whether any other work by him appeared during his life than the first of those enumerated below.

1. Traité des Jardins Fruitiers et Potagers. Amsterdam. 4to. fig.

2. Instructions sur les Jardins Fruitiers et Potagers, avec un Traité des Orangers, et des Réflexions sur l'Agriculture. 4to.

Both works have come through numerous editions in the French language, and were translated into English by Evelyn, and by London and Wise.

1696. *Anon;* ascribed to N. Volney.

Connaissance et Culture parfaite, des belles Fleurs des Tulipes rares, des Anémones extraordinaires, des Œillets fins, et des belles Oreilles d'Ours Panachées. Paris, 12mo.

1696. *Anon.*

La Culture des Fleurs, où il est Traité généralement de la manière de Semer, Planter, &c. toutes Sortes de Fleurs et d'Arbres connus en France. Bourg-en-Bresse, 12mo. 1696.

17. . . *Anon.*

Ordre des Plantations pour les Jardins à l'Anglaise, 4to.

17. . . *Anon.*

Dictionnaire raisonnée de Jardinier, Botaniste, Fleuriste, Maraicher, Pépiniériste, 8vo. 2 vols.

17. . . *Anon.*

Decades des Cultivateurs, contenant cours de Morale Naturelle, l'Agriculture Pratique des Jardins Potagers et à Fruits, &c. Paris, 12 vols. plates.

17. . . *Anon.*

Avis aux Propriétaires des terres sur les Arbres d'Allemagne, des Pépinières, dans le grand parc de Versailles.

17. . . *Chomel, Noel*, a curate in Lyons, who died in 1712. His nephew, a physician, published, in 1761, "Histoire des Plantes usuelles."

Abrégé de l'Histoire des Plantes usuelles, &c. An Edition in 1803, with the Linnean names by Maillaud.

17. . . *F. D* ——.

Manuel du Jardinier, ou la Culture complete des Jardins Potagers, Fruitiers, et Fleurs, &c. Paris, 2 vols. 12mo.

17. . . *Lemarie, Fr.* ——.

Supplément à l'Ami des Jardins d'Utilité et d'Ornement; contenant des notions sur la culture de diverses plantes; entre autres le rutabaga au chou-navet de Laponie, qui ne gêle jamais en terre, et qui remplace le colsa; sur de nouveaux arbres et arbrisseaux, tels qu'un nouveau Rosier, le Mangoustan, et autres; avec deux listes des panachés, dont l'une des plants vivaces en pleine terre, et l'autre des arbres et arbrisseaux. Paris, 12mo.

17. . . *Maret.*

Discours sur l'établissement d'un Jardin des Plantes.

17. . . *Pelée, M. de St. Maurice*, member of the Paris Agricultural Society.

L'Art de Cultiver les Peupliers d'Italie, &c. Paris, 12mo.

17. . . *Renault*, ——, a civil officer in the district of Rouen.

Mémoire sur la Culture des Pommiers dans toute l'étendue de la France. Rouen, 8vo.

1701. *Marchant*, ——, of the Academy of Sciences.

Dissertation sur la Préférence que nous devons donner aux Plantes de notre Pays, par-dessus les Plantes étrangères.

1703. *Liger, Louis*, born in 1658, died in 1717; author of various works on rural and domestic economy, and of a "Theatre d'Agriculture," in several volumes, and a new edition of *La Maison Rustique*.

1. Traité facile pour apprendre à élever des Figuiers. 12mo.

2. Le Jardinier, Fleuriste, et Historiographe, 2 vols. in 12mo. 1703. An edition with the title somewhat varied in 1704.

3. La Culture parfaite des Jardins, Fruitiers, et Potagers. 12mo. 1714.

1705. *Besnier*, ——, a physician in Paris, father-in-law to the celebrated physician Dionis.

Le Jardinier Botaniste, ou la Manière de cultiver toutes sortes de Plantes, Fleurs, Arbres, et Arbrisseaux, avec leur usage en médicine et pour l'embellissement des jardins. Paris, 8vo.

1705. *François*, ——, one of the brothers of the Chartreuse in Paris.

Le Jardinier solitaire, ou Dialogues, contenant la méthode de cultiver un jardin fruitier et potager, 8vo. An edition in 1770, with the title somewhat varied.

1705. *Vallemont, L'Abbe de*, a naturalist and antiquarian, author of several works.

Curiosités de la Nature et de l'Art sur la Vegetation, ou l'Agriculture et le Jardinage dans leur perfection, &c. Paris, 12mo.

The same work in English, 8vo. 1784.

1706. *Anon.*

Traité curieux et très utile touchant le Jardinage. Paris, 12mo.

1707. *Andry*, ——.

Le Thé de L'Europe, ou les Propriétés de la Véronique. Paris, 16mo.

1707. *Tournefort, Joseph Pitton de*, a physician and botanist, was born at Aix, in Provence, June 5. 1656. He was intended for the church, but on the death of his father he relinquished the study of theology, to indulge his inclination for natural history. To gratify this passion, he made numerous journeys in Europe and Asia; after which he became professor of physic in the royal college, and of botany in the king's garden at Paris, where he died Dec. 28. 1708. His botanical publications are numerous; the most important is his *Institutiones rei Herbariæ*, which method of arrangement was followed in this country as well as in France, till supplanted by the systems of Linneus and Jussieu.

Observations sur la Naissance et la Culture des Champignons. Mem. de l'Acad. de Paris, 1707.

1712. *Angran de Ruenture*, a lawyer.

Observations sur l'Agriculture et le Jardinage, pour servir d'Instruction à ceux qui désirent de s'y rendre habiles. Paris, 2 vols. 12mo.

1712. *Boullay*, ——, Canon of Orleans.

Manière de bien cultiver la Vigne, de faire la vendange et le Vin dans le Vignoble d'Orleans, utile a tous les autres Vignobles du Royaume. 2d edit. in 12mo.

1713. *D'Argenville, Dezallier Ant. Joseph*, born in Paris, where he died in 1765. He held a public situation, and his principal study was natural history. The articles Hydrographie and Jardinage in the Dictionaire Encyclopédique were furnished by him.

1. La Théorie et la Pratique du Jardinage, ou l'on traite à fond des beaux Jardins de Plaisance et de Propreté, contenant plusieurs Plans et Dispositions générales des Jardins, nouveaux dessins de Parterres, de Bosquets, de Boulingrins, Salles, Cabinets, &c. Paris, 4to. 1713.

Only the first edition of this work appeared with the name of the author, who afterwards adopted that of Le Blond, by whose name the work is best known. It was translated into English by John James of Greenwich, architect, and entitled

The Theory and Practice of Gardening, containing all that relates to fine gardens, &c. &c.

2. Dictionnaire du Jardinage. Liege, 1783.

Besides the above, he remodelled and published the works of Roger Schabol, after his death. See *Schabol*, 1767.

1716. *Ressons, Jean-Baptiste Deschiens de*, born at Chalons; died in 1736. He was lieutenant-general of artillery, and member of the Academy of Sciences; united a taste for arms with that for study, and excelled in both.

Manière de greffer les Arbres des Fruits à Noyaux, sans perdre aucun tems, en sorte qu'un arbre qui aura fait de tres-mauvais fruits l'année précédente en pourra porter de tres-bons l'année suivante. Paris, 8vo.

1718. *Anon.*

De la Manière de Cultiver la Vigne et de faire le Vin de Champagne, ce qu'on peut imiter dans les autres provinces. Paris, 4to.

1719. *Lemaistre, M——*, curate of Joinville.

Fruitier de la France, ou Description des Fruits, à Noyaux et à Pépins, qui se cultivent dans le royaume; avec une dissertation historique sur l'origine et les progrés des Jardins. 4to.

1722. *Saussai, le Sieur de*, gardener to the Princess of Condé, at Anet, afterwards inspector of the gardens of the Duke of Bourbon.

Traité des Jardins. Paris, 12mo.

1726. *Anon.*

1. Dictionarium Rusticum, Urbanicum et Botanicum. 2 vols. 8vo.

1730. *Hamel du Monceau, Henry Lewis du*, a distinguished naturalist, was born at Paris in 1700. He became a member of the Academy of Sciences, to whom he communicated a number of papers on vegetable physiology. He died at Paris, where he was dean of the academy, in 1782.

1. De l'importance de l'Analogie, et des Rapports que les Arbres doivent avoir entre eux pour la reussite et la durée des greffes. Mem. Acad. Par. 1730. 31.

2. Sur les Plantes qu'on peut élever dans l'Eau. Mem. Acad. Par.

3. Traité des Arbres et Arbustes, qui se cultivent en France en pleine terre. Par. 1755, 2 vols. 4to.

4. Physique des Arbres, où il est traité de l'Anatomie des Plantes, et de l'Economie Végétale; avec une Dissertation sur l'Utilité des Methodes de Botanique, et une Explication des Termes propres à cette science. Par. 1758, 2 vols. 4to. With numerous copperplates. This is his most important work, and on it his merit as a Physiologist chiefly rests.

5. Traité complet des Bois et des Forêts. Par. 1758-67, 6 tom. 4to.

6. Des Semis et Plantations des Arbres, et de leur Culture. Par. 1760. 4to.

7. Art du Charbonnier. Par. 1761, fol.

8. De l'Exploitation des Bois, ou moyen de tirer parti des taillis demi futayes et hautes futayes. Par. 1764, 2 vols. 4to.

9. Du Transport, de la Conservation, et de la Force du Bois. 1767, 4to.

10. Traité des Arbres Fruitiers. Paris, 1768, 2 vols. 4to. With fine coloured plates of fruit-trees, &c. This is his most splendid work.

1732. *Guerin, M——.*

Traité de la culture parfaite de l'Oreille d'ours, 12mo.

1735. *Jussieu, Bernard de*, born at Lyons in 1699; practised physic, and became curator of the plants in the royal garden of Paris, and superintendant of that at Trianon. In this last garden he first displayed the celebrated system which bears the family name, and has been so much perfected by his nephew, Antoine de Jussieu. All the members of this family have devoted themselves to science.

Catalogue des Arbres et Arbrisseaux, qui se peuvent élever aux environs de Paris, &c. Paris, 12mo.

1737. *Thouin, André*, Le Chevalier de, Professor of Horticulture in the University of Paris; author of various Memoirs on Gardening and Agriculture, inserted in the French Encyclopædias, Dictionaries, and periodical works, and in the transactions of their learned bodies: an excellent man, and esteemed one of the very first gardeners in Europe.

1. Mémoire sur l'Usage du Terreau de Bruyère dans la Culture des Arbrisseaux et Arbustes étrangers, regardés jusqu'à present comme delicats dans nos jardins. Mem. de l'Acad. des Sc. de Paris, 1787, p. 481-495.

2. Sur les Avantages de la Culture des Arbres, étrangers pour l'emploi de plusieurs Terrains de differente nature abandonnés comme steriles. Mem. de la Soc. R. d'Agricult de Paris, 1786, p. 43-49.

3. Description du Jardin des semis du Musée d'Histoire Naturelle, de sa culture et de ses usages. Annales du Mus. d'Hist. Nat. Tom. 4.

4. Description de l'Ecole d'Agriculture pratique du Musée d'Histoire Naturelle. An. du Mus. Tom. 10, 11, & 12.

5. Mémoires sur des nouvelles Modes des greffes. Ibid. Tom. 12, 13, 14, &c.

6. Notes sur la Culture des Patates et des Pommes de terre. Sur la Culture des Plantes Alpines. Ibid. Tom. 3. p. 183.

7. Mémoire sur la Culture des Bruyères. Ibid. Tom. 2 and 3.

8. Mémoire sur la Culture des Dahlias, &c. Ibid. Tom. 3.

9. Monographie de greffes, ou Description technique de diverses sortes de Greffes, employées pour la multiplication des Végétaux. Paris, 1821, in 4to. avec 13 pl. in lithog.

10. Instruction sur l'Etablissement des Pépinières. Paris, 8vo.

11. Notes sur les Semis du Pin de Riga. Paris, 8vo.

12. Note sur la Culture et les Usages du Pin Laricio de Corse. Paris, 8vo.

1739. *Buffon, George Louis le Clerc, count de*, was the son of a counsellor of the parliament of Dijon, and born at Montbard, in Burgundy, in 1707. He studied at Dijon, and was intended for the law, but his inclination lay to the sciences, particularly astronomy and geometry; and it is said he was never without Euclid's Elements in his pocket. At the age of twenty he made the tour of Italy, after which he visited England. On his return he divided his time between Montbard and Paris, and in 1735 published a translation of Hale's Vegetable Statics, which was followed by one of Newton's Fluxions. In 1739 he was appointed superintendant of the royal garden and cabinet, which by his care were considerably enriched. He was a member of the French Academy, treasurer of that of Sciences, and in 1771 he was created a count. His private character was that of a libertine, and he was extremely vain of his person and talents. "The works of eminent geniusses," he would say, "are few; they are those of Newton, Bacon, Leibnitz, Montesquieu, *and my own!* He died of the stone in 1788. His only son was guillotined in 1793.

1. Memoire sur la Conservation et le Retablissement des Forêts. Mem. Acad. Par.

2. Memoire sur la Culture des Forêts. Id. ib. 1742.

1739. *Riviere, de la*, and *du Moulin*.

Méthode pour bien cultiver les arbres à fruit, et pour élever les treilles. Utrecht, 8vo.

1741. *Anon.*

Le Nouveau Jardinier Français qui enseigne à cultiver les Arbres, et les Herbes Potagères, &c. avec un Catalogue des plus excellentes Poires, et la manière d'élever les Abeilles, et de recueillir le Miel et la Cire. Paris, 12mo.

1741. *Bazin, Gilles-Augustin*, a physician of Strasbourg; author of some tracts on insects, trees, &c.; died in 1754.

1. Observations sur les Plantes, et leur analogie avec les Insectes.
2. Traité de l'Accroissement des Plantes. 8vo.

1745. *De Combles*, a native of Lyons, began to write on Agriculture in 1745; and after having led a life of agitation, he retired to a country house near Paris, where he gave himself up to gardening.

1. Traité de la Culture des Pêchers. 12mo.
2. L'Ecole du Jardin Potager. 2 vols. 12mo.

In 1802, these two works were published together in 2 vols. 12mo. which made the fifth edition of L'Ecole du Jardin Potager.

1746. *Ardenne, Jean Paul de*, born at Marseilles in 1689, where he became a priest and superior of the congregation of the oratory. He had a country house at Forcalquier, where he devoted great part of his time to the culture of flowers and to deeds of charity. He was reckoned among the most famous florists of his time. He died in 1769.

1. Traité des Renoncules. Paris, 1746. 8vo.
2. Traité des Tulipes. Plates. Aug. 1760, 12mo.
3. Traité des Œillets. Plates. Avignon, 1763, 12mo.
4. Traité des Jacinthes. Illustrated with plates. Avignon, 1763, 8vo.
5. Traité de l'Oreille d'Ours, 8vo. Avignon, 1759, 2 vols. 12mo.
6. Année Champêtre. Lyons, 1769, 3 vols. 12mo.

1750. *Anon.*

Les Agrémens de la Campagne, ou Remarques particulières sur la Construction des Maisons de Campagnes, Jardins de Plaisance, Plantages, &c. Leyde, 4to.

1750. *Roux, Augustin*, born in 1726; died in 1776; Member of the Royal Society of Agriculture.

1. Traité Physique de la Culture et de la Plantation des Arbres, avec la manière de les exploiter, de les débiter, &c. Paris, 12mo.
2. Traité de la Culture des Arbres à ouvrier. 12mo.

1751. *Desbois, Francis Alexander Aubert de la Chesnaye*, born at Ernay on the Maine in 1699, died in an hospital in Paris in 1784. One of the most indefatigable compilers of the 18th century.

Dictionnaire Universelle d'Agriculture et de Jardinage. Paris, 2 vols. 4to.

1753. *Francheville, Joseph Dufresne de*, of the academy of Berlin, born at Dourlens in Piccardy in 1704; better known by the first edition of Voltaire's Siècle de Louis XIV., which appeared under his name, than by any of his other works.

Catalogue nouveau de bons Fruits, 12mo.

1754. *Moer, M——*.

Traité de la Culture des Renoncules, Œillets, Auricules, et Tulipes. 12mo.

1757. *Bertrand, Francis*, a citizen of Paris, enthusiastically attached to the country, but not being able to retire to it, he amused himself by collecting passages from the poets on the pleasures of a country life.

Ruris deliciæ. Collectæ ex melioris notæ Latinis Gallicisque Poetis. Paris, 12mo.

1757. *Morel, N——*, of Lyons, born 172. . An ancient architect, who introduced the modern style of gardening in France. He assisted Girardin in laying out Ermenonville, and afterwards was employed at the extensive concerns of the park of Meriville.

1. L'Art de Distribuer les Jardins suivant l'usage des Chinois. Londres, 8vo. 1757.
2. Théorie des Jardins, ou l'Art des Jardins de la Nature. 8vo. 1776.

A new edition, enriched with a list of trees, their heights, and colours, by C. Morel, in 1803.

3. Tableau Dendrologique, contenant la Liste des Plantes Ligneuses, Indigènes et Exotiques acclimatées; la manière dont elles se propagent, le terrain et l'exposition qui leur conviennent. Lyons, 12mo. 1800.

1758. *Gouges de Cessieres;* advocate at Laon.

Les Jardins d'Ornement, poëme, 8vo.

1759. *Anon.*

De la Manière dont on cultive les Vignes aux environs de Paris, et quelle est la meilleure méthode qui se pratique in France. 8vo.

Inserted in the *Journal Œconomique* for this year.

1759. *Bidet, M——*, of the agricultural academy of Tuscany, and officer of the royal household; a native of Champagne.

Traité de la Culture des Vignes. 2 vols. 12mo. 1759.

An improved edition by Duhamel du Monceau, in 1752.

1760. *Buchoz, Pierre Joseph*, a physician and member of several societies; born at Metz in 1731, died in great distress at Paris in 1807. He wrote above three hundred volumes relative to medicine, agriculture, the veterinary art, and natural history. A plant, (Buchoziana,) was named after him by L'Heritier.

1. Catalogue Latin et François des Plantes, Vivaces, &c. pour la Decoration des Jardins, 1786 18mo.
2. Dissertation sur la Cèdre du Libon, le Platane et le Cytise. Par. 8vo. 1804.

He printed numerous other dissertations of this description separately, which are all collected in the following work.

3. Nouveau Traité Physique et Economique per forme de Dissertations de toutes les Plantes qui croissent sur la Surface du Globe. In fol. 1786. 2 vols.
4. Lettre sur la Méthode de s'enricher promptement, et de conserver sa santé par la Culture des Végétaux. 8vo. 1760.
5. Mémoire sur l'Hortensia, le Cestrau, &c. augmentée de deux mémoires sur le Lagerstrom et le Fothergill. 8vo. 1804.
6. Monographie de la Rose, et de la Violette. 8vo. 1805.
7. Observations sur Quatre Genres d'Arbustes; l'Azalia, le Cédre, le Kalmia et le Rhododendron, que méritent d' être cultivés dans les Jardins. 8vo. 1782.
8. Prospectus d'Histoire Naturelle des Végétaux de la France, &c.; ou la Botanique, la Médicine, l'Agriculture, le Jardinage et les Arts réunis dans le règne végétal de la France. Metz, in 8vo. 1765.

Buchoz was at this time botanical demonstrator to the Royal College of Physicians, at Nancy.

9. Réflexions sur le Genre du Robinier. 8vo.
10. Traité de la Culture des Arbres et Arbustes qu'on peut élever dans le royaume. 12mo. 1785.

1760. *Duchesne, Ant.-Nicolas*, professor of natural history, in the central school of Versailles, author of some geological works.

1. Traité des Fraisiers. 12mo. 1760.
2. Sur la Formation des Jardins. Par l'auteur des Considerations sur le Jardinage. Paris, 8vo. 1775.

1760. *Thierrat*, ——, a lawyer, and an officer in the woods and waters; author of various tracts on Agriculture.

Observations sur la Culture des Arbres à-haute Tige, particulièrement des Pommiers.

1762. *Anon.*

Nouveau Traité sur l'Arbre nommé Acacia. Bourdeau, 8vo.

1763. *Bonnelle, Charles*, born at Artois.

Le Jardinier d'Artois, ou Elémens de la Culture des Jardins Potagers et Fruitiers. 8vo.

1763. *Maupin*, ——, valet-de-chambre to

the Queen; author of a number of works on rural subjects.

1. L'Art de la Vigne, &c. 8vo. 1779.
2. Almanach, ou Manuel de Vignerons de tous les pays. Paris, 8vo. 1789.
3. Avis sur la Vigne, &c. Paris, 8vo. 1786.
4. Lettre de l' Auteur de la nouvelle Méthode de cultiver la Vigne, &c. Paris, 12mo. 1764.
5. Nouvelle Méthode de cultiver la Vigne, &c. 12mo. Paris, 1763.

A new edition, with additions, by Buchoz in 1799.

1763. *Mandirola*, ——.

Manuel du Jardinier. 8vo.

1764. *Anon.*

Ecole du Jardinier Fleuriste, par M——. Paris, 12mo.

1765. *Anon.*

Traité de la Culture de différentes Fleurs.

1765. *Chambray, Louis Marquis de*, born in 1708, occupied himself much in cultivating the apple, and in making cyder.

Art de cultiver les Pommiers, les Poiriers, et de faire les Cidres, selon l'usage de Normandie. Paris, 12mo.

1765. *Delille, Jacques*, an eminent French poet, member of the French Academy, born at Clermont, in 1738, died at Paris in 1811.

1. Les Jardins.

There is an English translation by Mrs. Montolieu, in 1797.

2. Le Jardin d'Eden, suivi d'une Epitre a deux Enfans Voyageurs. Paris, 18mo. 1817.

1765. *Dupuy*, ——.

Observationes sur la Culture de la Vigne.

1765. *Saint-Péravi, Guermeau de*, born in Beauce; author of some tracts on political economy and agriculture.

Traité de la Culture de différentes Fleurs, des Narcisses, Giroffliers, Tuberouses, Anémones, Jacinthes, Jonquilles, Iris, Lis, et Amarantés. 12mo.

1766. *Lataille-des-Essarts*, ——.

Mémoire sur le Safran. Orleans, 8vo.

1766. *Masse, Jean* ——, advocate.

1. Dictionnaire portatif des Eaux et Forêts. 2 vols. 8vo.
2. Traité des Bois et des différentes Manières de les semer, cultiver, planter, exploiter, &c. Paris, 2 vols. 8vo. 1769.

1767. *Chartreuse, les révérend Pères de, de Paris.* The nursery of these reverend fathers was for a long time the only one on the continent.

Catalogue des Arbres à Fruits, les plus excellens, les plus rares, et les plus estimées, qui se cultivent dans les Pépinières des Pères Chartreuse, avec la Description tant des arbres que des fruits, &c. 8vo.

1767. *Schabol, Jean-Roger*, a deacon, the son of a sculptor, who occupied himself much in gardening, and wrote several works, not elegant as to style, but original, and entirely from his own experience. He died in 1768, aged 77 years.

1. Théorie et Pratique du Jardinage, avec fig en taille douce. Paris, 3 vols. 12mo.

This work was prepared from the author's papers, and published after his death, by Dezallier d'Argenville, who collected all Schabol's works, and published them under the title "Manuel du Jardinier, ou Journal de son Travail distribué par Mois. Paris, 12mo. 1772.

2. Dictionnaire du Jardinage. 1 vol. 12mo. 1767.
3. Observations sur les villages de Montreuil, Bagnolet, Vincennes, Charonne, et villages adjacens, à deux lieues ou environ de Paris, au sujet de la Culture des Végétaux, avec une idée de la Méthode qu'on-y-emploie pour traiter les Arbres, surtout les pêchers. 1755. Inserted in the Journal Œconomique for that year.
4. Elémens du Jardinage utile, ou Méthode de cultiver avec succès le Potager, et le Verger, d'après les Experiences de Roger Schabol, &c. Metz, in 12mo. plates. 1786.

1767. *Wenckeler, Jean George*, commonly called *Egner*.

Instructions sur le Jardinage, que renferment en abrégé ce qui a rapport à la Culture des Fleurs, des Fruits, et des Legumes, &c. Paris, 8vo.

1768. *Saint Simon, Marquis de*, Aide-de-Camp to Prince de Conti; died in 1794. He wrote also on bees.

Des Jacinthes, de leur Anatomie, Reproduction et Culture. Paris, 12mo.

1768. *Tschoudi, Jean-Baptiste-Louis-Theodore, baron de*, author of some articles in the Encyclopædia, and translator of Miller's Dictionary, died at Paris, in 1784.

1. De la Transplantation, de la Naturalization, et du perfectionnement des Végétaux. 8vo. 1778.
2. Traité des Arbres résineux conifères, extrait et traduits de l'Anglais de Miller, avec des notes. 8vo. 1768.

1769. *Anon.*

Trois Poëms; sur l'Education, des Jardins d'Ornement, et les resources du génie. Paris, 8vo.

1769. *Anon.*

Abrégé des Instructions sur la Jardinage, &c. Marseille, 12mo.

1769. *Bearde, de l'Abbaye*, died young at Paris in 1771, author of a dissertation on a subject in political economy, which obtained the prize of the academy of St. Petersburg in 1769.

Essais d'Agriculture, ou Tentatives Physiques, &c. Par. 8vo.

1769. *Larivière de, et M—— Dumoulin.*

Méthode pour cultiver les Arbres à Fruits et pour les élever en treilles, par le Sieurs de Larivière et Dumoulin. Paris, 12mo.

1769. *Toustain-de-Limesy, Charles François*, an officer in a regiment of Champagne, under the old regime, member of several agricultural societies.

Mémoires sur les Plantations.

1770. *Anon.*

Le Jardinier prévoyant, Almanach suivi des Considerations sur le Jardinage. Paris, 16mo.

This work has been improved and continued to the present time, and now appears annually under the title of

Le Bon Jardinier, Almanach, avec Supplement, contenant des préceptes généraux de culture, &c. par M. M. Loiseleur des Longchamps, Vilmorin, et Noisette. Paris, 12mo. plates.

1771. *Hérissant, Louis Antoine Prosper*, born in Paris in 1745. His father was a celebrated printer, and the son was educated as a physician, but died in 1770, at the early age of twenty-five.

Jardin des Curieux, ou Catalogue raisonné des plantes les plus belles et les plus rares, soit indigènes, soit étrangères, avec les noms Français et Latins, leur culture et les vertus particulières de chaque espèce; le tout précédé de quelques notions sur la culture en général. Paris, 8vo.

This work is the description "raisonnée" of a fine garden which Mr. Cochin, an ancient magistrate of Paris, had formed at Chatillon near Bagneux, within two miles of Paris. Hérissant died before his work was completed, and it was finished by M. Coquereau.

1771. *Latapie* ——, the translator of Whateley's Observations on Modern Gardening; to which he added, a Discourse on the Origin of the Art, notes to the text, and a description of Stow, where he is said to have resided some time with Lord Temple.

L'Art de former les Jardins Modernes, ou l'Art des Jardins Anglais, traduit de l'Anglais, &c. Paris, 8vo.

1772. *Anon.*

Observations sur la Culture et la Nature des Vignes du territoire de Valence en Dauphiné. 8vo.

1772. *Brousse, M—— de la.*

Traité de la Culture du Figuier, suivi d'Observations et d'Expériences sur la meilleure maniére de la cultiver. 12mo.

1773. *A Society of Amateurs.*

Essai sur la taille des arbres fruitiers. Paris, 12mo. fig.

1773. *Pelletier, de Frepillon*, ——.

Essai sur la taille des Arbres Fruitiers. 12mo.

1773. *Trother*, ——,

l'Art de fertiliser les Terres, et de preserver de la gelée commodément et à peu de frais, les Arbres, et Arbrisseaux, les Vignes, &c. Paris, 3 vols. in 8vo.

1774. *Velan, l'Abbe de.*

Traité de la Culture de Melon. 8vo.

1774. *Watelet, Claude Henri*, receiver-general of finances, member of the Academy of Sciences, and other learned bodies, was born at Paris in 1715. He was celebrated for his love of arts and letters, and enjoyed himself at his country-house, called *Le Moulin joli*, near Paris, where he created an English garden, and wrote on the subject. He died in 1785.

Essai sur les Jardins. Paris, 8vo.

1775. *Anon;* ascribed to M. Le Bernyais.

Traité des Jardins, ou la nouveau la Quintinie, contenant la Description et la Culture des Arbres Fruitiers et des Plantes Potagères. 8vo.

A new edition in 1789, with increased lists of Shrubs and Flowers, and an abridged edition in 1793 in 2 vols. 12mo. Printed at Caen.

1775. *Mallet, Robert Xavier*, author of several works on agriculture.

1. Culture des Asperges, et des petits Pois. 12mo.
2. Beauté de la Nature, Fleurimanie Raisonnée, &c. 12mo.
3. Dissertation sur la Manière de cultiver des Plantes choisis dans les Chassis Physiques du Sieur Mallet leur Inventeur, avec la Description de ces Chassis. Paris, 4to. p. 33. pl. 1.

1775. *Roubo*, ——, joiner and architect, author of several works on joinery, died about the end of the 18th century.

L'Art de Treillageur, ou Menuiserie des Jardins. Par. fol. Duhamel is said to have praised this work, in which the author has exhausted his subject.

1775. *Vallet, A —— N ——*, a lieutenant-general under the old regime, and procurator fiscal of the barony of Romainville, near Paris.

Manuel Œconomique pour les Bâtimens et Jardins, tres-utiles aux Propriétaires et Enterpreneurs, &c. Paris, 8vo.

1776. *Anon.*

Almanach, contenant le précis de l'Agriculture du Jardinier, fleuriste, &c. Par. in 24mo.

1776. *Anon.*

Dictionnaire du Jardinage, relative à la Théorie et a la Pratique de cet art. 12mo.

1777. *Durival, Clement*, brother of N. L. Durival, an agricultural writer, was born at St. Aubin, in 1728; he wrote on the finances and rural economy, and his memoir on the vine was crowned with the prize at Metz, in 1777.

La Vigne, Mémoire Couronné à l'Académie de Metz, par M. Durival le Jeune. 8vo.

1777. *Girardin, L. R. Vicompte d'Ermenonville*, a military officer of high rank, who travelled in England about the time when the new style of laying out grounds was coming into fashion; and when he returned to France, laid out his seat at Ermenonville in this style.

La composition des Paysages sur le terrain, ou des moyens d'embellir la Nature autour des habitations, en y joignant l'utile à l'agréable. 8vo.

This work has been translated into English, with an historical introduction by Daniel Malthus, Esq.; and also into German and Italian.

Another edition, with notes, was published a few years ago, by René Girardin, the son of the author, and present proprietor of Ermenonville.

1778. *Anon.*

Considerations sur la Jardinage. Paris, 8vo.

1778. *Prudent, P* ——, a capuchin friar.

Reflexion d'un Vigneron de Besançon, l'Abbé Bovarel, en 1777, sur les Causes d'une Maladie qui attaque plusieurs Vignobles de Franchecomté. Vesaul, 8vo.

1779. *Calonne*, ——, advocate.

Essai d'Agriculture en forme d'entretien, sur les Pépinières des arbres, étrangères, et fruitiers, &c. Paris, 12mo.

1780. *Lamoignon-Malsherbes, Chrétien-Guillaume*, born in Paris in 1721, and guillotined there by the revolutionary faction in 1793. He was an excellent man, attached to the arts, and introduced on his estates many exotic trees.

Observations sur le Pins, les Orchis, le Mélèze, &c.

1780. *Maréchal, Pierre Sylvain*, born at Paris in 1750, died in 1803; author of a great many works, the principal of which is a dictionary of Atheists.

Décades du Cultivateur. Paris, 2 vols. 8vo.

1781. *Anon.*

Traité des Fleurs qui se cultivent en Hiver. 12mo.

1781. *Henriques, Jean*, a lawyer, author of different works on forests and the chase.

1. Mémoire sur les moyens de multiplier les plantations de bois sans nuire à la production des subsistences. Rheims, 12mo. 1789.
2. Observations sur le ménagement des bois. Verdun, 8vo. 1781.
3. Code pénal des Eaux et Forêts, 2 vols. 12mo. 1782.

1781. *Parmentier, Antoine-Augustin*, born in 1737, at Montdidier, in the department of La Somme, one of the most distinguished chemists, and active and careful philosophers which has appeared in France. Author of a great number of works, and co-operator in many others, as the Annales de Chemie, Nouveau Cours d'Agriculture, &c.

1. Recherches sur les Végétaux nourrissans qui, dans le tems de dissette, peuvent remplacer les alimens ordinaire; avec des nouvelles Observations sur la Culture des Pommes de Terre. Paris, 8vo.
2. Mémoire sur la Culture, et les usages de la Patate (Convolvulus Batatas). Mem. de l'Acad. de Toulouse. Tom. 3. p. 183.—196.

1782. *Anon.*

Traité de la Culture des Arbres.

1782. *Barruel-Beauvert*, Captain of dragoons under the old regime.

1. Plainte du Chou et du Navet contre les Jardins de l'Abbé de Lille. 8vo.

In verse, and considered a "plaisanterie agréable, piquante et fondée."

2. Lettres Critiques sur le Poëme des Jardins suivies du "Chou et du Navet." Amsterdam and Paris, 8vo.

1782. *Porcelin de la Roche-Tillac*, Doctor of Laws, Canon of Montreuil-Bellai, in Anjou; born in 1746 at Dissais.

Le parfait Vigneron, ou l'Art de Travailler les Vignes, de faire le Vin et de le conserver. 12mo.

1783. *Bretonniere, M. —— de la.*

1. Correspondence Rurale, sur la Culture des Terres, et des Jardins, &c. Paris, 12mo.
2. Ecole du Jardinier Fruitier, 2 vols. 12mo.
3. Ecole du Jardinier Potagere, 2 vols. 12mo.

1783. *Durdos*, ——.

Mémoire touchant les Pépinières. 8vo.

1783. *Filassier, N*——, director of a nursery near Meudon; member of several academies, born at Warwick in Flanders.

1. Culture de la Grosse Asperge, dite de Hollande, &c. Paris, 12mo.

2. Dictionnaire du Jardinier Français. Paris, 2 vols. 8vo. 1791.

1784. *Durand*, ——, a physician of Dijon, where he died in 1799, author of several works on botany.

Nouveau moyen de multiplier les Arbres étrangers. Nouv. Mem. de l'Acad. de Dijon. 2 sem. p. 7—9.

1784. *Mustel*, ——.

Traité Théorique et Pratique de la Végétation, contenant plusieurs expériences nouvelles et demonstratives sur l'économie végétale, et sur la culture des arbres. Paris, 4 vols. 8vo.

1785. *Anon.*

Traité de la Manière de sémer toutes sortes de Graines et Plantes Potagères, avec le Jardinier perpétuel qui enseigne ce qu'il faut faire chaque mois. Paris, 12mo.

1785. *Secondat de Montesquieu*, son of the celebrated author of *l'Esprit des Lois*, died in 1796, aged 79 years. He never would assume the name which his father had rendered illustrious; and had so great a respect for his memory, that he preserved in the Chateau of Brède the furniture and the library, exactly in the order in which his father had left them. He occupied himself chiefly in the study of natural history, and in agriculture.

Memoires sur l'Histoire Naturelle du Chêne, sur la resistance des Bois à être rompus par les poids dont ils sont chargés, sur la culture de la vigne, &c. Paris, fol. 15 plates.

1786. *Cabanis de Salagnac*, born at Issoudun in 1722; died in 1786; advocate of parliament, member of the Agricultural Society of Limoges.

Essai sur les Principes de la Greffe.

A new edition in 1802. Paris, in 12mo. By Chambray.

1787. *Le Rouge*. Geographical engineer to the king.

Recueil des plans et des vues des plus beaux Jardins de l'Europe, &c. Paris, oblong folio, 14 parts, 1787 to 1790.

An interesting and valuable work, now become scarce.

1787. *Lézay-de-Marnesia*, ——, born at Bensançon, and died at Paris in 1800, aged 66 years; a member of the assembly, &c.

De la nature Champêtre; Poëme. Paris, 8vo.

A very pleasing poem, which has passed through several editions.

1788. *Anon.*

Le Jardinier portatif, ou Quatre Classes des Jardins, Fleurs, Fruits, &c.

1788. *Bauman, F. G.*

Catalogue des Arbres Fruitiers les plus recherchés et les plus estimés qui peuvent se cultiver dans notre Climat. Paris, 8vo.

1788. *Bousmard*, ——, a Frenchman, a captain in the Prussian service, supposed to have been slain at the siege of Dantzic.

Mémoire sur cette Question; quelle seraient les moyens de multiplier les Plantations des Bois, sans trop nuire à la Production des Subsistances? 8vo.

1788. *Fontaines, Louis de*, Grand Master of the University of Paris, and President of the legislative body, &c.

Le Verger, poëme. 8vo.

1788. *Saint Martin, M—— de.*

Traité de la Culture du Chêne. 8vo.

This is esteemed a good work on sowing and planting woods, and disposing of their produce.

1789. *M. L. B.*, Mr. *Le Berriays.*

Traité des Jardins, ou le nouveau la Quintinie, contenant la Culture: 1o. des arbres fruitiers; 2o. des plantes potagères; 3o. des arbres, arbrisseaux, fleurs et plantes d'ornements; 4o. des arbres, arbrisseaux, et plantes d'orangerie et serre chaude. Paris, 4 vols. 8vo. figures.

1790. *Chassel*, ——, formerly president of the parliament of Metz.

Supplément au Dictionnaire des Jardiniers, qui comprend tous les genres et toutes les espèces non detaillées dans le Dictionnaire de Miller. Metz, 4to.

1790. *Masson-de-Blamont, Charles-François Phillibert*, born at Blamont in Montbelliard in 1762; became major in the Russian army; exiled from that country in 1797; in 1802 became secretary of the prefecture of Coblentz, and associate of the institute. He translated Mason's English Garden, and Whateley's Observations, into French.

Les Jardins de Samboursky, poete Russe, traduit du Russe en Français. 8vo.

1790. *Harvey, Villé*, principal gardener in the nurseries of the Chartreuse at Paris.

Taille raisonnée des Arbres fruitiers.

A new edition, with a supplement, sur la Greffe, in 1802, 8vo.

Catalogue Méthodique et Classique, de tous les arbres, arbustes fruitiers et des vignes, formant la collection de l'école imperiale etablie près le Luxembourg. Paris, 4to. 1809.

1790. *Rosier, François*, born in Lyons, in 1734, and killed there on the 29th September, 1793, during the siege of that city, by a bomb-shell, which buried his shattered remains in the ruins of the apartment which he occupied. He began his career as an author, by writing in the Journal de Physique et d'Histoire Naturelle, of which Gauthier Dagoty was editor. He next occupied himself with his Agricultural or Rural Dictionary, which is the work by which he is chiefly known. He cultivated a farm near Beziers, which Arthur Young went to see when on his tour in France in 1787; but the Abbé had left it, on account of the Bishop of Beziers, who kept a mistress somewhere near, and, for his more commodiously visiting her, got a road made across the farm at the expense of the province. This occasioned a quarrel between the Abbé and the Bishop, which ended in the former being obliged to quit his farm. The Abbé, like all other men who depart from common practices, was looked on as a fanciful and wild cultivator, and because he paved his stables and cowhouses, it was reported by his neighbours that he paved his vineyard. He wrote a great many works, chiefly on agriculture.

1. Manuel du Jardinier, mis en pratique pour chaque Mois de l'Année. 2 vols. 18mo.

2. Cours complet d'Agriculture théorique, pratique, économique, &c. 15 vols. 4to.

3. Cours complet d'Agriculture pratique, d'économie, rurale, et domestique, &c. 6 vols. 8vo.

4. Nouveau Cours complet d'Agriculture théorique, et pratique, contenant la grande et la petite Culture, l'Economie rural et domestique, la Médicine Vétérinaire, &c.; ou Dictionnaire raisonné et universel d'Agriculture. Ouvrage rédigé sur le Plan de celui de feu l'Abbé Rozier, duquel on a conservé tous les Articles dont la Bonté a été prouvée par l'Experience; par les Membres de la Section d'Agriculture de l'Institut de France, viz. par MM. Thouin, Parmentier Tessier, Husard, Silvestre, Bosc, Chassiron, Chaptal, Lacroix, De Perthius, Yvart, Decandolle, Du Tour. 13 vols. 8vo. 1810.

This is by far the best general work on the agriculture and gardening of France, and supersedes the use of a great many others.

1791. *Nectoux*, ——.

Observations sur la Préparation des envois des Plantes, et Arbres des Indes Orientales pour l'Amérique, et leur traitement pendant la traversée. Mem. de la Soc. R. d'Agricult. de Paris. Trimestre, d'Hiver, p. 110.

1791. *Tessier, Henri-Alexandre*, Professor of Agriculture and Commerce to the Central Schools, Member of the Institute, and Doctor of Medicine, &c.; author of a great number of works, and, jointly with Professor Thouin, of the article Agriculture, in the *Encyclopédie Méthodique*.

Mémoires sur les Plantations des Terrains vaques, sur-tout sur celles des grandes routes, et sur les causes du dépérissement des Bois, et les moyens d'y remédier. 8vo.

1792. *Ceruti, Joseph Ant. Joachim*, born at Turin in 1738, became a member of the society of Jesuits, and rendered himself famous at the suppression of that order by his *Apologie de l'Institut*. He was the friend of Mirabeau, and the principal editor of the *Feuille Villageoise*.

Les Jardins de Betz, Poëme accompagné de Notes instructives sur les Travaux Champêtres; sur les Arts, les Lois, &c. 8vo.
This work was written in 1785, but did not appear till 1792.

1793. *Anon*.

Abrégé du Traité des Jardins, ou le petit la Quintinie, &c. Paris, 2 vols. 12mo.

1793. *Paulet*, ——.

Traité des Champignons, Ouvrage dans le quel on trouve la Description détaillez, les Qualités, les Effets, les différens Usages des Champignons, &c. Paris, 2 vols. 4to. plates.

1794. *Préaudeau-Chemilly, Eugene*, cultivator at Bourneville, in the department of Oise.

Des Haies considérés comme Clôtures; de leurs avantages, et des moyens de les obtenir. Paris, 8vo.

1795. *Butret* ——, gardener.

Taille raisonnée des Arbres Fruitiers, et Opérations relatives à leur Culture, démonstrées clairement par des raisons physiques tirées de leur différente nature. Paris, 8vo. A tenth edition in 1804.

1797. *Rossignol, l'Abbe de*.

Le Jardinier Universel, ou l'art de cultiver les jardins potagers, les arbres fruitiers de toutes espèces; tous les oignons, et plantes à fleurs; les arbres et arbrisseaux d'ornement, le chêne, les fourrages, &c. Liege. 12mo.

1798. *Bridel*, ——, an officer employed in the management of the national woods and waters at Orleans.

Manuel Pratique du Forestier. 12mo.

1798. *Curten*, ——, architect and garden engineer at Grenoble.

1. Le Guide des Cultivateurs. Grenoble, 8vo.
2. Coup-d'œil Politique et Economique sur l'état actuel des Bois et Forèts en France, suivi d'un projet d'Institution Forestière. Grenoble, 8vo. 1804.

1799. *Anon*.

Catalogue Latin et Français de tous les arbres, arbustes, et plantes qu'on peut cultiver dans la France, en plein air, dans les Orangeries et Serres Chaudes. Paris, 12mo.

1799. *Anon*.

Manuel du Jardinier, ou Traité complet de tout ce qui a rapport à la Culture d'un Jardin; 1o. des qualités que doit avoir le Jardinier; 2o. de la culture des différentes sortes des Narcisses, &c.; 3o. de la culture de 48 Fleurs; 4o. de 39 différente Arbres, &c. Paris, 2 vols. 12mo.

18... *Anon*.

Agriculture Théorique et Pratique tant des Jardins, que de la Campagne, &c. d'après la Quintinie, Rosier, Miller, Duhamel, la Société de Berne, &c. Par. 4 vols. in 18mo. fig.

18... *Tatin, A* ——, of Paris.

Principes raisonnés et Pratiques de la Culture des Arbres Fruitiers, d'Agrément et Forestiers, Arbrisseaux et Arbustes d'agrément, des graines, plantes potagères et legumeneuses, des prairies naturelles et artificielles. Paris, 2 vols. 8vo. 4th edit. in 1811.

18... *Larochefocauld-Liancourt*, a proprietor of considerable extent, who studied agriculture under Arthur Young, and travelled in North America. He has published his travels, and some other works, but is best known in France by the *vastes enterprises* which he made on his estates.

Notes sur le Chêne. Par. 8vo.

1800. *Anon*.

Calendrier du Jardinier. Paris, 8vo.

1800. *Anon*.

Manuel Floréal des Plantes, ou Traité de toutes les Plantes qui peuvent servir d'ornement dans les jardins, les orangers, les serres chaudes, parterres haies, &c. 8vo.

1800. *Anon*.

Observations essentielles sur le Tems de Semer les Haricots. Paris, 8vo.

1800. *Anon*.

Le Guide du Jardinier, ou la Culture des Jardins Fruitiers et à Fleurs, et les Meilleures Méthodes pour former les Jardins Modernes: le tout mis en Pratique d'après les Cultivateurs les plus distingués. Paris, 2 vols. 12mo. 4 plates.

1800. *Bertin*, ——.

Essai sur la Culture des Châtaignes, &c. Rheims. 12mo.

1800. *Bertholon*, native of Lyons, where he died in 1799. He was professor of physical science at Montpelier, and afterwards of history at Lyons; the friend of Franklin, and author of several works on rural, political, and domestic economy.

Traité de la Taille de la Vigne. 8vo.

1800. *Bornet, Charles Henry*, agent to the administration of forests in the circle of Turnehem, in the department of the *Pas de Calais*.

1. Code de la Conservation générale des Bois et Forêts nationales. 12mo.
2. De l'Agriculture des Bois d'après les Principes de la Culture Végétale, 1804. 1 vol. 8vo.

180.. *Charpentier de Caussigny*.

Note sur les Moyens à employer pour transporter au loin, par mer, dans des Voyages de long cours, les Végétaux et les Graines exotiques. Mem. des Sociétés François, tom. i. p. 481.

1800. *Cointereaux, François*, professor of rural architecture, and author of several works, particularly of the mode of building *en pisé*.

1. Traité de l'ancien Pisé des Romains.
2. Traité qui enseigne le nouveau Pisé, la manière de le faire lors des pluies, des neiges et des frimas.
3. Nouveaux Murs de Terasses solides et durables, et qui dispensent de cette profusion de matèriaux qu'on y emploie; ouvrage utile à tous les Pays principalement aux architects, ingenieurs, maçons, &c. 8vo. 1805.
4. Instruction agréable et utile pour embellir les jardins à peu de frais. 1814, 8vo.

1801. *Cadet, Charles Louis*.

1. Mémoire sur l'Arbre Cirier de la Louisiane et de la Pensylvanie. Paris, 8vo.

1809. *Deleuze, J. P. F.* The translator of Darwin's Loves of the Plants; secretary to several learned institutions at Paris.

Recherches sur les Plantes d'Ornement, et sur leur Introduction dans nos Jardins. Annales du Museum d'Hist. Nat. tom. 8 et 9.

1800. *Dalmar, Busse N* ——, a native of Germany, purchased the estate of Villegeries, near Paris, and greatly improved it both as to use and beauty.

De la Utilité et de la Culture de l'Acacia-Robinier: dédié aux Cultivateurs. Paris, 8vo.

1800. *Guillemeau, Jean Louis Marie*, in the employ of government, born at Niort in 1766.

Histoire Naturelle de la Rose. Paris, 12mo.

1800. *Jolyclerc, N——.*

Phytologie Universelle, ou Histoire Naturelle et Méthodique des Plantes, de leurs propriétés, de leurs vertus, et de leur culture: ouvrage consacré aux progrés des sciences utiles, de l' agriculture et de tous les arts. Paris, 5 vols. 8vo.

1800. *Querber, J——.*

Moyens d'Encouragement pour les Plantations Artificielles, &c. Metz. 4to.

1801. *Lemoine Léonor*, founder of an academy of theoretical and practical gardening, held in Paris, Rue-d'Enfer.

1. Manuel du Pépiniériste de Paris. 12mo. 1805.
2. Cours de Culture des Arbres à Fruits, et de la Vigne des Jardins. Paris, 8vo. 1801.
3. Cours complet sur la taille du Pêcher et autres Arbres à Fruit, &c. Paris, 12mo. 1803.

1801. *Lefebvre, E——A*, assistant chemist to the school of health at Strasbourg.

Expériences sur la Germination des Plantes Strasbourg, 8vo.

1801. *M. M. Chaptal, Rozier, Parmentier*, et *Dussieux*, eminent chemists and naturalists, members of the Institute.

Traité Théorétique et Pratique sur la Culture de la Vigne, avec l' Art de faire le Vin, les Eaux de vie, Esprit de Vin, Vinaigres simples et composés, &c. Paris, 2 vols. 8vo. Plates.

1801. *Rauch, B. A.*——, engineer of roads and bridges.

Harmonie Hydro-Végétale et Météréologique, ou Recherches sur les moyens de Recréer, avec nos forêts, la force des températures, et la regularité des saisons, par deses plantations raisonneés. Paris. 2 vols. 8vo.

1801. *Robin, C*——, cultivator.

Observations en faveur de l'Acacia. Paris, 8vo.

1802. *Calvel, Etienne*, member of several literary and agricultural societies, and a scientific experimenter in the latter art.

1. Traité complete sur les Pépinières, tant pour les Arbres fruitiers, et Forestiers que pour les Arbrisseaux. Paris, 3 vols. 8vo.
2. Notice Historique sur la Pépinière national des chartreux au Luxemburg. 12mo. 1804.
3. Mémoire sur l'Ajonc ou Genêt épineux, considéré sous le Rapport de Fourrage, de l'Amendement des Terres Stériles, et de Supplement au Bois. Paris, 8vo. 1809.
4. Du Melon et de sa Culture sous châssis, sur couche, et en pleine terre. Paris, 8vo. 1805.
5. Manuel Pratique des Plantations, &c. Paris, 12mo. 1804.
6. Des Arbres Fruitiers Pyramidaux, vulgairement nommés Quenouilles, avec la manière de élever sous cette forme tous les Arbres à Fruit. Paris, 18mo. 1802.
7. Principes Pratiques sur la Plantation et la Culture des Chasselas et autres Vignes Précoces, principalement sous la latitude des environs de Paris, avec la Liste des Nouvelles Variétés, Figures, &c. Paris, 8vo.

1802. *Castel, René Richard*, professor of literature in the Prytanée Français.

Les Plantes; Poëme. Paris, 18mo.

1802. *Dumont-Courset*, born at Boulogne-sur-mer in 1746, member of several societies. He retired to Courset, near Boulogne, in 1809.

Le Botaniste Cultivateur, ou Description, Culture, et Usages de la plus Grande Partie des Plantes étrangères, naturalisées, et indigènes, cultivées en France et en Angleterre, rangées suivant la Méthode de Jussieu. Paris, 5 vols. in 8vo.

This is generally esteemed one of the best French books on gardening.

1802. *Duplessis, F. S.*

Des Végétaux résineux, tant indigènes qu' exotiques, avec le procédés pour extraire les résines, &c. Paris, 4 vols. 8vo.

1802. *Hammer, F —— L* ——, and *Dietricht*. The first, formerly professor of natural history at Calmar and Strasbourg; he is author of several articles in the Journal d'Economie Rurale. Of Dietricht nothing is known.

Mémoires sur les Arbres qui peuvent être employés aux plantations le long des routes. 8vo.

1802. *Richard*, ——, an officer in the department of woods and forests.

Manuel du Forestier, ou Traité élémentaire, contenant le ballivage, le martilage, les ventes et exploitations des coupes annuelles, l'estimation d'icelles, leur récolement, l'aménagement, le bornement, et la regeneration des forêts, suivi du Traité des Pépinières, leur culture, semer, et plantations, appuyé par la pratique. Paris, 12mo.

1802. *Siegel*, ——.

Description Pittoresque des Jardins du goût le plus moderne, ornée de 28 planches. Leipsick, 4to. 1802.

1803. *Cubieres*, —— *Ainé*, an esteemed writer, member of the agricultural society of Versailles.

1. Mémoire sur le Tulipier, 8vo.
2. Mémoire sur l'Erable à feuille de chêne, ou *Acer Negundo*. Versailles, 8vo. 1804.

1803. *Francois, Nicolas*, born, in 1752, at Neufchâteau, which name is generally joined with his own. He has been successively a deputy, advocate, and judge; and for some years past has occupied himself much in agriculture. He was several years president of the Paris Agricultural Society, in which are a number of his papers.

Lettre sur le Robinier, connu sous le nom impropre de Faux Acacia, avec plusieurs pièces relatives à la culture et aux usages de cet arbre. Paris, 12mo.

1803. *Lorenz, J —— B* ——.

Manuel du Forestier, ou Traité complet de tout ce qui a rapport à l'Histoire Naturelle des Arbres. Strasbourg, 2 vols. 8vo.

1803. *Une Société des Savans.*

Bibliothéque des Propriétaires Ruraux, ou journal d'économie rural et domestique, &c. 8vo.

A periodical work begun in 1803, and of which 74 numbers had appeared up to May 1809.

1804. *Dubois, Louis*, born at Lisieux, in 1770, librarian of the department of l'Orne, member of various societies.

1. Du Pommier, du Poirier, et du Cornier, considérés dans leur histoire, leur physiologie, et les diverses usages de leur fruits, &c. Paris, 2 vols. 12mo.
2. Des Melons, et des leurs Variétés, considérés dans leur histoire, leur physiologie, leur culture naturelle et artificielle, &c. Paris, in 12mo.

1804. *Fanon*, ——, author of various works on rural economy.

1. Des Arbres à fruits, et nouvelle méthode d'affructer le pommier et le poirier, fondu sur 28 ans d'expériences consécutives. Paris, 12mo.
2. Causes du Dépérissement des Forêts, &c. 1806, 8vo. Supplément in 1811, 8vo.

1804. *Poinsot*, ——.

L'Ami des Jardiniers. Paris, 2 vols. 8vo.

1804. *Sonnini de Manoncourt, Charles Sigisbert*, born at Luneville, in the Department of Meurthe, in 1750; formerly an officer of the marine, a learned man, who travelled in Egypt and South America, and wrote a number of esteemed works. He was one of the principal writers in the Dictionnaire d'Histoire Naturelle.

1. Culture de la Julienne comme plante utile. Paris, 8vo. 1804.
2. Traité de l'Arachide, ou pistache de terre; contenant la description, culture, et usages de cette plante, &c. Paris, 8vo. 1808.

1805. *Anon.*

La Jardinier fidèle, qui enseigne la Manière de Semer dans toutes les Saisons toutes sortes de Graines et Plantes tant Fleurs que Potagères, par ordre alphabétique. Paris, 12mo.

1805. *Bastien, Jean François*, a bookseller of Paris, who put his name as the author of several books on agriculture which he procured to be compiled.

1. Calendrier du Jardinier. Paris, 12mo.
2. La Nouvelle Maison Rustique, &c. 8vo.
3. La Flore Jardinière, &c. 8vo. 1809.

1805. *Jaume, Saint Hiliaire*, a co-labourer with Jussieu in the Dictionnaire des Sciences Naturelles.

Exposition des Familles Naturelles, et de la Generation des Plantes. Paris, 4 vols. 8vo.

1805. *Leschevin, C.* member of the agricultural society of the Seine.

De l'usage de la Fumée dans les Vignes, contres les gelées tardives du Printems. Paris, 8vo.

1805. *Michaux, F—— A——*, a celebrated naturalist, who has travelled in North America, and published an account of the trees of that country.

1. Mémoire sur la Naturalisation des Arbres, Forestiers de l'Amérique Septentrionale, dans le quel on indique ce que l'ancien Gouvernement avait fait pour arriver à cet but, et les moyens qu'il conviendrait d'employer pour y parvenir; suivi d'un tableau raisonné des Arbres de ce Pays, comparé avec ceux que produit la France. Paris, 8vo.
2. Histoire des Arbres Forestiers de l'Amérique Septentrionale. 2 vols. 1810.
3. Histoire des Chênes de l'Amérique, ou Descriptions et Figures de toutes les espèces et variétés des Chênes cultivées dans l'Amérique Septentrionale, in fol. fig.

1805. *Roard, I. L.*, director of the dyers of the imperial manufactory.

Abrégé du Traité sur la Culture de la Vigne, avec l'Art de faire le Vin, et les Eaux-de-vie. Paris, 8vo.

1806. *Caylus, N—— de*, formerly inspector of the royal nurseries.

Histoire du Rapprochement des Végétaux. Paris, 12mo.

1807. *Cadet-de-Vaux, Antoine-Alexis*, born in 1743, a patriot, incessantly engaged in the interests of humanity, has founded, or led to the foundation of several useful establishments, and among others, of public nurseries in the departments. He translated the chemistry of Spielmann.

1. De la Restauration et du Gouvernement des Arbres à Fruits, mutilés et dégradés par la succession annuelle de l'ébourgeonnement et de la taille. Paris, 8vo. 1807.
2. Procédés de la Culture des Asperges de Hollande, Décade Philosophique. 6 Année.

1808. *Anon.*

Bibliothéque des Propriétaires ruraux et des Cultivateurs de tout genre, &c. 2 vols. in 12mo.

1808. *Anon.*

Manuel des Jardiniers, ou Guide des Travaux à faire dans les jardins pendant le cours de l'année, &c. Paris, 18mo. 400 pages.

1808. *Cherrier, J—— B——*, gardener at Wassy, in the department of Haute Marne.

Mémoire sur la Culture de la Vigne. 8vo.

1808. *Douette-Richardot*, cultivator (or yeoman) at Langres, who has planted extensively, and if not the inventor, was the first to publish in France the mode of cutting and felling trees by removing a part of the ground's surface, and cutting over close by the roots, or what the French term cutting "Entre deux terres."

De la Coupe des Bois entre deux Terres. Paris, 8vo.

1808. *Un Amateur.*

Traité complet sur le Jardin Potager, &c. avec une Grande Planche offrant les Plans, coupe et élévation d'une serre à legumes. Paris, 12mo.

1809. *Anon.*

Plantations des Routes et des Avenues, moyens de rendre les Plantations perpetuelles. Paris, 8vo. 1 plate.

1809. *Desfontaines, René*, professor of botany.

Tableau de l'Ecole de Botanique du Jardin du Roi. Paris, 8vo. 2d. edit.

181 . . *Germon* or *Gernon*.

Questions et Réponses sur les Vignes et sur les Vins de Champagne. Annales de Chemie, tom. 61.

181 . . *Lasteryie, Ch. Ph. Comte de*, an active patriot and philanthropist, author of various works on agriculture and general economy; but chiefly known by his treatises on wool, Merino sheep, and education.

Culture du Souchet, tuberculeux. Decade Philosophique. 7 Année.

181 . . *Harman, Jean.*

Sur l'explication du capitulaire de Charlemagne de Villis et Curtis, donnéz par le Comte Sereau. Mag. Encyc. 5th Année.

181 . . *Loisleur de Longchamps*, M. D., one of the compilers of "Le bon Jardinier." See *Anon.* 1770, and *Delaunay*, 1811.

Nouveaux Duhamel, ou Traité des Arbres, et Arbustes qu'on cultive en France en pleine terre. Paris, fol. 71 livraisons in 1815.

181 . . *Laborde, Alexandre Comte de.*

Description des Nouveaux Jardins de la France, et de ses Anciens Châteaux. Les Desseins, par C. Bourgeois. Paris, folio.

181 . . *Noisette, Louis Claude*, botanist and nurseryman at Paris, one of the compilers of *Le bon Jardinier*. *Anon.* 1770, and *Delaunay*, 1811.

1. Le Jardin Forestier, contenant l'Histoire, e la Culture des Arbres Forestiers, &c. Paris, 4to.
2. Le Jardin Fruitier. 12 livraisons. 4to. 1813.
3. Catalogue des Arbres Fruitiers. Paris, 4to. 1821.

181 . . *Sereau, J. B. E. B. Comte de.*

Le Jardin de Charlemagne, tiré de son capitulaire, &c. Mag. Encyc. 5th Année.

181 . . *Tournon.*

Sur la Culture de la Vigne dans la Guienne, (department de la Gironde.) Mag. Encyc. 9th Année.

181 . . *Lair, P. A.*

1. Description des Jardins du Courset. Paris, 8vo.
2. Notice sur M. Le Berriays, auteur du Nouveau de la Quintinie. 8vo.

1810. *Anon.*

Traité sur la Culture des Fleurs. Printed with Nouvelle Instructions façile pour la Culture des Figuiers. p. 165.

1810. *Kraft, J—— Charles*, a German architect and designer, author of an esteemed work on carpentery.

1. Plans des plus beaux Jardins Pittoresques de France, d'Angleterre, et d'Allemagne, et des edifices, monumens, fabriques, etc. qui concourent à leur embellissement, dans tous les genres d'architecture, tels que Chinois, Egyptien, Anglais, Arabe, Moresque, &c. Paris, imper. fol.
2. Recueil des plus Jolies Maisons de Paris, et de ses environs, comprenant les élevations intérieures, et extérieures de chaque maison, &c. Paris, folio.

1811. *Anon.*

Promenades, ou Itinéraire des Jardins de Chantilly, orné d'un plan et de vingt estampes qui en représentent les principales vues, dessinées et gravées par Merigot fils. Paris, 1 vol. 8vo.

1811. *Delaunay, Mordaunt*, one of the librarians of the Jardin de Plantes, principal editor of the following works. See *Anon.* 1811.

1. Le bon Jardinier. Paris, 12mo.
2. Figures pour l'Almanach du Bon Jardinier. 12mo.

1811. *Gallesio, George*, sub-prefect of Savonna, near Genoa.

Traité du Citrus. Paris, 1 vol. 8vo.

1811. *Lelieur de Ville-sur-Arc, Le Compte*, administrator-general of the parks, nurseries, and gardens of the king.

1. La Pomone Française, ou Traité de la Culture Française et de la taille des arbres fruitiers. Paris, 8vo. 8 plates.
2. Mémoire sur les Maladies des Arbres Fruitiers. Paris, 12mo. 1811.
3. De la Culture du Rosier. Paris, 12mo. 1811.

1813. *Guerin et Schwartz*.

Vues et description du jardin des plantes. Paris, folio.

1813. *Pelleport-Saune, M——*, member of the Toulouse Agricultural Society.

Traité de la Manière de planter, d'élever et de cultiver la Vigne. Toulouse, 1 vol. 8vo.

1814. *Percier, Charles*, et *P. F. L. Fontaine*, architects.

Choix des plus célèbres Maisons de Plaisance de Rome et de ses environs. Paris, fol.

This splendid work contains, in most cases, plans of the gardens attached to the villas.

1815. *Montpelier, A——*, cultivator in the department of L'Aude.

De la Culture des Arbres à Fruits. Castlenaudary, 8vo.

1815. *Malo, Charles.*

Guirlande de Fleurs, ou Origine et Histoire des jolies Fleurs qu'on cultive en France, &c. Paris, 18mo. 16 plates.

1815. *Mozard*, ——, propriétaire cultivateur at Montreuil, near Paris, a village famous for its peaches.

Principes Pratiques sur l'Education, la culture, la taille, et l'ébourgeonnement des arbres fruitiers, et principalement du Pêcher, d'après la Méthode de Pepin et autres Cultivateurs de Montreuil: ouvrage qui a obtenu deux Médailles d'Or de la Société Royale d'Agriculture du departement de la Seine. Paris, 8vo. 4 plates.

1816. *De Caumels.*

Tables Synoptiques des Charactères differentes de la Vigne. Touloux, 8vo. p. 235.

These tables are for the most part taken from Clementi's work, which De Caumels translated from the Spanish.

1816. *Du Petit, Thouars* Le Chevalier *Aubert Aubert;* director of the government garden of the minister of the interior.

1. Recueil de Rapports et de Mémoires sur la Culture des Arbres Fruitiers lue dans les séances particulières de la Société d'Agriculture de Paris. Paris, 8vo. plates.
2. Histoire d'un Morceau de Bois, précédée d'un Essai sur la Séve, considerée comme résultat de la végétation, &c. Paris, 8vo. 1 plate.
3. Le Verger Français, ou Traité Générale de la Culture des Arbres Fruitiers qui croissent en pleine terre dans les environs de Paris. 1 vol. 8vo.

1816. *Julien, A——*, author of the "Manual du Sommelier;" inventor of some instruments in use for the filtration of liquids.

Topographie de tous les Vignobles connus, &c. suivie d'une classification générale des vins. Paris, 8vo.

1816. *Jaunez, J—— P——*, of the city of Metz, engineer, and member of the Agricultural society of the department of Moselle.

Manual du Vigneron du Département de la Moselle. Metz, 8vo.

1816. *Thouin, Jean*, C. M. H. S. brother to the Professor, and to Gabriel Thouin; foreman of the Jardin des Plantes, Paris.

Mémoir sur l'Emploi de Mâchefer dans le Jardinage. 4to.

1817. *Lambray, M——*, nurseryman, at Mandres, in the canton of Boissy-Saint-Leger, in the department of the Seine and Oise.

Exposé d'un Moyen mis en pratique pour empêcher la Vigne de couler, et hâter la maturité du raisin. Paris, 8vo.

This author practices ringing when the vine is in flower, which he finds has the effects to which he alludes in his title.

1817. *Redoute, P—— J——*, painter of flowers to the *Classe de Physique* of the Institute and of the Museum.

Les Roses. Paris, fol. many coloured plates.

1817. *Regnault*, ——.

Notice sur la Nature et la Culture du Pommier, la qualité des Pommes, &c. Paris, 8vo.

1818. *Anon.*

Essai sur la Composition et l'Ornements des Jardins. 12mo. Paris.

1818. *Lalos, J——*, architect des jardins Anglois, in Paris.

De la composition des Parcs et Jardins pittoresques, ornée de planches par Reville. Paris, 1 vol. 8vo.

1818. *Pronville, Auguste de.*

Nomenclature raisonnée des Espèces, Variétés, et Sous-variétés du genre Rosier, observées au Jardin Royal des Plantes, dans ceux de Trianon, de la Malmaison, et dans les Pépinières des environs des Paris. Paris, 1 vol. 8vo.

1818. *Risso, A.* of Nice, and *A. Poiteau*, of Versailles.

Histoire Naturelle des Orangers. Paris, 2 vols. fol. many coloured plates.

1819. *Anon.*

Parterre de Fleurs, ou Origine et Histoire des plus jolies fleurs qui font l'ornement de nos jardins et de nos parterres, avec toutes les anecdotes et toutes les superstitions qui leur sont relatives. Paris, 18mo.

1819. *Anon.*

Hommage rendu à la Rose par les Poetes, anciens et modernes, précédé de l'Histoire de cette Reine des Fleurs chez tous les peuples. Paris, 16mo. 13 plates.

1819. *Bosc, Louis Auguste Guillaume*, F.L.S. H.S., inspector of the government garden at the Luxemburg; author of various articles in the Nouveau Cours d'Agriculture, and in other works.

Exposition du Plan de Travail adopté pour étudier et classer les diverses variétés des Vignes cultivées dans les Pépinières du Luxembourg. Journal de Physique, tom. 66.

1819. *Redouté, J. P.* painter of flowers, and *C. A. Thory*, a clerk in the office of the mayor of Paris.

Les Roses. Paris, folio, many coloured plates, 1 vol. completed.

1819. *Thouin, Gabriel*, cultivator and architect of gardens, brother to Professor Thouin, of the jardin des plantes.

Plans raisonnés de toutes les Especès de Jardins. Paris, folio, 50 lithographic plates.

1819. *Thory, Claude Antoine*, clerk in the office of the Mayor of Paris, member of several learned societies.

1. Rosa Candolleana, seu Descriptio novæ Speciei Generis Rosæ, dicata, Pyr. Aug. de Candolle à Cl. Ant. Thory, &c. addito Catalogo inedito Rosarum quas Andreas Dupont in horto suo studiose colebat, Anno 1813, cum Figuræ ænea picta. Paris, 8vo. 1819.
2. Rosa Redouteæ, seu Descriptio novæ Speciei Generis Rosa, dicata Petro Joseph Redoute, 8vo. Paris, 1817.
3. Prodromie et Monographie des Espèces et Variétés counues du Genre Rosier, divisées selon leur Ordre naturel, avec la Synonymie des noms vulgaires, un Tableau synoptique, et des Planches gravées en couleur. Paris, 1 vol. 12mo.

1819. *Viart*, ——, proprietor and creator of Jardins Pittoresque at the park of Brunehaut.

Le Jardiniste Moderne, Guide des Propriétaires qui s'occupent de la Composition de leur Jardins et de l'Embellissement de leurs Campagnes. Paris, 12mo.

1820. *Beaunier*, ——, author of a treatise on bees.

Le Guide des Propriétaires et des Jardiniers pour le Choix, la Plantation, et la Culture des Arbres, &c. Paris, 1 vol. 8vo. fig.

1820. *Chesnel, Marquis de.*

Histoire de la Rose chez les peuples de l'antiquité et chez les modernes; description des espèces cultivées; culture des Rosiers; et leurs diverses propriétés alimentaires et domestiques. Toulouse, 1 vol. 8vo.

1820. *Pierard, Charles Frances,* C.M.H.S.

Notes sur le Saugier ou Poirier de Sauge. Paris, 8vo.

1820. *Vibert, J—— P——.*

Observations sur la Nomenclature et le Classement des Roses, suivies du Catalogue de celles cultivées par J. P. Vibert. Paris, 8vo.

1821. *Calvert.*

Catalogue of Roses. Rouen, 8vo.

1821. *Lebret, M—— Isidore,* pharmacien et propriétaire rural.

Mémoires sur la Trappa Natans, ou la Châtaigne d'eau. Rouen, 8vo.

Subsect. 2. *Books on Gardening published in Germany, including Denmark and Switzerland, exclusive of Translations.*

2285. The Germans have an immense number of books on every subject, and in the gardening department are more especially prolific on the subject of planting and forests. We have made a selection, with a view to giving an idea of the progress of gardening in Germany, and also to include the books contained in the Banksian and other public libraries of this country. Every English work of merit is translated into German as soon as it appears, and the same may be said of the best works of France, and of every other country. Two of the most desirable books for giving an idea of the state of culture in Germany, are Dietrich's Wörterbuch, with the Supplement to 1820, 10 vols. 8vo., and Sickler's Deutsche Handwirtschaft. *Many* vols. 8vo.

849. *Anon.* ascribed to the learned Benedictine, Wallafrid Strabon, of the diocese of Constance, who died in 849.

Hortulus.

An elegant poem on the culture of plants and flowers.

1578. *Heresbachius, Conradus,* counsellor to the Duke of Cleve; was born in 1508, died in 1576. He wrote various theological works; besides his Rei Rusticæ libri IV., which was published in 1570, and his Legum rusticarum, et operarum per singulos Menses digesta, in 1595. The former was translated by Barnaby Gooch, of Lincolnshire, with the following title

Foure Bookes of Husbandrie, containing the whole art and trade of Husbandrie, Gardening, Graffing, and Planting, with the antiquitie and commendation thereof. Newly Englished, and increased by Barnabe Googe, Esquire. At London. 4to. 1578. Leaves 194, besides the Dedication, Epistle and Table at the beginning; and Olde English rules in verse, for purchasing Lande, at the end.

His authorities extend from the Bible and Doctors of the Church, through the Greek and Roman writers, Homer, Cato, &c. to the Moderns as low as Ruellius, Fuchsius, Mattholius, Cardanus, and Tragus. He subjoins a list of his friends and others, who assisted him. S. Nich. Malbee, M. Cap. Byngham, M. John Somer, M. Nicas, Yetzwert, M. Fitzherbert, M. Willi. Lambert, M. Tusser, M. Tho. Whetenhall, M. Ri. Deering, M. Hen. Brockhull, M. Franklin, H. King, Richard Andrewes, Henry Denys, William Pratte, John Hatche, Phillip Partridge, Kenworth Daforth.

The work is in dialogue. The persons are, Cono, a gentleman retired into the country; Rigo, a courtier; Metella, wife of Cono; and Hermes, a servant.

1597. *Peschelius.*

Garten Ordnung. Eisleben. 1597, folio, with wood cuts.

1620. *Caus, Salomon,* author of some works on perspective, hydraulics, and dialling.

1. Hortus Palatinus à Frid. Rege Boemiæ, Heidelbergæ extractus. Francf. fol.
2. Les Raisons des Forces mouvantes, avec divers Desseins de Fontaines. Paris. fol. 1624.

1630. *Clusius, Carolus,* (not the celebrated botanist of the proceding century).

Catalogi seminum, cum regulis circa eorum stationem. Printed with Herbario Horstiano, 385—414. Marburg. 8vo.

1631. *Laurenberg, Peter,* of Rostock, who died in 1639.

1. Horticultura et apparatus Plantarum. Frankfort, 4to.
2. De Horticultura libri duo, regulis observationibus, experimentis et figuris novis instructa, &c. Frankfort, 4to.

164. . . *Royer, Johann.*

Unterricht wie ein feiner lust-obst-und Küchengarten anzulegen, allerley schöne Gewächse darein zu zeugen, zu verpflangen, zu warten. Printed with this author's Beschreibung des Gartens zu Hessem. 45—96.

1647. *Vredmannus, Johannes Frisius,* a German architect, who published some works on his art.

De Hortorum, Viridiarumque, formæ elegantes. Col. 1647. fol.

1647. *Anon.*; attributed to Stengeline.

Hortorum, florum et arborum historia. Munich, 2 vols. 12mo.

1662. *Jonston, Johann,* born at Sambter, in Poland, in 1603, died on his estate at Ziebendorf, in Silesia, in 1675; a learned naturalist, author of several works which have been collected in six folio volumes.

Dendrographia, sive historia naturalis de arboribus et fructibus, tam nostri quàm peregrini orbis, libri x. Frankfort, fol. et figuris æneis, 1662.

1663. *Elsshols, John Sigismond,* an eminent Prussian botanist, was born at Frankfort on the Oder 1623, practised with great reputation as court physician at Berlin, and died in 1688.

1. Flora Marchiæ, or a Catalogue of Plants, cultivated in the principal gardens of Brandenburg. Berlin, 8vo.
2. De Horticultura. Berlin, 4to. 1682.
3. Vom Garten-bau, oder Unterricht von der Gärtnerey auf das Clima der Chur-Marck Brandenburg, wie auch der benachbarten eutschen Länder gerichtet. Berlin, 4to. p. 395. plates, 1684.

1671. *Hiebern, John Christian.*

Horticultura.

1695. *Packbusch, Stephanus Ludovicus,* author of some medical works.

Dissertatio de varia plantarum propagatione. Leipsic, 4to.

1696. *Anon.*; attributed to Tschiffeli.

Ecole des Jardiniers, où l'on apprend à semer des arbres fruitiers, à les mettre en Pépinière, &c. Berne, 12mo.

1697. *Stisser, John Andrew.*

Botanica Curiosa, oder Anmerckgunen, wie einige fremde Kräuter in seinem garten bishero cultiviret. Helmstadt, 8vo. p. 244. 12 plates.

16... *Anon.*

Ein neues Garten-Baum und Holz-Büchlein. 8vo. p. 112.

1700. *Volkamer, Johann Christoph*, a physician in Nuremberg, and the director of the botanic garden there.

1. Nurnbergische Hesperides. Numb. fol.
2. Hesperidum Norimbergensium sive de Malorum Citreorum Limonum, Aurantiorumque cultura et usu, libri 4. Norimbergæ, fol.

1702. *Siegelsteiner, George.*

Wohlfundirte Zwergbaum Schule, oder Unterricht wie die Zwergbäume beschnitten werden. Frankfort-on-the-Maine, 8vo. p. 124. plates.

1702. *Anon.* thought to be F. C. Weber, who translated Quintinie's works.

Gründliche Anweisang zu eimer wohleingerichtete Baumschule. Hamburgh, 8vo. p. 120, 12 plates.

1703. *Anon.*

Eines Chur-Fürstlichen Kunstgärtners Garten memorial, samt einem catalogo der Gewächsen. Leipsic, 8vo.

170.. *Schmersall, Elias Frederick.*

Abhandlung von dem Baumschnitte. Hamb. Mag. 10 band, 4266.

1712. *Waldtschmidt, Wilhelmus Huldericus.*

Programma de industria œvi hodierni, qua propagatio plantarum, veterum circa res hortenses occupationes post se relinquit. Kiel, 1712.

1713. *Hesse, Henry.*

Neue Garten-Lust. Leipsic, 4to. p. 389, plates.

1715. *Anon.*

Historischer und verständiger Blumengärtner, und von Anlegung, Wartung und Pflegung eines Baum und küchen-gartens. Leipsic, 4to. p. 783, 21 plates.

170.. *Agricola, George Andrew*, author of several agricultural works, which have been translated into French and English.

1. The Artificial Gardener, translated from the German. London, 1717, 12mo.
2. Philosophical Treatise of Husbandry and Gardening, &c. translated from the German, by Bradley. London, 4to. cuts, 1721.

There is a volume on planting "by Agricola," of which Dr. Anderson (see Sect. 1.) is the author.

1735. *Deuso, Johann Daniel*, author of a naturalist's calendar, and some other works.

Von Anlegung und Vermehrung wilder Obstbäume. Printed in his Beyträge zur Naturkunde. Berlin, 7 stuk. p. 690—627. 1752 to 1765.

1738. *Krause, L. Ph.*

Kluger und sorgfältiger Gärtner. Leipsic, 8vo.

1741. *Ungehauer, John Andrew.*

Dissertatio de cultura plantarum. Leipsic, 4to.

1750. *Lehmann, John Christian.*

Vollkomner Blumen-garten in Winter. Leipsic, 4to. p. 71, 1 plate.

1750. *Grotjan, John August.*

1. Physikalische Winter-belustigung mit Hyacinthen, Jonguillen, Tazzetton, Tulipanen, Nelken und Leucojen. Nordhausen, 8vo. p. 120.
2. Ergötzlige Sommerbelustigung, &c. mit Garten Kalendar. Nordhausen, 2 vols. 8vo. 1759.

1750. *Seligmann, J. Mich.*

1. Abbildung des lieblichsten Blumen mit Beschreibung. Nuremburg, fol.
2. Hortus Nitidissimus. (By Seligmann and Cp. Jac. Trew.) Also in German. Leipsic, folio, many plates.

1751. *Riedel, J. Cp.*

Vermehrtes Garten-Lexicon benebest nützlichen Garten Kalendar. Nordhausen, 8vo.

1753. *Gesner, John*, a canon of Zurich, and professor of mathematics and natural philosophy in that university, was born in 1709. He studied at Leyden and Basle, where he contracted an intimacy with Haller; and their epistles have been printed. He died in 1790. Gesner published two dissertations on plants, in 1741, in which he announced the new system of Linnæus, of whom he says, that he was a man destined to reform all natural history. Besides these he was the author of eleven dissertations, published under the title of "Phytographia Sacra." He also wrote on extraneous fossils; and compiled an index to Weinman's "Phytographia." But he was grossly imposed on, as well as Haller, by the present of a meadow crowfoot, on the branches of which the flowers of the daisy had been so neatly fastened as to escape detection till after Gesner's death. Of this rarity he published a description, in a learned discourse on vegetable monsters, entitled, "De Ranunculo Bellidifloro." The cheat was discovered by Sir Joseph Banks, who procured a specimen, and separated the parts by the application of steam.

1. De Ranunculo Bellidifloro, et de Plantarum generibus. Zurich, 4to.
2. Theses Physicæ Miscellaneæ speciatim de Thermoscopio Botanico. Zurich, 1755, 4to.
3. Vom Gebrauche des Thermoscops Thermometer bey Wartung der Pflanzen. Hamburg Mag. 16 band. p. 288.

1753. *Reichard, Ch.*

Land-und Gartenschats. Erfurth, 8vo.

A new edition in 1802, by J. Volkmer Sickler.

1761. *Boehmer, George Ralph*, professor of botany and anatomy at Wittemberg, was born in 1723; studied under the celebrated Ludwig; wrote various botanical works, and died in 1803.

1. Programmata, De serendis vegetabilium seminibus monita. Wittemberg, 4to.
2. Bibliotheca scriptorum historiæ naturalis, œconomiæ, aliarumque artium et scientiarum ad illum pertinentium realis systematica. Leipsic, 1785-89. 9 vols. 8vo.

This is considered a very valuable work.

1761. *Schaffer, Jac. Ch.*

Der wunderbare Eulentzwitten nebst der Baumraupe, ans welcher derselbe entstanden, &c. Regensburg, 4to. plates.

1764. *Plaz, Anthony William*, author of a tract on vegetable physiology, published in 1745.

Programma de plantarum sub-diverso cœlo nascentium cultura. Leipsic, 4to. p. 13.

1765. *Gleditsch, John Gotlieb*, a naturalist, was born at Leipsic in 1714. He took his doctor's degree in physic at Frankfort on the Oder, where he was appointed professor of botany, physiology, and medicine. He was also a member of the Academy of Sciences at Berlin, and died in 1786.

1. Vermischte Physicalisch-Botanisch-Œconomische Abhandlugen. Halle, 1765-67, 3 theil, 8vo.
2. Pflanzenverzeichniss zum Nuzen und Vergnügen der Lust-und Baumgärtner, nebst Anmerkungen, die deren Pflege, Vermehrung, Pflanz und Blütezeit betreffen. Berl. 1773, 8vo.
3. VollständigeTheoretisch-Praktische Geschichte aller in der Azeny, Haushaltung und ihrer verschiedenen Nahrungszweigen nüzlich befundenen Pflanzen. Berl. and Leips. 1777, 8vo.

4. Ueber die Ursachen einer unsichern Verpflanzung der bereits erwachsenen Fichten und Wachholdern, aus ihren natürlichen Standplåsen, in unsern Heyden. In his Phys. Botan. Œcon. Abhandl. 1 theil, p. 39—57.

5. Gedanken über die Fragen: durch was für Wege geschiehet die Hauptvermehrung des wilden Holzes in unsern Forsten am besten? und welches st die vorgüglichste Art, die Eichen zum Nuzen des Forstwesens zu säen? Ib. 69—93.

6. Systematische Einleitung in die neuere Forstwissenschaft. Berlin, 1775, 8vo. 2 vols.

1765. *Rettelet*, *K. Cp.*

Praktischer Beweis dass die Mathesis bey der Forstwessenshuft unentbehrliche Dienste thue. Eisenach, 8vo.

1766. *Cramer*, *John Andrew*, a metallurgist, was born at Quedlinburg in 1710, and died in 1777. He was the first who formed the art of assaying into a system.

Anleitung zum Forstwissen. Brunswick, fol. p. 200, 60 plates.

1768. *Von Brocke*, *Henrich Christian.*

1. Wahre Gründe der Physicalischen und experimental Allgemeinen Forstwissenschaft. Leipsic, 1768-75, 4 vols. 8vo.

2. Beobachtungen von einigen Blumen deren Bau, und Zubereitung der Erde. Leips. 1771, 8vo.

1768. *La Societé Œconomique de Berne.*

Traité des Arbres Fruitiers, extrait des meilleurs auteurs. Paris, 12mo. Translated from the German.

1768. *Lüder*, *Fr. Hm. H.*

1. Briefe über die Bestellung eines Küchengartens in Niedersachsen. Hanover, 3 vols. 8vo.

2. Nachricht von Anbau und Erhaltung des grünen Kohls in Winterzeit. Flensburg, 1772, 8vo.

3. Briefe über die Anlegung und Bestellung eines Blumengartens. Hanover, 1777.

1771. *Münchausen*, *O. F. von.*

Monatliche Beschäftigung für Baum-und-Plantagen Gärtner, &c. Hanover, 8vo. plates.

1771. *Henne*, *Sm.* D.L.

Anweisung wie man eine Baumschule von Obstbäumen in Grossen Anlegen soll. Halle, 8vo.

1771. *Ossenfelder*, H.A.

Vom Weinbau in den sächsischen Landen. Dresden, 8vo.

1773. *Hirschfeld*, *Ch. Cai. L.*, counsellor to his Danish Majesty, and professor of the fine arts at Kiel.

1. Remarques sur les Maisons de Campagne et l'Art des Jardins. (Also in German.) Leipsig, 12mo.

2. Théorie de l'Art des Jardins. (Also in German.) Leipsig, 8vo. 1775.

3. Théorie de l'Art des Jardins. (Also in German.) 6 vols. 4to. many plates. Leipsic and Amsterdam, 1777 to 1782.

In the Gazette Littéraire de l'Europe, for January 1781, it is said of this work, that reading it "expands the heart, exalts and ravishes the soul, so much so that one would say, pleasure had taken the pencil and painted the most agreeable scenes, to recall the idea of the charms of the finest day."

4. Gärtenkalender, Hambugh, 16mo. plates. 1782 to 1790.

5. Gärtenbibliotheke. Kiel, 8vo. 1790.

6. Handbuch der Fruchtbaumzucht. Brunswick, 1788, 2 vols. 8vo.

7. Über die Verwandtschaft der Gartenkunst und der Malery (im gothaish. Magazine.)

1773. *Krause*, *Ch. L.*

Fünfzigjährige erfahrungsmässige Unterrichte von der Gärtnerey. Berlin, 2 vols. 8vo.

1774. *Glaser*, *J. F.*

Physikalishe ökonomische Abhandlung von den schädlichen Raupen der Obstbäume und bewährten Hülfsmitteln, solche abzuhalten. Leipsic, 8vo.

1775. *Weiss*, *Frederick William*, author of Floræ Gottingensis, and other botanical works.

Entwurf einer Forstbotanick. Gottingen, 1 vol. p. 358. Eight plates.

1775. *Saussure*, *Nicolas de*, father of the famous natural philosopher (Horace Benedict de Saussure), was born in Geneva, in 1709, and died in 1790. He devoted himself to agriculture, and obtained a prize from the Œconomical Society of Auch, for a memoir on the subject.

1. Manière de Provigner la Vigne sans engrais. 8vo.

2. Le feu, principe de la fécondité des plantes et de la fertilité des terres. 8vo. 1783.

3. Essai sur la Taille de la Vigne; et de la Rosée. 8vo. 1780.

1776. *Mayer*, or *Meyer*, *John*, gardener to the Bishop of Wurzburg, in Franconia. He appears to have worked some time in the royal gardens at Paris, and to have travelled in England. His work is understood to have considerably promoted the culture of fruits in that part of the country where he lived.

1. Pomona Franconica, ou Description des Arbres Fruitiers, les plus estimés en Europe, de la cour de Wirtemberg. 3 vols. 4to. Fr. and Ger. 264 plates.

2. Pomona Franconia, ou Description des Arbres Fruitiers, les plus estimé en Europe, qui se cultivent, maintenant au Jardin de la cour de Wurzburg. Nuremberg, 2 vols. 4to. fig.

1776. *Schmidt*, *J. Ch. E.*

Geprüfte Anweisung zu der Erziehung, Pflanzung und Behandlung der Hochstämmen und Zwergfruchbäume. Manheim, 8vo.

1776. *Von Dieskau*, *Christian John Frederick.*

1. Das regelmässige Versezen der Bäume in Wäldern und Görten. Meiningen, 8vo.

2. Vortheile der Gärtnerey, &c. Coburg, 2 vols. 8vo.

177. . *F. A. M.*

Gedanken über diejenigen Unterhaltunganstalten, die durch Holzsaat, und das Anflanzen in unsern Waldungen, nach der Natur derselben, unserer Kameralverfassung und dem Holzhandel geschehen können. Berlin in Gesch. Naturf. Fr. 2 Band p. 307.

177. . *Anon.*

Anleitung für die Landleute in Absicht auf die Pflanzung der Wälder. Abhandl. der Naturforscher Gesellschaft in Zurich. 3 B and p. 205-266.

1777. *Anon.*

Die beste Art und Weise Ananas zu pflanzen, aus einer französischen Handscrift übersetzt; or, The best manner to plant ananas, and to keep them through summer and winter in vineries and frames, so as to obtain ripe fruit; with a correct description of the insects, and particularly of the Coccus Bromelia, or the ananas' shield, which is so injurious and even deadly to this noble plant; and a sure method of destroying them. With three plates. Translated from a French manuscript. Stutgard, 8vo. 1778. A plate of a pine and grape-house, one of pits for pines, and one of the Coccus Bromelia.

It is chiefly an abridgment of La Court's Directions for Cultivating the Pine Apple. See Dutch authors on gardening, A. D. 1737.

1777. *Anon.*

Briefe über den English-Chinesishen Gärten zu Marienwerder bey Hanover.

1777. *Hiltenbrand*, *Ant.*

Œstericher Weinkatechismus, oder kurzer Unterricht von Weinbau in Œstreich. Vienna, 8vo.

1778. *Anon.*

Beschreibung des Pallasts und Gärtens von Rheinsberg, Berlin.

1778. *Mayer*, *J. F.*

1. Von Gartenbau. Frankfort on M. 8vo.

2. Der Maykäfer als Wurm und Vogel, in Gär-

ten, auf Ækern, und auf Wiesen, &c. Nurenburg, 8vo. 1768.

1778. *Voch.*

Erste Gründe fur Gartenrisse. Augsb. 8vo.

1779. *Walther, I. Iac.*

Praktische Anleitung zur Gartenkunst; oder des Schwäbischen Gärtners getreuer Unterricht. mit einem dreyfachen Gartenkalendar. Stutgard, 8vo. plates.

1779. *Weismantel, J. N.*

Blumisterey. Leipsic, 8vo. plates.

1780. *Faudel, Fredericks Gulielmus.*

Specimen inaug. de Viticultura Richovillana Argent. 4to. p. 30.

1780. *Götz, J. F.*

Anweisung zur vortheilhaftigen Anlegung der Baumschulen, Baum und Küchengarten, auf dem Lande, &c. Altenburg, 8vo.

1780. *Feuereisen, K. Glo.*

Praktische Abhandlung ueber einige wichtige Gegenstände in der schönen Gartnerey; nebst einem Anhang von einigen in Gärtenhäusern, Mistbeeten und in freyen Gärten befindlichen fruchten. Han 8vo.

1781. *Beckmann, John*, professor of economy in the university of Göttingen, was born at Haye, in the kingdom of Hanover in 1739; he wrote a number of works, but is best known by his History of Inventions. After a life of great industry and usefulness, and loaded with academical honors, he died in 1811.

1. Gartenblumen, in his Geschichte der Erfindungen, 2 band, p. 296-308.
2. Versuche und Erfahrungen über die Kunst Holz zu säen. Leipsic, 2 vols. 8vo.

1781. *Salzmann, F. Z.*, gardener to Frederick II. of Prussia, at Potsdam.

1. Gründliche Anweisung wie man allerley Küchengewächse und Spicerey Kräuter durch das ganze Jahr zu behandeln hat.
2. Pomologie. Berlin, 1774.

1781. *Märter, Fr. Jos.*

Verzeichniss der oesterrichen Bäume, Stauden und Buschgewächse, mit Kurzgefeatsten Anmerkurgen über die Natur und ökonomische Geschichte deselben. Vienna, 8vo.

1782. *Ehrhart, Frederick.*

Garten Anmerkungen. Printed in the Hanover Magazine, p. 529. 524.

1782. *Medikus, Frederick Kasimir*, author of a number of works on botany and natural history.

1. Beiträge zur schönen Gartenkunst. Manheim, 8vo. p. 378.
2. Anmerkung über die Versuche, ausländischer Bäume und Sträuche an unsern Himmelsstrich anzugewöhnen.
3. Bemerkung der Kuhrpfältzischen. Phys. ökon. Gesellsch, 1778, p. 29—61.
4. Versuche über die beste Art der Anpflanzung, oder auslandische Bäume an unsern Himmelsstrich anzugewöhnen. Ib. 1780, p. 131—177.
5. Von dem Einflusse der strengen Winter der drei Jahre von 1782 bis 1785 auf die Kultur fremder an unsern Himmelsstrich angewöhnter, oder anzugewöhnender Bäume und Sträucher, &c. Vorles. derselb. Ges. 1 Band, p. 39—176.
6. Ueber das Ausdaurungsvermögen des Cannacorus in freyer Luft. Usteris Annalen der Botanick, 13 stuck, p. 39—43.
7. Briefe über die Robinia, 12mo. 1804.

1783. *Von Wilke, G. W. Cst.*

1. Sammlung der wichtigen Regeln in der Küchengärtnerey, nebst häuslicher Benutzungslehren. Halle, 8vo.
2. Sammlung der witchtigen Regeln in der Baumgärtnerey. Leipsig, 1783.
3. Handbuch für Lustgärtner und Blumenfriende. Halle, 8vo. 1785.

1783. *Von Burgsdorf, Frederick Augustus Louis.*

1. Von den eigentlichen Theilen und Grenzen der systematischen Forstwissenschaft. Berlin, in Ges. Naturf. Fr. 4 band, 99.
2. Versuche einer vollständigen Geschichte vorzüglicher Holzarten. Berlin, 2 vols. plates.
3. Anleitung zu sicherer Erziehung und Zweckmassiger Anpflanzung der einheimischen und fremden Holzarten, welche in Deutschland im freien. fortkommen. 2 theile, Berlin, 1795, 8vo.

178 . *Heppe, John Christopher.*

Von der Forstkentniss. Printed in his Jagdlust. 3 theil, p. 351—754.

1783. *Klüpfel, I—— Alb. ——.*

1. Journal für die Gärtnerey.
2. Vortheile zur Erziehung eines guten Nelkensaamens. Stutgard, 1780, 8vo.

1784. *Von Vothman, J. G.*

1. Wartung und Anlegung des Spargels. Fleusburg. 8vo.
2. Oekonomischer praktischer Gartenkatechismus. Leipsic, 2 vols. 8vo.

1784. *Plenck, Jos. Jacques*, M. D., a physician at Vienna, author of a number of medical works, and of some on botany.

Bromatalogia, seu Doctrina de Esculentis et Potulentes. Vienna, 8vo.

1784. *Anon.*

Vues du Chateau et du Jardin de Ludwigslust, 12 plates, fol.

1785. *Anon.*

Beschreibung der Gärten für Ehre deutscher Kunst und deutschen Geschmacks. Altona. 8vo.

1786. *Seidel, Cp —— F.*

1. Kurze Anweisung den Spargel zu bauen. Erlangen, 8vo.
2. Blumengärtner Kalender. Leipsic, 8vo. 1790.

1788. *Schmahling, L. Cp.*

Aesthetik der Blumen. (The sublime of flowers.) Dessau, 8vo.

We have no English word answering exactly to the German term Aesthetik; which means the highest degree of refinement or perfection, to which the thing to which it is applied, can be carried.

1786. *Anon.*

Collection choisie des Plantes et arbustes, avec un Abrégé de leur Culture. Zurich, 4to. fig.

1786. *Kob, J. And.*

Die wahre Ursache der Baumtrockniss der Na delwälder durch die Naturgeschichte den Er phalaene (Phal. noct. Pinip. L.) erwiesen und durch einen Versuch erläutert. Nurenberg, 4to. 3 plates.

1787. *Gmelin, John Frederick.*

Abhandlung über die Wurmtrockniss. Leipsic, 8vo.

1788. *Samrow, Cp. L.*

Verfahrung einer praktischen Anleitung zum Teltower Rübenbau. Berlin, 8vo.

1788. *Gerthing, Joseph.*

Gedanken, Wünsche und Vorschläge zu Emporbringung der nutzbaren Gärtnerey. Jena, 8vo.

1798. *Ranfft, J. F.*

1. Beschreibung einer sehr vortheilhaftigen Nelken und Aurikel-Stellage. Freyburg, 8vo.
2. Bemerkungen und Regeln über die Cultur und Charakter der Aurikel. Bey J. F. Ranfft. J. Tim. Val. Seelig und J. Sm. Schröter. Erfurth, 8vo. 1800.

1788. *Anon.*

Theorie der Gartenkunst. Iter Heft enthält den Bau der Tempel Pavillions, &c. Prag and Wien, 8vo.

1788. *Rode.*

Ground Plan of the Garden of Wörlitz. Dessaux, 8vo. plates.

2. Der Garten zu neu Waldeck mit den Grund Plan des Gartens zu Wörlitz, 1788.

1789. *Etler, J. Ch.*

1. Die Farben der Nelken unter gemeinschaftlichen Namen vorgestellt, nebst Angabe eines Mahlers Verfahren beym Nachcopiren. Gera, 8vo. 1 plate.

2. Berühmte Nelkensammlung nach der Natur gezeichnet; mit Erklärung unter alter und neuer Classification, &c. Leipsic, 8vo. 1805.

1790. *Anon.*

Einige Bemkungen über die Gärten in der Mark Brandenburg. Berlin, 8vo.

1790. *Von Sierstorpff, Kp. H.*

Einige Bemerkungen über die im Winter 1788 und 1789. erfrornen Bäume. Brunswig, 8vo.

1790. *Gurnth, Amelia.*

1. Gartenökonomiefür Frauenzimmer. Zoll, 4 vols. 8vo.

2. Gartenfreundinn. Glogau, 8vo. 1807.

1790. *Feige, K. Theodore, L.*

Anweisung zum Vertilgen des schädlichen Blüthenwicklers, nebst einer Beschreibung von mehrern shädlichen Obstraupen. Berlin, 8vo.

1791. *Römer, John Jacques.*

Garten der Flora, oder Beschreibung und Abbildung verschiedener Pflanzen für liebhaber der schönen Gartenkunst. Winterthurm, 4 vols. 8vo.

1792. *Müller, J. G.*

Deliciæ Hortensis, oder vollständiges Gartenbuch nebst einem Anhang Baumschulen anzulegen. Stutgard, 1772.

1792. *Kraft, John.*

1. Abhandlung von den Obstbäumen, 2 thiel. Vienna, 8vo.

2. Pomona Austriaca, oder Abbildung von 576, Obstguttungun in der Verfassers Pflanzenschulen, zu Wabring und Weinhaus. Vienna, 18 parts, 4to. many plates.

1792. *Huber, Cand.*

1. Den Ebersberg Holzbibliothek.

It consists of 100 boxes in the form of books of as many different sorts of wood; each book contains specimens of the bark, leaves, blossoms, twigs, seeds, timber, and charcoal of the particular wood or tree designated.

2. Esläutung zu Hubers Holzcabinet, &c.

This explanation and the books are sold at Munich.

1793. *Mayer, J. Jac.*

Physische ökonomische Baumschule; nebst einer Anweisung zur wilden Baumzucht für das kleine Nutzholz in der Landwirthshaft, auch von Anpflanzen und Abholzen der Weiden. Stettin, 8vo.

1793. *Anon.*

Rettungsmittel bey Obst-und-Waldbäumen und anderen Gewächsen, die im Winter der Gefahr des Erfrierens ausgesetzt sind. Leipsic, 8vo.

1793. *Von Hass, J. Ad.*

Beobachtungen über den Rinden und Borkenkäfer, &c. Erlangen, 8vo.

1793. *Bernstein, J. Glo.*

Antitypographus, oder Widerlegen der Meynung, dass die Borkenkäfer an der Trockniss der fichten-Waldungen schuld sey. Leipsic, 8vo.

1794. *Anon.*

Anweisung für Anlegung der Gärten im Englischen Geschmack. Leipz. 4to. plates.

1794. *Anon.*

Würdigung und Veredlung der regelmässigen Gärten oder Versuch die nach dem franfösischen Geschmach angelegten Gärten nach den Grundsätsen der Englischen Gartenkunst zu bearbeiten. Leipsig, 8vo.

1794. *Anon.*

Beschreibung deutscher Gärten. Frankfort am Main.

1794. *Sickler*, the Rev. *T. Volkmar*, who maintains a nursery for the propagation and sale of fruit-trees.

1. Der Teutsche Obstgärtner. 2 bände. Weimar, 8vo.

2. Gärten memorandum für Liebhaber, welche ihren Gartenbau entweder selbst besorgen, oder doch richtig überschen und leiten wollen. Rudolst, 8vo. plates.

3. Pomological Cabinet enthält alle im deutschen Obstgärtner beschriebenen Früchte, &c. (A collection of models in wax of all the fruits in Germany, made under his direction, and sold in collections, &c.)

4. Die deutsche Landwirthschaft. Erfurth, many vols. 8vo. with plates.

5. Allgemeines deutsches Gartenmagazin, &c. Weimar, 8vo. 1804.

6. Des Kurfürst Augusts zu Sachsen köstlich Obstgartenbüchlein. (Printed from the edition of 1620.) Weimar, 8vo.

1794. *Leibitzer, J.*

1. Vollständiger Gartenkalendar nach den vaterländischen Klima und der Natur der Gewächse entworfen. Vienna, 8vo.

2. Vollständiges Handbuch der Küchengärtnerey. Vienna, 8vo. 1797.

3. Vollständiges Handbuch der Obstbaumzucht. Vienna, 8vo. 1798.

4. Praktisches Handbuch du Zwergbaumzucht und Obst-Orangerie, für alle die sich damit beschäftigen wollen, &c. Leipsic, 8vo.

1795. *Anon.*

Taschenbuch für Natur und Gartenfreunde. Tübingen, 1795-1806, 8vo. plates.

1795. *Beckstedt, I. Kp.*

Der Küchengartenbau für die Gärtner und gartenliebhaber. Schleswig, 8vo.

1795. *Schiller, I. Kp.*

Baumzucht im Grossen, aus 20 yährlicher Erfahrung im Kleinen. Giessen, 8vo.

1795. *Albonico, J. H.*

Nützliche Bemerkungen für Garten und Blumenfreunde, &c. Leipsic, 8vo.

1795. *Becker, W. Glo.*

Taschenbuch für Natur und Gartenfreunde. Leipsic, 1795 to 1799.

1795. *Ideler, G. F.*

1. Der Gartenfreund, oder Inbegriff des Wesentlichen aus allen Theilen der Gartenkunst. (The preface by Willdenow.) Berlin, 8vo.

2. Plan zu Verbesserung der Obstkultur in der Kurmark. Berlin, 8vo. 1800.

3. Brieffe über die wirthschaftliche Obstbaumzucht. Berlin, 8vo. 1802.

4. Die wirtschaftliche Gärtnerey in Briefen. Berlin, 2 vols. 8vo. 1798.

1796. *Kirchner, I. F.*

Praktische Anweisung zur Gartenkunst, besonders Treibung, Ananasse, &c. Leipsic, 8vo.

1796. *Geiger, Fr. X.*

1. Kurtzer Unterricht in der Baumgärtnerey; eine gekrönte Preischrift. Vienna, 8vo. 1796.

2. Die Baumzucht. Munich, 8vo. 1804.

1796. *Genssler, Ch. Jac.*

Der Maykäfer und seine Larve, &c. nebst der Mitteln, ihre schädliche Wirkungen zu mindern. Gotha, 8vo.

1796. *Neuenhahn, K. Ch. Adf.*

1. Annalen den Gärtnerey. Erfurth, 1796 to 1800, 12 parts.

2. Die Blumenzwiebel-Grätnerey; oder Beschreibung von allen auf der Erde bekannten lillienarten Gewächsen, nebst Anzeige ihrer Cultur, (in Alphabetischer Ordnung.) Leipsic, 2 vols. 8vo. 1804.

3. Ueber die Aurikel-Systeme; nebst Versuchen einer ganz neuen Classification der Aurikel. Frankenheim, 1791, 8vo.

1796. *Von Derczen, J.*

Ueber Tokays Weinbau, dessen Fechsung und Gährung mit geognostichen Beylagen. Vienna, 8vo.

1797. *Müller, J. C. F.*

1. Der vollständige Monatsgärtner, oder deutliche und vollständige Anweisung zu allen Geschäften im Baum-Kuchen und Blumengarten. Frankf. on the Maine, 8vo.

2. Deutschländischer Weinbau nach Gründen, &c. Leipsic, 8vo. 1803.

3. Anweisung zu Zweckmässiger Behandlung der Obst und Gemüsegartens, nebst einem Anhangvon-Blumen. Frankf. on M. 8vo.

1797. *Siemssen*, *Adf. Ch.*

Naturgeschichte der grossen Tannenraupe. Schwerin, 8vo.

1797. *Jacob*, *R.*

Oekonomisches Handbuch zur Beförderung des frühen Anziehens der Gemüse-und Obstgärten in Mistbeeten und Treibhäusseem, mit dem nöthwendigen Luftmaase-stahl und ständliche Wettertabelle versehen. Frankfort on the Maine, 8vo. 4 plates.

1798. *Spitz*, *Ans. Cp.*

1. Ueber Erziehung guter und neuer Obst-und Spielarten aus Kernstämmen. Erfurth, 8vo.

2. Bemerkung über die durch das Abschälen der Baumrinde vermehrte Fruchtbarkeit der Bäume. Erfurth, 8vo. 1802.

1798. *Achard*, *Franz. Karl*, director of the physical class in the Royal Academy of Sciences, Berlin.

Ausführliche Beschreibung der Methode, nach welcher bei der Kultur der Runkelrüben verfahren werden muss, um ihren Zukkerstoff nach Möglichkeit zu vermehren, und sie so zu erhalten, das sie mit Vortheil zur Zukkerfabrikazion angewerdit werden kann. Berlin, 8vo. 63

Translated in Nicholson's Journal, vol. iii. 237.

1798. *Grohmann.*

1. Schöne Gartenkunst. Leipsig, eight plates.

2. Ideemagazin für Liebhaber von Gärten und Englischen Anlagen. 60 Hefte. Leipsig, 1779-1305, 4to. plates.

3. Kleines Ideemagazin oder Sammlung von Ideen die mitwenig Kosten aus zuführen, &c.

This work may also be had in French under the following title: Magasin petit, ou recueil d'idées peu dispendieuses à exécute. Leipsic, fol. 12 cahiers. plates.

4. Plans nouveaux pour distribuer et orner des petits Jardins. Leipsic, folio.

1798. *Anon.*

Nelkenflor, oder nach der Natur gemaltes Verzeichnis aller schönen und guten Sorten Nelken. Meissen, 8vo.

1798. *Hildt*, *I. Adf.*

Sammlung inheimische und ausländische Holzarten, zur technologische Kenntnisse, Charakten und Waarenkunde aller kunst farb und apothekhölser. Weimer, 4to.

Sold with 144 specimens of woods, of two inches in length each, for 14 dollars, or of five or six inches long each, for 36 dollars. See 1792. *Huber.*

1798. *Gatterer*, *Cp. W. Jac.*, author of a work on zoology.

Forst Kalendar, oder Verzeichnis den Verrichlungen in jedem Monate. Ulm, 8vo.

1798. *Dallinger*, *Prosp.*

1. Vollständige Geschichte der Borkenkäfers, Fichtenkrebses, oder sogennanten schwartsen Wurms. Weisenbach, 8vo.

2. Gesammelte Nachrichten und Bemerkung über die Fichtenspinner oder die Baumraupe Phalaena: Bombyx pini, Linn. Weisenbach, 8vo. 3 plates.

1798. *Jordens*, *J. H.*

Geschichte der kleinen Fichtenraupe, oder der Larve von der Phalæna Monacha, Linn; mit Beyträgen zur Berichtigung der Ausrottungsmittel dieser Waldverheererin. Hof. 4to. plates.

1798. *Zoph*, *K.*

Die Nonne im Walde und ihre Schwestern; kein Roman. Leipsic, 8vo.

1798. *Bretschneiden*, *K. Beat.*

Beytrage zur Kentniss der verderblichen Fichtenraupen. Weimar, 8vo.

1799. *Erbstein*, *K. F. W.*

Aurikelflor, oder nach der Natur gemalte Versamlung aller vorzüglich schönen Sorten Aurikel. Meissen, 8vo. plates.

1799. *Diel*, *Augustus Frederick Adrian*, M.D. of Nassau, Dietz; a scientific writer on gardening.

1. Versuch einer systematischen Beschreibung der in Deutschland gewönlichen Kernobstsorten. Frankfort on the Maine; 10 vols. of Apples, and 5 of Pears, to 1807.

2. Uber die Anlegung einer Obstorangerie in Scherben, und die Vegetation der Gewächse. Frankfort on the Maine, 12mo. 1796.

1800. *Keyser*, *G. Ad.*

Ueber die Vereilung des Obstes und der Verhandlung der Obstkernstamme. Erfurth, 8vo.

1800. *Von Weiss*, *K.*

Deutliche Anweisung der Nelken durch Schnitlinge zu vermehren; nebst einigen Gedanken über die Entstehung und Fortpflanzung der Nelkenläuse und deren Vertilgen. Halle, 8vo.

1800. *Anon.*

1. Einige Bemerkungen eines Rheinländers über den Weinbau des seits des Rheins zwischen Mayne und Bingen. Nau's Neue Entdeckung. 1 Band. 63.

2. Ueber das besetzen, der rottfelder, und die frage ob Veiflinge oder Blindholszum Anpflanzen junger Weingarten am vortheilhaftesten seyn.

1801. *Fukker*, *F. Jac.*

Beschreibung des Tokayer Gebirgs, nebst Belehrung wie bey der Weinlese zer verfahren. Vienna, 8vo.

1801. *Hermes*, *I. Gf.*

Beschreibung der vorzüglichsten Gartenblumen nach der Zeitfolge betrieben. Zerbst, 8vo.

1801. *Hübner*, *K. Jos.*

1. Blumisterey Bemerkungen aus dem Jahr 1800, für Nelkenliebhaber, &c. Brezlau, 8vo.

2. Sirisas, vollständiger charakter der Gartennelke oder Grasblume. Reichenbach, 8vo. 1814.

1802. *Berger*, *Ch. Gle.*

1. Taschenbuch für Blumenfreunde, oder kurze Charakteristik und Anweissung zur Cultur der vorzüglichsten in neudeutschen Garten befindliche Gewächse. Leipsic, 2 vols. 8vo.

2. Handbuch zur Pflanzenkenntniss für ökonomische Gartenliebhaber und Forstliebhaber zur leichten und vortheilhaftigen Betreibung ihrer Geschäfte. Leipsic, 8vo.

1802. *Goring*, *E. H. I. Bm. Trommsdorff*, and *F. K. L. Sickler.*

Durtscher Gartenschatz; herausgegeben von. J. Volkmar Sickler. Erfurth, 5 vols. 8vo.

1802. *Anon.*

Collection des nouveaux bâtimens pour la Décoration des grands Jardins et des Campagnes. Leipsic, fol. 44 plates.

1802. *Sickler*, *Francis Karl Ludwig*, son of Dr. Volkmar Sickler, a scholar and antiquarian. He invented, in 1805, a drill plough, called the spirodiphere, and in 1816 came to England, to submit to government a plan for unrolling the Herculanean MSS., which, however, was not attended with success.

1. Allgemeine geschichte der Obstkultur von den Zeiten der Urweltan, bis auf die gegenwärtigen herab. 1st vol. Frankfort, 8vo.

2. Der vollkommene Orängeriegartner, oder vollständige Beschreibung der Limonen, Citronen, und Pomeranzen, oder der Agrumi in Italien, und ihrer Cultur. Weimar, 1815, 4to. plates.

An analysis of this work is given in the third volume of the Horticultural Transactions, by Dr. Noehden.

1802. *Dietrich*, *Fr —— Gli ——.*

1. Vollständiges Wörterbuch der Gärtnerey und Botanique (the Introduction by Sprengel). Berlin, 10 vols. 8vo.

2. Oekonomischer botanischer Garten-journal. Eisenach, 6 vols. 8vo. 1795.

3. Wintergärtner, oder Anweisung der beliebten Modeblumen und œkonomischer Gewächse ohne Treibhäuser und Mistbeete in Zimmern, Kellern, und Andern Behältern zu überwintern, oder sie

für den offnen Garten vorzubereiten. Weimar, 8vo. 1801.

4. Unterhaltungen für Gärtner und Gartenfreunde. Tübingen, 8vo.

5. Die Linnæn Geranien für Botaniker und Blumenliebhaber, &c. Weimar, 4to. 6 parts, many plates.

6. Die Weimar Flora, oder Verzeichniss der im Herzoglichen Park, in Weimar, befindlichen Bäume, Sträucher and Stauden. Eisenach, 8vo. 1800.

7. Nachtrag zum Lexicon der Gärtnerey und Botanick. Berlin, 8vo. 1820.

1802. *Schröter*, *I. Sm.*

1. Erfahrungen in Meinem Blumem-obst-und Gemüssgarten.

2. Abhandlung über Gärtnerey und Blumisterey. Eisenbach, 8vo. 1802.

1802. *Friederich*, *I. P.*

Den Küchengarten, Schwerin, 8vo.

1802. *Rudolphi*, *J. Ch.*

1. Garten-Kalender für das ganze Jahr. Meissen, 8vo. p. 184.

2. Nelkentheorie, oder eine in systematischer Ordnung nach der Natur gemalte Nelkentabel. Meissen, fol. 1787.

1803. *Leonharde*, *F. G.* and *J. H. Seidel.*

1. Der Frühlings und Sommer Gärtner, oder Anweisung, jede Art von Blumen, wohlriechende niedrige Strauch-Stauden, und rankende Gewächse, nebst Küchengarten-Kräutern, so wie auch Obst-Orangerie nach art der Chinesen in Scherben zu erziehen — und für den Winter aufzubewahren, und zu erhalten. Leipsic, 8vo. 2 plates.

2. Forst und Jagd-Kalendar. Leipsic, 1794, 8vo.

1803. *Rocholl*, *A.*

Die Kunst Zwergobstbaume und unter diesen besonders Spalierbaume zu erziehen und zu Behandeln. Leipsig, 8vo.

1803. *Weber*, *F. Bd.*

Handbuch der Oekonomischen Litteratur; oder systematische Anleitung zur kentniss der deutschen ökonomischen Schriften, &c. Berlin, 2 vols. 8vo.

1804. *Wendf*, *G. T. K.*

Deutschlands Baumzucht, oder Verzeichniss der Holzarten, welche das Klima von Deutschland im Freyen aushalten; nebst Angabe ihrer Grösse, Erforderliche ihres Bodens, Standes, der Bluthezeit, Reife und Ausdauer. Eisenbach, 8vo.

1804. *Ritter*, *Ch.*

Tafel der Culturgewächse in Europa, geographisch nach den Klimaten dargestellt. Schnepfenthal. 1 large sheet.

1804. *Frege*, *Ch. A.*

Versammlung einer Classification der Weinsorten nach ihren Beeren. Meissen, 8vo.

1804. *Sprengel*, *Kurt.*

Gartenzeitung. Halle, 1804 to 1806. 4 vols. 8vo.

1805. *Mayer*, *Frederick.*

Der Monats-gärtner. Giessen, 8vo.

1805. *Theuss*, *Theodore.*

1. Monatlich Garten-Handbuch über obst und Gemüsegärtenerey. Halle, 1805.

2. Allgemeines Blumenlexicon. 2 Band. 8vo. Weimar, 1811.

3. Handbuch für Gartenbesitzer die keine gelernte Gartner sind, &c. Gotha, 8vo. 1805.

4. Der Obstbaumzucht nach theoretischen und praktischen Grundsatzen bearbeitet. Halle, 8vo. 1804.

1805. *Kannegiesser*, *F. A.*

1. Die Gattungen der Rosen. Freyburg, 4to.

2. Aurikelfloren. Dresden, 1800, 2 vols. 8vo.

3. Abhandlung der Levkoyen. Dresden, 4to. 1807.

4. Abhandlung der Ranunkeln und Anemonen. Dresden, 4to. 1807.

1805. *Von Hugen*, *F. W.*

Ueber die Verwüstung der Borkenkäfer und die Mittel ihnen zu begegnen. Göttingen, 8vo.

1805. *Breitenbach*, *Ph. Fr.*

Die Obst-Oekonomie, oder vollständiger Unterricht in Erziehung Wartung und Pflege der Obstbäume, &c. Berlin, 2 vols. 8vo.

1805. *Burchardt*, *Th. H. O.*

Pomologische Bibliothek, oder alphabetisches Verzeichnis der Pomologischen Schriften; mit Zuschreiben und Berichtung, nebst Urtheilen älter und neuerer Shriftsteller über Pomologie. Coblentz, 1805.

1805. *Weissenbruch*, *J. W. Jos.*

Das Ganze des Küchengartenbaues. Frankf. on the Maine, 2 vols. 8vo.

1806. *Gotthardt*, *J. Ch.* and *R. Eyserbock.*

1. Der deutsche Saamengärtner, oder Anweisung zur Kentniss, Erziehung und Aufbewahrung der in Deutschland einheimischen Kirchensämereyen, &c. Erfurth, 8vo.

2. Der Deutsche Gemüs-und Küchengartenbau. Erfurth, 8vo. 1797.

3. Vollständiger Unterricht von der Erziehung und Behandlung der Obstbäume, nebst Anziehung ihrer Feinde und Krankheit. Ib. 8vo. 1798.

4. Deutschlands Weinbau, &c. Ib. 2 vols. 8vo.

5. Der Rathgeber in der Obstbaumzucht, für Bürger und Landleute, U. S. W. Ib. 8vo. 1804.

6. Der Theoretische Praktische Wein und Kellermeyster, oder vollständige Unterrichtung in der Cultur und Behandlung des Weins. Ib. 8vo.

1806. *Windt*, *L. G.*

Der Berberitzenhauchein Feind des Wintergetreides. Hanover, 8vo.

180 . . *Von Stetterheim*, *Frederick.*

Pomologie. 8vo.

1806. *Günther*, *J. Jac.*

Anweisung für Weinbauer wider das Beschädigen durch Frühjahr und Herbstfröste. Heidelburg, 8vo.

1806. *Waller*, *K. Alxi.*

Der Stubengärtner — nebst einem Anhang wie im Winter schöne Blumen zu erziehen. Nordhouse, 8vo.

1807. *Rössig*, *K. Glo.*

1. Versuch über den Gartenmohn, &c. Leipsic, 8vo.

2. Tractate über Cultur aller sorten Obstbäume, &c. Schneeberg, 8vo. 1792.

3. Oekonomische Beschreibung der vorzüglichen Arten, Abhandlung und Spielarten der Rosen, &c. Leipsig, 1799.

4. Die Rosen nach der Natur gezeichnet, &c. Leipsic, folio, 8 parts.

1808. *Poscharsky*, *Ch. F.*

1. Der Monats Gärtner. Pirna, 8vo.

2. Der Stuben-gärtner, &c. Ib. 8vo.

1808. *Rosenberg*, *O. F.*

Anleitung Fruchtbäume durch das Copuliren zu veredeln. Königsberg, 8vo. 1 plate.

1808. *Anon.*

1. Garten und Parks-Verzierungen oder Zeichnungen fur neuen Gartenthüren. Leipsig, 4to. plates.

2. Neue Gartenpläne. Leipsig, fol.

1809. *Hellbach*, *J. Ch.*

Handbuch über den Küchengartenbau für die grosse Volksclasse; mit Zweckmässiger Literature versehen. Erfurth, 8vo.

1809. *Bouché*, *P.*

Die Zimmer und Fenstergärten, oder Anweisung die beleibtesten Blumen und Gewächse in Zimmern und Fenstern zu ziehen und zu überwintern; nebst einer Anweisung zur Blumentreibery. Berlin, 8vo.

1809. *Dreyssig.*

Der Levkoyen Gärtner, oder Anweisung zur Cultur der Levkoyen, u. s. w. Erfurth, 8vo.

1809. *Christ*, *I. L.*, nurseryman at Kronberg, near Frankfort on the Maine.

1. Beobachtungen über die heisse und trockne Witterung des Sommers 1800, deren Ursache, und

Mittel die weitern Zunahme des Uebels zuvorzukommen. Frankfort on M. 8vo.

2. Praktisches Gartenbuch. Heilbrun. 2 vols. 8vo. 1811.

3. Der Baumgärtner auf den Dorfe, oder Anweisung wie der gemeine Landmann Obstbäume erziehen und benutzen könne. Frankfort on M. 8vo. 1792.

4. Handbuch der Obstbaumzucht und Obstlehre. Ib. 8vo. 1794.

5. Pflanzung and Wartung der nützlichsten Obstbäume, &c. Ib. 8vo. 1789.

6. Pomologisches, theoretisches, praktisches Handwörterbuch. Leipsic, 4to. 1802.

7. Plan zum Anlegen eines Obstgartens. Ib. fol. 1799.

8. Die Krankheit Uebel und Feinde der Obstbäume und ihre Abhülfe. Frankfort on M. 8vo. 1808.

9. Von Weinbau, &c. Ib. 1793, 8vo.

10. Geschenk an den Weinhändler von Wichtigkeit Anweisung, Roggen in Weinbergen zu bauen. Ib. 1791, 8vo.

11. Vollständige Pomologie, und zugleich systematisch richtiges und beschreibung Verzeichniss der vornehmsten Sorten des Kern und Steinobstes, &c. die Christische Baumschule zu Kronberg. Ib. 8vo. plates.

1810. *Von Sponeck.*

Forstliche Aufsätze und Bemerkungen. Manheim, 8vo.

181. . *Sternber.*

Ueber die Kultur der Alpenpflanzen. Bot. Ges. in Regenbarg Abh. i.

181 . *Bœttiger*, C.A. an eminent German scholar and antiquary, author of Sabina, or Morning Scenes at the Toilette of a Roman Lady; of Zusammen, Neuesten Literatur, &c.

Racemazionen zur Gartenkunst der Alten. Translated under the title of "Fragmens sur le jardinage des anciens," in the Mag. Encyc. 7th Anneé.

1810. *Willdenow*, C. L. Professor of Botany at Berlin, author of various botanical works, and of a new edition of the species Plantarum of Linnæus.

1. Ueber die Anzucht ausländischer Bäume und Sträuche. Mag. du G. p. 212.

2. Gekrönte Preisschriften über die von der Kurfürstlichen Akademie nüzlicher Wissenschaften zu Erfurt aufgegebenen pomologischen Preisfragen. Nov. Art. Acad. Magunt, tom. ii. 159.

3. Berlinishe Baumzucht, &c. Berlin, 8vo. 7 plates, coloured.

1810. *Altenburg, Pomological Society.*

Annalen der Altenburgischen pomologischen Gesellschaft. Altenberg, 8vo.

1810. *Kalb. Bhd. H.*

Der Weinbau nach theoretischen und praktischen Kentnissen. Stuttgard, 8vo.

1810. *Laurop, P.*

Annalen der Forst-und Jagdwissenschaft. Darmstadt, 8vo. a volume appears occasionally.

1810. *Rieffelson, Pl.*

Beschreibung und Abbildung der von ihm erfundenen grossen Kraft-und Hebemaschine, mitteist welcher in wenig zeit Bäume von ansehnlicher Grösse samt ihren Wurzeln aus der Erde gehaben, und ungeheure Lasten von der Stelle geschafft werden Können. u. s. w. Hamburgh, 4to. 3 plates.

1810. *Guimpel, F.*

Abbildung der deutschen Holzarten für Forstmänner und Liebhaber der Botanik; mit Beschreibung desselben von K. W. Willdenow. Berlin, in numbers in 4to. coloured plates. Nos. 35 and 36 were published in 1821, containing specimens of the woods of the following trees and shrubs. Juniperus sabina, communis and nana. Taxas baccata. Atriplex portulacoidés. Acer pseudo platanus, platanoides, austriacum and campestre, and Fraxinus excelsior.

1811. *Crome, G.*

Der Boden und sein Verhältniss, &c. (Method of knowing soils by their plants, turf, &c.) Hanover, 8vo.

1811. *Ransleben.* Holds a government situation at Berlin, and propagates fruit-trees for sale in his garden there.

Einige Aufsätze für Gartenfreunde, &c. Leipsic, 8vo.

1811. *Fritsch, A ——.*

Versuch eines Birnsystems. Altenburg, folio, coloured plates of fruit.

1812. *Fischer, V. F.*

Anleitung zur Trüffeljagd, &c. (Truffle hunting in Germany, is considered as a part of forest management.) Carlsrouhe, 8vo.

1812. *Walroth.*

Geschichte des Obstes der Alten. 1st Heft. Halle, 8vo. p. 169.

1813. *Kellermann.*

Bemerkungen über de Felpe. Magdebourg, 8vo.

1813. *Kecht, J. C.*

Versuch einer durch Erfahrung erprobten Methode den Weinbau zu verbesserrn. Berlin, 8vo. 1 plate.

1814. *Geist, J ——*, M. D.

Ueber die Verbesserung des Weinbaus. Würtzburg, 8vo.

1814. *Corthum, J. E.*

Handbuch für Gartenfreunde, &c. Zerbst, 2 vols. 8vo.

1815. *Böckmann, A ——.*

Beschreibung eines höchst einfachen und wohlfeilen Höhenmessens, womit in Gebirge, wie in der Ebene, die Höhen der Bäume ohne Gehülfen leicht geschwind und genau gemessen werden Können. Giessen, 8vo. plates.

1815. *Zeyher*, and *G. Römer.*

Beschreibung der Gartenanlagen zu Schwetzingen. Manheim, 8vo. 9 plates, and a plan of the garden.

1816. *Hempel, G. E. L.*

Der Pomologische Zauberring. Ein leichtes Mittel jeden Obstbaum zum Tragen zu zwingen. Nunneburg, 8vo.

1817. *Lindegaard, Peter*, C.M.H.S. gardener to the king of Denmark.

A new Method of Forcing Grapes. London, 8vo. Translated from the Danish.

1817. *Roulet, Jean Antoine*, cultivator at Péseur.

Recueil de Mémoires sur la Culture de la Vigne successivement présentés et couronnés par la Société d'émulation patriotique de Neufchatel. Neufchatel, 8vo.

1817. *Cotta.*

Anweisung von Waldbau. Dresden, 8vo. p. 226.

1818. *Bechstein, D.I.M.*, author of a work on Domestic Animals.

Forstinsectologie, oder Natur-geschichte der für den Wald schädlichen und nützlichen Insecten, nebst Einleitung in die Insectenkunde überhaupt. Nurenberg, 8vo. colored plates.

1819. *Hundeshagen, C ——.*

Anleitung zum Entwerfen von Bauholzanlagen, und zur zweckmässigen Aufarbeitung, &c. Tubingen, 8vo. plates.

1820. *Wetzhausen von Truchsess.*

Systematische Classification der Kirschensorten. Stutgard, 8vo.

Two hundred and thirty-three sorts of cherries are here described.

1820. *Anon.*

Anweisung jede Rosenart Baumartig zu erziehen. Ulm. 8vo.

1820. *Schreiber, J. C.*

Anweisung zum Beschneiden der Fruchtbäume. Zullichau, 8vo.

1820. *Blotz, F.* and *J. C. Christ.*

Die Gartenkunst. 3d edit. 5 vols. 8vo.

1820. *Lupin.*

Die Garten. Vienna, 12mo.

1821. *Anon.*

1. Neue Erfindung wie man im Winter Ananas, Spargel Melonen, &c. und andere Vegetabilien ingleichen Rosen Veilchen, Hyacinthen, &c. ohne Mistbeet und sogar in Zimmern erziehen und zur Reife bringen kan. Nuremburg, 8vo.

This piece of horticultural quackery is sold in a sealed envelope. The pamphlet contains a few pages, illustrated by a plate. The mode is to introduce boiling water into a leaden cistern, inclosed in a case or frame, containing the plants; to renew it as it cools, and give very little air.

2. Neue Gartenbau Kunst, oder Sammlung zur Verzierung des Parks und Garten. Leipsic, folio, 8 plates.

1821. *Bertuch, M.*, author of an Essay on Hieroglyphics.

Garten-Magazin. Weimar, one or more numbers annually. 5 vols. and 6 numbers, published up to June, 1821.

Subsect. 3. *Books on Gardening published in Italy, exclusive of Translations.*

2286. A considerable number of books on rural affairs have been published in Italy; but there, where garden and field culture are so nearly allied, gardening and agriculture have been so blended by the writers, that it is difficult to know under which department to include the books. The best work for giving a general idea of the state of culture in Italy is, the Annali dell' Agricultura, 22 vols. 8vo. by F. Re. 1809 to 1814.

1546. *Alamanni, Louis*, a Florentine gentleman, an eminent poet, born in 1495. Having conspired against Julius de Medicis, (Pope Clement VII.) he took refuge in France, where he was well received by Francis I., and sent in embassies to several courts. He wrote several poems, beside the following, and died in 1556.

Della Coltivazione.

It is translated into French with the title of *Georgiques Italiennes.*

1596. *Bacoii, A ——.*

De Naturali Vinorum Historiâ, de Vinis Italiæ, et de conviviis antiquorum, libri viii. folio, Rome.

1622. *Soderini, Giovanvettorio, e Bernardo Davazati.*

Coltivazione toscana delle viti e d' alcuni alberi. Aggiuntovi la coltivazione degli olivi; di Piero Vettori. Firenze, 4to.

1629. *Rendella, Prospero.*

Tractatus de vinea, vindemia et vino. Ven. fol.

1633. *Ferrari, John Baptist*, a Jesuit of Sienna, author of a Syriac dictionary and other works, died in 1665.

1. Hesperides, sive de Malorum aureorum Cultura et Usu, libri iv. Rome, fol. 1646.

2. Flora, seu de Florum Cultura, lib. iv. Rome, 4to. 1633.

1670. *Falli, Francesco.*

Dialogo interno alla Cultura della vite. Florence, 8vo. p. 79.

167. . *Caronelli, Conte Pietro, de.*

Memoria sulla Coltivazione delle viti. Atti della Soc. Patriot. de Milano, vol. iii. p. 3. 83.

167. . *Bramieri, Don Giulio.*.

Transunto delle riporte al quesito della Societa Patriotica de Milano, intorno alla Coltivazione delle viti. Atte. Patriot. de Milano, vol. iii. p. 84. 157.

1697. *Sacconi, Agostino.*

Ristretto delle piante, con sui nome antichi e moderni, della terra, aria, e sito, ch' amano. Vienna, 4to. p. 127.

1726. *Clarici, Paolo Bartolomeo*, a Benedictine monk of Padua.

Istoria e coltura delle piante che sono pe'l fiore più ragguardevoli, e più distnte per ornare un giardino in tutto il tempo dell' anno; con un trattato degli Agrumi. Venice, 4to. with a plan of the garden of Gerarde Sagredo.

1768. *Arrigoni, Stefano.*

Trattato sulla cognizione e coltura de giacinti. Viterbo, 1763, in 8vo. fig.

1767. *Cattaneo, Giacomo.*

Della Idropisia de' Gelsi. Milano, 1767, in 8vo.

1769. *Anon.*

Maniera di coltivare gli alberi fruttiferi, opera postuma d' illustre autore. Firenze, 1769, in 8vo.

1773. *Anon.*

Trattato de' fiori, che provengono da cipolla, in cui si contiene tutto cio, ch' é necessario per ben coltivarli. Cremona, 12mo. p. 108.

1777. *Tozzetti, Octavianus Targioni*, M. D. regius professor of botany and agriculture, at Florence; author of various works on agriculture; and his son has translated the Agricultural Chemistry of Sir H. Davy.

Des differentes especes de Meuriers qui se cultivent dans le terretoire Florentin. Mem. Acad. Scien. Paris, 572.

1777. *Brochieri, Francesco*, gardener to the King of Sardinia, at Turin.

Nuovo Metodo, adattato al Clima del Piemonte, per cultivare gli Annanas senza Fuoco. Turin, 12mo. 1 plate.

He recommends pits and dung, or tan; this, he says, is the English and Dutch method, both which countries he had visited.

1780. *Freylino, di Buttigliera, Conte.*

Sulla maniera di rescaldare economicamente le serre degli Ananassi. In the Opusculi, scelti. Florence, 8vo. tom. 11, p. 15-17.

His improvement consists in mixing saw-dust with tan or dung, to lessen expence, and prolong the heat.

1780. *Borch, Michael Jean Compte de*, a Piedmontese gentleman, author of various works on Lithology.

Lettres sur les Truffes du Piémont. Milan, 8vo. 3 plates.

1788. *Piccinoli, Guiseppe*, curator of the garden of the illustrious Marchese Niccolò Panciatechi, at the villa Loggia, near Florence.

Memoria sulla coltivazione degli Ananassi. Printed at the end of his Horto Panciatico, p. 24-32. Florence, 8vo.

His method is nearly the same as that of La Court, and Brocchieri. See sect. ii. and A.D. 1777 above; he notices Bastard's mode of ripening the fruit in water, translated and published in Opusculi, scelti. tom. 2. and Count Freylino's, of mixing saw-dust with the dung. Brocchieri, he says, is one of the first gardeners in Italy.

1783. *Gardini, M——*, a physician at St. Damiens, near Asti, in Piedmont.

De influxa electricitatis atmosphericæ in vegetantia, dissertatio ab academia Lugdunensi præmio donata anno 1782. Turin, Octavo, 1783.

1787. *Affaitati, Casimiro.*

L'ortolano in Villa, e l'accurato giardiniere in Città. Bassano, in 12mo.

1794. *Bussato, Marco.*

Giardino di Agricoltura nel quale s' insegna tutto quello che appartiene ad un perfetto giardiniero. Bassano, in 8vo. fig.

1798. *Comparetti, Andrea*, a physician at Turin, author of some anatomical dissertations.

1. Saggio sulla coltura e governo dei Boschi. Padova, in 8vo.
2. Dinamica degli insetti. Ib. 1800, 2 vols. in 8vo.

180. . *Fiuorchi*, *Anton. Maria.*

Memoria sopra le fecondazione dei fiori doppie. Mem. dell'Acad. de Sienna, tom. 8.

181. . *Fernaini*, *D —— Louis*, Abbé of Vallombrosa.

Dissertations sur la culture des sapins. Paris, 8vo. plates. Translated by M. Desacres Fleurange.

1803. *Silva*, *Sigismondo*, a physician at Milan, who has a handsome villa in the suburbs.

Arte de' giardini Inglesi. Milano, 1803, 2 vols. in 8vo. fig. An edition afterwards in quarto, in great part translated from Hirschfield.

1804. *Bruley*, *C——*, a proprietor of lands at St. Domingo.

Rapport sur les essais de culture des plantes, exotiques, dirigés à la venerie, (at Turin) du departement du Pô Turin, 8vo.

1807. *Carradori.*

Degli organi assorbenti delle radici delle piante. Milano, 1807, in 8vo.

1808. *Barelle*, *Giuseppe.*

Descrizione esatta dei Funghi nocivi o sospetti, con figure colorate. Milano, 1808, in 4to.

1809. *Re*, *Filippo*, librarian to the Patriotic Society at Milan, afterwards in the employ of government, at Turin, where he died in 1820 or 21. He wrote a great number of works on rural and economical subjects.

1. Lettera su alcune particolarità osservate nella coltivazione dei giardini del Milanese. Milano, 1811, in 8vo.
2. Lettera sopra alcune di quelle produzioni che volgarmente diconno rose di quercia, e sulla michrorhizomania. Verona, 1814, in 4to. fig.
3. Elementi di giardinajio. Milano, 1806, in 8vo.
4. Della poesia didascalica Georgica degli Italiani dopo il ristoramento delle scienza sino al presente. Saggio. Bologna, 1809, in 8vo.
5. Annali dell'agricoltura del regno d'Italia comminciati in Gennajo 1809, e terminati in Giugno 1814, 66 parts, forming 22 vols. in 8vo., with about 30 plates.
6. Il Giardiniere avviato nell'esercizio della sua professione, terza edizione. Milano, 1812, 2 vols. in 8vo. con figure colorite.
7. L'Ortolano dirozzato. Milano, 1811, 2 vols. in 8vo. con figure.
8. Saggio Teorico Pratico sulle Malattie delle piante. Seconda edizione. Milano, 1817, in 8vo.
9. Saggio sopra la Storia e il Coltivamento dell' Erba Medica. Seconda edizione rifusa e notabilmente accresciuta. Milano, 1817, in 8vo.

1810. *Anon.*

Della scelta degli alberi ne' giardini e delle loro buone e cattive qualità. Venezia, 1810, in 8vo.

1810. *Pozzi*, *George.*

Del vino, delle sue malattie, de suoi remedi, &c. Milan, 8vo. plates.

1810. *Spadoni*, *Paolo.*

Dello stabilimento, piantagione e conservazione delle siepi, con il disegno per ben formarle. Venezia, in 8vo.

1811. *Savi*, *Gætano.*

Trattato degli alberi della Toscana. Firenze, 2 vols. in 12mo.

1811. *Soderini*, *S.*

1. Trattato di agricoltura. Firenze, 1811, in 4to.
2. Della Cultura degli Orti e Giardini. Firenze, 1814, in 4to.
3. Trattato degli arbori. Ib. 1817, in 4to.

1811. *Gallesio*, *Georgio*, a magistrate at Savonna.

1. Traité du genre Citrus. Paris, 8vo.
2. Pomona Italiana, ossia Trattato degli Alberi fruttiferi, in folio, con fig. Pisa, 1817, in parts; 1l. 11s. 6d. each.

1813. *Benigni*, *Fortunato.*

Sugli insetti distruggitori delle Viti. Milano. in 8vo.

1813. *Colla*, *Luigi.*

L'Antolegista Botanico. Turino, 1813-14, 6 vols. in 8vo. fig.

1815. *Gautieri*, *Giuseppe*, inspector-general of the royal forests of Lombardy.

1. Noticie elementari sui boschi. Naples, 8vo.
2. Dell' Influsso de' Boschi sullo stato fisico de, Paesi e sulla prosperità della nazione. Milano, 8vo. 1817.
3. Memoria sul pascolo de' Boschi resinosi, da fronda, d'alto fusto e cedui. Milano, 1815, in 8vo.

1816. *Sartorelli*, *Giorgio Battisti.*

Degli alberi indigeni ai boschi del l'Italia superiore. Milano, 1816, in 8vo.

1816. *Anon.*

Manuale del Giardiniere pratico, &c. Milan, 8vo.

1817. *Mabil*, Sig. *Lingi*, of Verona.

Saggio sopra l'indolè dei giardini moderni. Verona, 1817, in 8vo.

181. . *Anon.*

Dell'Arte de Giardini Inglesi, 2 vols. 8vo.

1817. *Pindemonte*, *Ippolito di*, an Italian poet, who has spent some time in England, and Luigi Mabil, a gentleman of Lombardy.

Su i Giardini Inglesi, e sul merito in cio' dell' Italia, Dissertazione d' I. P. —— e sopra l'indole dei giardini moderni saggio di L. M. Con altre operette sullo stesso argomento. Verona, 8vo. 1 plate.

1817. *Anon.*

1. Accurato agricoltore per Campi, Orti e Giardini, con tutte le regole della Coltivazione sulla fondata esperienza di uomini periti. Milano, 1817, in 12mo.
2. La Coltura dei fiori a seconda del clima Lombardo. Ib. 1817, in 12mo.

Subsect. 4. *Books on Gardening originated and published in Holland, exclusive of Translations.*

2287. The Dutch, like the Scotch, excel more in the practice than in the literature of gardening. The works of La Court, and Van Osten, the former little known, are among the best that have been produced. There are none of recent date of any consequence. The announced "Journal of a Horticultural Tour in Holland," by P. Neill, Secretary of the Caledonian Horticultural Society, will, it is presumed, give the best idea of the state of culture there.

1560. *Curtius*, *Benedictus.*

Hortorum libri xxx., in quibus continetur arborum historia, partim ex probatissimis quibusque auctoribus, partim ex auctoris observatione collecta. Leyden, fol.

1613. *Meursius*, *Jean*, died at Leyden, in 1613, in the flower of his age.

De arborum fruticum et herbaceum proprietate usu et qualitatibus, lib. iii. Leyden, 8vo.

1631. *Cluyt*, *Outger Augerius*, author of some works on minerals and insects.

Memorie der vreemden blom-bollen, wortelen, kruyden, planten, struycken, zaden ende vruchten, hoe men die sal wel gheconditioneert bewaren ende over seynden, that is

Memoir on the mode of preserving and sending over in good condition, foreign bulbs, roots, herbs, plants, shrubs, seeds, and fruits. Amsterdam, 8vo.

1669. *Vander, Groen, I——*, gardener to the Prince of Orange.

Le Jardinier Hollandais, avec environ deux cents modéles de parterres à fleurs et autres; labyrinthes, pavillons, ouvrages, treillis et mailles de lattes, et de quadrans et horloges solaires. Amsterdam, 4to.

1672. *Munliguis, Alrahoue*, physician, and professor of botany at Groningen; born in 1626, died in 1682.

De cura et cultura plantarum. Amstel. 4to. fig.

1676. *Cause, D. H.*

De Koninglycke hovenier, (the Royal Gardener.) Amsterdam, fol. p. 224, plates.

1676. *Commelin, John*, a botanist, was born at Amsterdam in 1629. He succeeded his father as one of the magistrates of his native city, where he formed a new botanical garden, and died in 1692. His nephew, Gasper Commelin, a physician, was appointed professor in botany, and director of the garden at Amsterdam.

Nederlandtze Hespérides. Amst. fol. with many plates. Englished by G. V. N. London, 1683. 8vo.

1682. *Van Sterbeeck Francis*

Citricultura, of regeringhe der uythenische boomen. (Of the culture of the orange tribe, and the management of exotic trees.) Antwerp, 4to. p. 296, 14 plates.

1703. *Osten*, or *Oosten, Henry Van*, curator of the botanic garden at Leyden.

1. Der Neiderländische Garten. Leyden, 8vo. 5 plates.

Translated into German and French; and into English, as

The Dutch Gardener, &c. Lond. 1710, 8vo.

1713. *Anon.*

De nieuwe naauwkeurige Neederlandse hovenier. (The New Improved Dutch Court Gardener.) Leyden, 4to. p. 286, plates.

1721. *Anon.*

Le Jardin de Hollande planté et garni de fleurs, de fruits, et d'orangeries, &c. Le tout après une longue expérienee, mis au jour pour l'intérêt public. Amsterdam, 12mo.

1737. *Anon.*; the author, Mr. La Court, a Dutch merchant, who had a country-house and fine garden at Driehoek, (triangle,) near Leyden, where he was the first to introduce and cultivate, with success, the pine-apple and the tuberose. He died between 1737 and 1740.

Aenmerkingen over het aenleggen van landhuizen, lusthoven, plantagion, enz, enz. (Remarks on the laying out of country-houses, pleasure-gardens, plantations, &c. &c.) Leyden, 4to. p. 412, with 15 plates.

These plates contain plans of pits for growing the pine and the vine; a general plan of Driehoek, and figures of the pine-apple, tuberose, and some varieties of oranges and lemons. The book is very scarce; only a few having been printed. The only copy we have seen is in the Banksian library.

1752. *Voorhelm, George*, commercial florist, at Harlem, of the firm of Voorhelm and Van Zompel.

Traité sur la Jacinthe.

1760. *Van Kampen*, or *Campen, et fils*, florists, at Haerlem.

Traité des Fleurs à oignons. 8vo. with plates; translated with this title.

The Dutch Florist; or true method of managing all sorts of Flowers with Bulbous roots. 4to.

1771. *Knoop, Jean Herman*, a gardener at Leuwarden, in Friezland, died about the end of the 18th century.

1. Pomologie, ou description des meilleures sortes de pommes et de poires que l'on estime et cultive le plus, soit aux Pays-bas, soit en Allemagne, soit en Angleterre. Amsterdam, fol. fig.

2. Fructuologie, ou description des arbres fruitiers, ainsi que des fruits que l'on plante et qu'on cultive communément dans les jardins. Amsterdam, folio.

1772. *Poederle, —— l'ainè.*

Manuel de l'arboriste du forestier Belgique, ouvrage extrait des meilleurs auteurs anciens et modernes, et soutenu d'observations faites dans différens pays ou l'auteur a voyagé. Brussels and Paris, 2 vols. 8vo.

An anonymous work, with nearly the same title, appeared in 1774.

1784. *Burtin, Francis Xavier*, a physician in Lorrain, author of some works on mineralogy.

Mémoire sur la question; quels sont les végétaux indigenes que l'on pourrait substituer dans les Pays-bas, aux végétaux exotiques. Brussels, 4to.

1817. *Musche*, curator of the botanic garden at Ghent.

Hortus Gandensis. 12mo. Ghent.

1817. *Huthem.*

Discours sur l'etat ancien et modern de l'agriculture et de la botanique dans les Pays-bas. Ghent. 8vo. p. 70.

Subsect. 5. *Books on Gardening, published in Sweden, Denmark, Norway, and Iceland, exclusive of Translations.*

2288. These are few, and chiefly by Linnæus or his pupils. A knowledge of the present state of culture in Sweden is best obtained by reference to the Transactions of the Stockholm and Upsal Academies.

1648. *Anon.*

Een ny trägården Book. (A new garden book.) Printed with Arv. Mansons Ortabook. Stockholm, 8vo.

1664. *Rudbeck, Olaus*, a Swedish physician, was the son of the Bishop of Vesteras, and born in 1630. While a student at Upsal, he discovered the lymphatics in the liver, and other parts of the body; though his claim of priority was contested by Bartholine. He also cultivated botany and founded a garden for the university of Upsal, where he held the chair of medicine till his death in 1702, having resigned the professorships of botany and anatomy, some years before, to his son, of the same name.

1. Præside, Dissertatio: Horticultura nova Upsaliensis. Resp. Gust. Lohrman. Upsaliæ, 4to.

2. Catalogus Plantarum Horti Upsaliensis.

3. Campi Elysii, liber primus. Upsal, 1702. Liber secundus. Upsal, 1701, 2 vols. fol.

This was to be a vast work, in which all the known plants in the world were to be represented by wooden cuts, in twelve volumes, folio. The two first volumes, however, were so unfortunate, as to put an end to this stupendous project. A dreadful fire having broken out in Upsal in 1702, among its ravages reduced to ashes the printing-office, when only a few copies of the work had been removed. These are, of course, extremely valuable.

1686. *Rudbeck, Olaus, filius*, the son and successor of the professor of the same name, was born at Upsal in 1660. He took his doctor's degree at Utrecht, and in 1720 joined Berzelius in founding the Swedish Academy of Sciences, the memoirs of which learned body contain a number of his dissertations on subjects of natural history. He also published some works on the plants and animals mentioned in Scripture. He died in 1740.

Propagatio Plantarum Botanico-physica. Upsal, 8vo. p. 142. with wood-cuts and copper-plates.

17. . . *Fragræus, Jonas Theodor.*

Konsten at skära frukt träd. (The art of nursing fruit-trees). Wetensk. Acad. band. 2. 45.

1723. *Dahlman, G. T.*

Den fürdige trädgärdmästaren. (The successful Gardener.) Stockholm, 8vo. p. 230.

1738. *I. P. B.*

En trägärdsbok. (A Garden-book). Stockholm, 8vo. p. 212.

1739. *Linnæus*, or *Von Linne, Charles*, was the son of a clergyman at Rashult, in Sweden, and born there May 13. 1707. He was educated at Lund, from whence he removed to Upsal, where he was appointed to read lectures on botany, in 1730; and the year following he received a commission from the academy of sciences, to travel in Lapland and Norway. In this journey he paid attention to the art of assaying metals, on which he afterwards delivered a course of lectures. In 1735 he went to Harderwyck, in Holland, where he took his doctor's degree, and while in that country he became, through the introduction of Boerhaave, superintendent of Mr. Clifford's garden, at Hartecamp, of which he drew up a catalogue. While in this situation he published also his "Flora Lapponica;" after which he visited England. On his return to Holland he continued his "Genera Plantarum," and was chosen a member of the imperial academy. In 1737 he printed the "Hortus Cliffortianus," in fol.; and his "Critica Botanica." He returned to Sweden in 1738, and was chosen a member of the academy at Upsal; and soon afterwards he laid the foundation of that at Stockholm. In 1740 he was chosen professor of medicine at the former place, where he undertook the reform of the botanical garden, to which he gave many valuable exotics. In 1745 he published his "Flora Suecica;" which was followed by the "Fauna Suecica." At this time his merits were so well appreciated, that a medal was struck to his honour, and he was appointed archiator to the king. In 1749 appeared his "Materia Medica;" and in 1751 he published the "Philosophia Botanica." His most splendid publication came out in 1754, with this title, "Musæum Regis Adolphi Frederici," comprising a description of the natural curiosities in the royal musæum. While conducting this work through the press, Linnæus was honoured with the order of the Polar Star; and in 1756 he was ennobled. In the mean time he prepared for publication his "Species Plantarum," which was followed by the "Systema Naturæ." This illustrious naturalist died at Upsal, Jan. 10. 1778, and his remains were interred with great solemnity, in the cathedral of that city, where his pupils erected a monument to his memory. His son, Charles Linnæus, born in 1741, became demonstrator in the botanic garden, and published some valuable works. He was ill-used by his mother, which is supposed to have hastened his death, in 1783. His sister, Elizabeth Christina, discovered a luminous property in the flowers of the nasturtium.

1. Rön om växters plantering, grundat pä naturen. (Experiments on the planting of vegetables, founded in nature.) Vetensk, Acad. Handling. 1739, p. 1-24.
2. De cultura vegetabilium naturæ convenienter instituenda. Analect Transalpin. tom. i. p. 1-15.
3. Dissertatio de Horticultura Academica. Upsal, 1754, 4to.
4. Dissertatio Hortis Culinaris. Stockholm, 1764, 4to.
5. Handling om skogars plantering. (Treatise on planting woods.) Vetensk. Acad. Handling, 1748, p. 264—269.

1740. *Cederhelm, Baron Carl Wilhelm.*

Tal on wilda träds planteringi Sverige. (Discourse on planting trees indigenous in Sweden.) Upsal, 8vo.

1740. *Triewald, Marten.*

Anmärkningar vid ütländska fruktoch andra träds planterande i Sverige. (Remarks on exotic Fruits and other Garden Plants in Sweden.) Vetensk Acad. Handling, 204-207.

1752. *Wallerio, Johanne Gotschalk.*

Præside, Dissertatio de artificiose fecundatione, immersiva seminum vegetabilium. Stockholme 4to. p. 24.

1754. *Kalm, Peter*, a naturalist, was born in Finland in 1715. He became professor of botany at Abo, and in 1747 went to North America, for the purpose of exploring that country; where he remained two or three years, and then returned to Abo. He afterwards made an extensive tour in Russia, with the same object, and died in Sweden in 1779. His Travels in America were translated into English by Forster, in 1771.

1. Almänna anmärkingar wid en Kryddoch trägärds anläggande. (General Remarks on the laying out of a Kitchen and Fruit-Garden.) Abo, 4to, p. 8.
2. Om möjeligheten och nyttan af Kryddoch trä-gärdars anläggande i Finland. (On the Practicability and Advantage of laying out Kitchen and Fruit Gardens in Finland.) Abo, 4to. p. 12.
3. Dissertatio possibilitatem varia Vegetabilia exotica fabricis nostris utilia in Findlandia colendi. Abo, 4to. p. 11.
4. Utkast til en blomstergard af inhemska växter. (Sketch of a Flower Garden of native Vegetables.) Abo, 1766. 4to. p. 15.
5. Anmarkningar om vara Furuoch Gran-skogars ömmare ward, tagne af deras alder. (Observations on Fuel and Timber Woods, &c.) Abo, 1757, 4to.
6. Anmärkningar rörande nödvändigheten af Ekskogarnas battre vaord och ans i Findland. (Observations on Oak Woods in Findland.) Abo, 1757, 4to.
7. Anmärkningar vid fruct-träno plänterande i Finland. (Remarks on Planting Fruit-trees in Finland.) Abo, 1757, 4to. p. 12.

1759. *Gadd, Peter Adrian*, professor of chemistry at Abo, author of a number of tracts on chemistry, natural history, &c.

1. Om Brünne-torf. (On Burning Turf.) Abo, 4to.
2. Upmuntran och underrättelse til nyttiga plantagers vidläggande i Finland. (Encouragement and Instruction to take Measures for useful Planting in Finland.) Abo, 4to. 1765.

Academisk Afhandling om medel at underhälla och öka skogsvaxten i Finland. (On Oak Woods in Finland.) Abo, 4to. p. 26.

1768. *Lissander, Andrew.*

Anmärkningar vid Svenska trägärdsskotseln. (Remarks on Swedish Gardening.) Stockholm, 8vo. p. 351. 4 plates.

1770. *Olafsyn, Olaf*, author of a voyage in Iceland, made by order of the Danish court.

Islendsk Urtagards Bok. (Iceland's Garden Book.) Kaupmaunaöfn, 8vo.

1771. *Osbeck, Peter; Alof Toreen*, and *Captain Eckeberg*, natives of Sweden, who made a voyage to China.

A voyage to China and the East Indies; together with a voyage to Surrate, by Alof Toreen; and an account of the Chinese Husbandry, by Captain Eckeberg. Translated from the German. To which is added, a Formula and Flora Sinensis. Lond. 1771, 2 vols. 8vo. Vol. ii. contains a Speech, shewing what is most worthy to be attended to in voyages to China. Translated from the Swedish, by John Reinhold Forster, LL.D. F.R.S. a distinguished Prussian naturalist.

178. . *Sommerfeldt, Christian.*

Af handlingom nyttige have-vexters dyrkning for Norge. (Treatise on the Culture of Vegetables in Norway.)

178. . *Schmidt, Christian Francis.*

Kort anvisning til vilde träers opelskriug og skoves rette anläg, behandling og vidligeholdelse i Dannemark.) On the management of wood in Denmark.) Danske Landhmfh. Selsk. Skrift. 3 Decl. p. 1.—170.

1780. *Troselius, Clas Blechort.*

Landtmarina genväg til frukt-trän. (An easy mode of having fruit trees.) Lund. 4to. p. 16.

1780. *Bergius, Peter Jonas*, a physician, and professor of natural history at Stockholm, published several botanical works, and a Materia Medica; died 1791.

Den Obstbaumgarten in Schweden. Translated from the Swedish. Leipsig, 1794, 8vo.

1784. *Englebert, Jortin.*

Flora maccelli Hortensis. Svenska Köks-och kryddigarden, försvenskad. Lund. 8vo. p. 44.

1789. *Hellenius, Charles Nicolas*, professor of botany at Abbo, in Finland; died 179. .

1. Strödole anmarkningar rörande frukttrans skötsel i Finland. (On nurseries of fruit-tree plantations in Finland.) Abo, 4to. p. 13.
2. Anmarkningar vid fruktbärande buskars skötsel. (Remarks on nursing fruit-bearing shrubs.) Abo, 4to. p. 10.

1799. *Thunberg*, Sir *Charles Peter*, M.D. professor of botany in the University of Upsal, author of the Flora Japonica, and various papers in the Linnæan Transactions.

1. De Nutritione Plantarum. Upsal, 4to.
2. Omplantering Frukt-Träd, Buskar och Blomster Vaxter, som kunna vala Svenska Klimatu. (On planting fruit-bushes, and flowering vegetables, suitable to the Swedish climate.) Upsal, 180., 4to.
3. Om Hackars Plantering tile Lefvande Gardesgarder. (On planting Hedges, &c.) Upsal, 4to.

Subsect. 6. *Books on Gardening, published in Poland and Russia.*

2289. Of originals there are very few; but a number of translations were made in Poland during the early part of the 18th century. There are agricultural transactions published occasionally by a society at Warsaw, which, with the translations of the Economical Society of St. Petersburgh, may be considered as the best books for obtaining some idea of the state of culture in these countries.

1788. *Sambourshy*, a Russian poet, author of a number of works chiefly in verse, and of a poem on gardens, which has been translated into French, with the title

Le jardins de Sambourshy. 8vo.

1793. *Georgi*, a physician, and member of several learned societies.

Description de la Ville de St. Petersburg et de ses Environs. Petersburg, 8vo.

18 . . *Lomonosow*, a Russian poet and miscellaneous writer, author of a poem on glass, and the advantages resulting from its use in a northern climate. The subject of hot-houses forms a considerable part of the poem.

1808. *Czartoryska*, Princess *Isabella*, a lady of one of the most ancient families in Poland in the royal line. She spent a considerable time in England, where she acquired a taste for the modern art of laying out grounds, introduced it on her estate at Lublin, and wrote the following work on the subject.

Mysli Rozne o Sposobie Zakladania Ogrodow, &c. (Thoughts on the manner of Planting Gardens.) Warsaw, 4to. plates.

Subsect. 7. *Books on Gardening, published in Spain and Portugal.*

2290. There is a royal agricultural society at Madrid, whose transactions are almost the only recorded source of obtaining any knowledge of the state of culture in that country.

1557. *Herrera, Gabriello Alphonso.*

Libro di Agricultura. One book treats "De las Huertas," or of Gardens.

178. . *Cavanilles, Antonio Joseph*, an eminent botanist, author of various works, and among others, of Figures and Descriptions of the Plants of Spain.

De la Juncia avellanada o'chufas de Valencia. Anales de Ciencias Naturales. Tom. iii. 234.

1807. *Clemento y Rubio, Don Simon de Roxas.*

Ensayo sobre las variedades de la Vid comun que vegetan en Andalusia. Madrid, 4to.

Translated into French by de Caumels of Toulouse.

1817. *Anon.*

Notice sur un Arbre à Sucre, (Arbutus Unedo?) découverte en Espagne. Traduit de l'Espagnole par D. A. Armesto. Paris, 8vo.

Subsect. 8. *Books on Gardening, published in North America.*

2291. A number of articles belonging to gardening will be found in the agricultural transactions of the Philadelphia and New York societies, in the transactions of the Society of Arts of New York, and in Dr. Dean's New England Farmer's Dictionary. Cobbett's American Gardener may be considered as affording a tolerable picture of the state of gardening in the United States, where it appears the long and severe winters are material drawbacks to every branch of the art.

1755. *Belgrove, William.*

A Treatise upon Husbandry and Planting. Boston, New England, 4to. p. 86

1785. *Marshall Humphrey.*

The American Grove; a catalogue of the trees and shrubs which grow naturally in North America, with notices of their culture. New York, 8vo.

1790. *Peterkin, Joshua.*

A Treatise on Planting, from the origin of semen to ebullition, 2d edit. Basseterre, St. Christopher's, 4to.

179 . . *Johnson, John B.*

On the Culture of the Vine. New York Soc. Trans. vol. 2.

1806. *M'Mahon, B.* an American seedsman.

The American Gardener's Kalendar. 12mo.

1810. *Peters, Richard.*

On Peach-trees. Massachuss. Soc. Trans. vol. ii. 48.

1811. *Hosack, David*, M.D. F.R.S. L.S. &c. professor of medicine in the university of the state of New York.

1. Hortus Elginensis. New York, 8vo. 2d edit.
2. Statement of Facts relative to the Elgin Botanic Garden. New York, 8vo. 1811.

1817. *Coxe, William*, Esq. of Burlington, in New Jersey.

View of the Cultivation of Fruit-trees, with the Management of Orchards and Cyder, with accurate descriptions of the most estimable varieties of native and foreign Apples and other Fruits, cultivated in the United States of America. Philadelphia, 8vo.

Subsect. 9. *Of the Literature of the Gardening of Antiquity.*

2292. The few Greek and Roman authors whose works on rural affairs have reached the present age, are sufficiently well known. Among the ancient Greek writers, Hesiod, Homer, Theophrastus, Xenophon, and Ælian, may be mentioned as having touched more or less on gardening. The works of the modern Greeks, or those who wrote after the seat of the Roman government was transferred to Constantinople, are collected under the title of Geopcnica; and have been translated by T. Owen, who also translated Varro and Palladius. Among the Latins, the works of Varro are the first in the order of time; next Cato, and Pliny, and Columella, and, lastly, R. T. E. Palladius, supposed to have lived in the fourth century. Passages relative to the subject may be found in most of the Roman poets, especially in Martial, Virgil, and Horace; but Pliny's natural history, and Columella's 11th book on gardens, are those from which the most correct ideas may be obtained of Roman gardening.

Chap. V.

Of the Professional Police, and Public Laws relative to Gardeners and Gardening.

By professional police, we mean those associations which gardeners have formed, at different times, for mutual benefit, or instruction, or the improvement of their art; by public laws, those of the legislature.

2293. We have already remarked (82.) that *a Fraternity of Gardeners* has long existed in Germany, as regularly organised as that of masonry. There are also a few similar fraternities in this country, who hold meetings, and have secret signs and other rites nearly similar to those of masonry; but these societies have no systematic connection like those of Germany. From masonry they have undoubtedly taken their origin; but how, when, and where, and for what object, in the first instance, though we have corresponded with the lodges, and other competent persons in all parts of the kingdom, we have been unable to ascertain.

The oldest gardeners' lodges seem to be those in Aberdeenshire, and *Adam's Lodge*, held in the city of Aberdeen, seems the oldest; there is another of nearly equal antiquity, called *Solomon's Lodge*, held in Banf. These lodges profess to be for the mutual instruction of the members in their art; for the assistance of brethren in distress; and for the benefit of travelling members. The first object is attained both by secret instructions, and also by competitory exhibitions of gardening productions, as flowers and fruits; the second, by annual subscriptions, from which a fund is formed, managed by a committee of the society; and the third, by signs and pass-words, as in masonry. They have a general meeting, formal procession with symbols and flowers, and afterwards a feast, once a year.

There were formerly a number of gardeners' lodges in Scotland, and there are still a few besides those of Aberdeen and Banf. The principal lodge, though it has no connection or controul over the others, like the metropolitan mason's lodge, is the Caledonian Lodge of Edinburgh, founded about the end of the last century: its object is the same as that of the Aberdeen lodge; but it has no shows of flowers, or other garden productions. Their meetings are respectable, their processions pompous, and their funds considerable.

There are very few *gardeners' lodges in England*; the only one of which we have been able to obtain any distinct account is "Adam's Lodge, of London," founded June 4, 1781, of which the rules and orders have been published. This lodge is described in the "rules," &c. as a "Fraternity or community for improving the art of Gardening; to establish a fund for the mutual support and relief of each other in the time of sickness, lameness, or distress; and also to ascertain the characters and abilities of such gardeners who shall belong to, or may be recommended by this society, to obviate the difficulty so commonly complained of by the nobility, gentry, and others, of obtaining skilful and experienced persons to undertake the employment."

At present it consists of about one hundred and fifty members, and is on the decline. The allowance to the sick or disabled has been gradually diminished from insufficiency of funds; and from having been originally fixed by a random guess, instead of estimations of the value of lives, &c. as ought to be done in all benefit societies.

2294. About the middle of the last century, Lee, Gordon, Russel, and Malcolm, all Scotch gardeners, commenced their nurseries at Hammersmith, Mile-end, Lewisham, and Kennington. Their success excited the jealousy of the established commercial gardeners, who, between 1760 and 1770, held several meetings, and entered into resolutions not to employ young men from the north. These resolutions were not long adhered to; but a tract, entitled "*Adam armed*," published by this *association* at the time, shows the extent of what they intended. From this tract it appears, that James I. had granted a charter to certain persons inhabiting within London, and six miles of it, who were capable to educate and instruct young men in the art of gardening. This charter was granted in the third of this king's reign, and renewed in the fourteenth; but in the tract alluded to it is stated never to have been put in force, and not to be sufficiently extensive; and therefore it is proposed, that a charter be granted to extend over the whole kingdom, to prevent mere labourers and other unqualified persons from assuming the profession of gardeners, and thereby doing "great injury to the nobility's and gentry's gardens and plantations," as well as to proprietors who let ground to such as "undertake to furnish the market with eatables." Only a certain number of gardeners were to be licensed to take apprentices, and of these the number was to be limited, &c.

This attempt at monopoly of skill does not appear to have met with serious attention, and all that resulted from the association, as far as we have been able to learn, (from a gardener, Wm. Duncan, upwards of 90 years of age,) was the partial exclusion, for a year or two, of young Scotchmen from a few of the nurseries and gentlemen's gardens near town, which were managed by Englishmen.

2295. The origin of *Florists' Societies* we have not been able to discover. It is more than probable that meetings for the display of fine flowers and the estimation of their merits, were first held at Norwich, where, as Sir I. E. Smith informs us (*Supp. Encyc. Brit.* art. *Bot.* 386.) a love of flowers, and a great degree of skill in their culture, had been introduced into that city with its worsted manufactures, about the middle of the sixteenth Century. At all events, there were florists' feasts held there so early as 1637; a play called "Rhodon and Iris," being extant, which was acted before the company in that year. *Linn. Trans.* vol. ii. p. 226.

The next florists' meetings, it is probable, sprung up about London; and Nathaniel Rench, of Fulham, is said (Faulconer's *Historical Account of Fulham*) to have been the first who established them, probably about the end of the seventeenth century. According to Mr. Davey, florist, King's-Road, whose father was also an eminent florist, and lived to be upwards of ninety years of age, the florists' feats and meetings were at their greatest height about London, between 1740 and 1770. They were then attended by many noblemen and gentlemen, as the horticultural societies are at present. They declined towards the end of the last century, but have since revived, and are at present rather on the increase.

The florists' meetings, and those of gooseberry-growers, in Lancashire and the adjoining counties, are very numerous, and rather on the increase. When they were first adopted in that part of England is not exactly known. From the best accounts we have been able to collect, they were in vogue there in 1760, and are recollected so far back as 1740.

Some florists' societies existed in Edinburgh during the latter end of the last century; and on one of these the Caledonian Horticultural Society was founded. The principal florists' societies in Scotland are at Paisley.

The principal modern societies for the encouragement of gardening are, the London and Caledonian Horticultural Societies already mentioned at length. (132 and 133.)

2296. There are few *public Laws* specially formed for the two first branches of gardening, horticuture and floriculture; the general laws being quite sufficient for their protection. Robbing of orchards or gardens, of fruit growing therein, is punishable criminally by whipping, small fines, imprisonment, and satisfaction to the parties wronged, according to the nature of the offence. (43 Eliz. c. 7.)

There are a number of acts relative to arboriculture, and especially against the cutting down of young trees. See Tomlin's *Law Dict.* vol. ii. art. *Timber.*

BOOK II.

OF THE FUTURE PROGRESS OF GARDENING IN BRITAIN.

The improvement of gardening, like that of every art or commodity, necessarily depends on demand and production. These causes operate reciprocally on each other: a nicety of taste in the purchase of vegetables and fruits exposed in public markets, will occasion articles of better quality being brought there; and articles of a superior quality, by improving and rendering more fastidious the taste of the purchaser, will ensure the continuance of their production. In like manner, if those who have private gardens were a little more difficult to please in selecting a gardener, and in the quality of the produce sent to table, the consequence would be, an improvement in that produce, and more scientific gardeners. More scientific gardeners would surprise and delight, by their superior fruits and flowers, and the greater order, beauty, and high keeping of their gardens; and the habits of both parties accommodating themselves to this improved state of things, would be the ground on which to rely for its continuance.

In this view of the subject, the future progress of gardening depends on two causes; the improvement of the taste of the patrons of gardening; and the improvement of the science and art of practical gardeners.

Chap. I.

Of the Improvement of the Taste of the Patrons of Gardening.

2297. Men rest satisfied with what they have, when they know of nothing better; and therefore, one of the first sources of improvement in the taste of the patrons of gardening; whether of the tradesman who has recourse to the public market, or the private gentleman who is in possession of a garden, is the increase of knowledge. The wealthy tradesmen of Dublin and Edinburgh should look into Covent-Garden market in London; and, not to mention fruits, and forced or exotic productions, let them compare the cauliflowers and salading of the three markets. Those who have once acquired a taste for such salads of endive as are afforded in the London market throughout the winter, would not very readily reconcile themselves to the acetarious productions of Dublin and Glasgow during that season.

Another retarding cause, is the general ignorance of the mode of cooking vegetables, and especially of dressing salads, which exists among the middling classes almost every where. A French laborer, out of a few leaves of dandelion and wild sorrel, which may be gathered by the hedge sides any where, and almost at any time, will produce, merely by the aid of the common condiments, what the wives of the greater number of respectable tradesmen in the kingdom have no idea of. There can be no great demand for a thing, of which the use is not thoroughly understood; and, therefore, an improvement in the knowledge and practice of cooking must take place among a certain class before much can be expected in the quantity, kind, or quality of the gardening articles which they commonly consume.

Another requisite wanting for the improvement of horticulture in Scotland and Ireland, is the more general use of desserts of fruit among the middling classes; and of better desserts among the independent orders. If fruit, physiologically considered, is less wholesome after dinner than before it, (which is questionable,) it is at least more so than where drinking is substituted in its place. To prolong the period of eating, and the conversation of female society, are not only objects which afford immediate satisfation; but, by moderating the use of stimulating liquors, tend to ensure future health.

But, even in England, where a dessert is universal among the independent class, there is a great want of nicety of taste: fruit is valued by many only as a symptom of the presence of wine: others contentedly use pears and plums that would be rejected at the most common French déjeuné; and many content themselves with melons and grapes, who, at almost no additional expense, might have pine-apples. Wherever the litter of four horses is at command, pine-apples may be grown in Baldwin's manner (1157, and 1172, &c.) with very little trouble to the gardener, and, indeed, at much less trouble than trying to have very early cucumbers, or melons. But why speak of pines, when not one family in a hundred are properly supplied with mushrooms, which ought to be on table in some form, every day of the year. On a small scale, the grand secret is, to employ a gardener who knows his business; and to direct his attention less to raising ordinary productions at extraordinary seasons, than to raising first-rate crops of every thing in due season. On a larger scale, all ordinary and extraordinary things should be attempted that art and wealth can accomplish.

So much with respect to horticultural productions; a taste for fine flowers and rare exotics must be preceded by some knowledge of plants, or a taste for scientific botany, and the history, geography, and uses of plants. These branches of knowledge may be considered as gaining ground. A good deal also depends on the fashion of using flowers as chamber ornaments, and on having green-houses attached to dwellings; both are most agreeable and rational luxuries; and it is much to be desired that a taste for them was more general, especially in provincial towns, and in the cities of Scotland and Ireland.

The taste for planting has attained a greater height, during the last twenty years, than any other department of gardening; the beneficial consequences of which are already powerfully felt in Scotland, and the exposed parts of England. An essential requisite in this department is attention to the future management, thinning, and pruning of plantations. The taste for landscape gardening has been nearly dormant, in England, during the last thirty years; in Scotland it has been more active, but not of the purest kind; little has been done in Ireland generally, though there are some patriots there, who have been active in improvement. A taste for deer-parks is not common in Scotland; and rare in Ireland.

A park in Scotland is a grass field; and the park of a mansion is a number of green enclosures lying contiguous to each other, (not united), and surrounded by strips or rows of trees. In Ireland a mansion and park is a naked house, in a naked grass field, surrounded by a stone wall. There are exceptions in both countries; and many lawns or sheep-parks in Scotland of considerable beauty. Besides a union of pasturable, wooded enclosures, as a park may be very well defended on the principle of utility; but there can be no defence of the naked parks of Ireland.

The taste for public gardens, as promenades and botanic gardens, seems on the increase; but unfortunately these are seldom founded on a sufficiently secure basis. The funds of the recently established botanic gardens have been generally raised by the subscriptions of a certain number of individuals, to whom, and to certain annual subscribers, the garden is alone accessible. Perhaps it would be better, if, as in the case of public promenades, the funds were raised by the whole town or community; and the garden thrown open to all, like that of Paris. Public umbrageous promenades, either equestrian or pedestrian, are very desirable additions to all congregations of houses.

Very much of the comforts and pleasures which a private gentleman derives from his garden, and garden scenery, depends on the qualifications of the gardener which he employs to manage them. It was formerly the practice, in books of gardening, to give directions to gentlemen how to choose a gardener. These might have been of use when the qualities desired differed little from those sought for in a common laborer; such as sufficient strength and health, and good morals, disposition, temper, &c. But every master can judge of these and other similar points; and for any gentleman who has not a knowledge of gardening to go further, would be more dangerous than useful. We are clearly of opinion, that in almost every case the best mode is to apply to a respectable nurseryman; to describe to him the sort of garden and garden-scenery to be managed, and the sort of productions desired, and to rely on his recommending a fit person for accomplishing the intended objects. If this person should not turn out so well as was expected, the nurseryman will be in some degree responsible for his conduct, and will feel doubly anxious to replace him by a more competent person.

Chap. II.

Of the Education of Gardeners.

By education is generally understood that portion of knowledge which is obtained at schools; but we shall here use the term in a somewhat more extended sense, and consider it as the means which may be employed to render man competent for performing the part which he undertakes to perform in life with increased satisfaction to himself and others. Education may thus be considered as extending to every thing which operates on the body or mind, from the earliest period of our existence to the final extinction of life. With this object in view, we shall consider in succession the professional, intellectual, moral, religious, physical, and economical education of gardeners, previously submitting some general remarks.

Sect. I. *On the degree of Knowledge which may be attained by practical Men, and on the general Powers of the human Mind, as to Attainments.*

2298. The knowledge of languages, history, geography, arts, sciences, and literature, which a gardener daily occupied with his profession may acquire, provided he begins at the commencement of his apprenticeship, and continues to employ his leisure hours in reading till he is twenty or twenty-five years of age, is by no means inconsiderable: not that he can, or need become learned; but, if desirous, he may become generally intelligent; render himself fit, as far as conversation is concerned, for good society; prove instructive and entertaining to others by his conversation; and provide a reserve fund of enjoyment for himself, by laying up a store of ideas for reflection in misfortune, disease, or old age.

The terms knowledge and ignorance are entirely relative: the knowledge of a modern chemist's porter would have subjected him to be hanged and burned in the days of the first popes; and any bricklayer's laborer who reads the London newspapers, has more correct ideas on the principles of political economy than nine-tenths of the nobility in Russia and Spain. It is impossible to set limits to the knowledge which may be obtained by those who are destined even to the most severe and constant labor. The intelligence of the miners in Scotland and Sweden may be referred to as proofs. The miners at Leadhills have a regular library and reading society; and the works they make choice of are not only histories, voyages, travels, &c. but even works of taste, such as the British classics, and best novels and romances. The degree to which knowledge will prevail among any class of laboring men, will depend jointly on their own ambition; on the demand for, or reputation in which knowledge is held; and on the opportunities of acquiring it. A dull, stupid person, with little native activity, will never desire to know more than what enables him to supply the ordinary wants of life. Where the workmen of any art are required to have technical knowledge of any particular kind, they will be found invariably to possess it. Thus carpenters and masons require some knowledge of the mechanical principles of architecture, and working engineers of the strength of materials; and these kinds of knowledge are acquired by them without an hour's interruption of their daily labor; on the contrary, the habit of evening study renders them more steady, sober, and industrious than other workmen; than bricklayers and paper-hangers, for example, whose employments require much less intellectual skill. If every cook-maid, before she could obtain a first-rate place, were required to be able to read Apicius Redivivus in the original tongue, there would be no want of learned cooks; and if no gardener could obtain a first-rate situation who had not written a thesis in Greek, or who had not made the tour of Europe, there would soon be found abundance of gardeners so qualified. A Caledonian, when he comes to the low country, soon acquires the English tongue, and if he has been taught Latin, thus knows three languages. The servants at the inns on some parts of the Continent, frequented by different nations, often acquire a moderate knowledge of three or four languages. A late custom-house officer on the island of Cronstadt, spoke and wrote ten languages; and the bar-maid, at the hotel (de Londres,) at which we lodged in Moskwa, in 1814, could make herself intelligible in Swedish, Russian, Polish, German, French, Italian, and English.

The certain way of obtaining any thing is to be impressed with the necessity of possessing it; either to avoid the evil of being without it; to satisfy the desires of others as to ourselves; or, our own desires. There is scarcely any thing that a rational man can desire that he may not obtain, by maintaining on his mind a powerful impression of the necessity of obtaining it; pursuing the means of attainment with unceasing perseverance, and keeping alive that enthusiasm and ardor which always accompany powerful desires. Even the most extravagant desires, when sufficiently powerful, are often gratified.

Suppose, for example, a man desires to be a king; that is a desire sufficiently extraordinary; but if he will first make himself acquainted with the history of all men who have raised themselves from nothing to be kings, and then consider in which part of the world he is most likely to succeed, he may very likely attain his object. Let him first choose a country where the inhabitants are unsettled or discontent, or credulous; and let him ingratiate himself with the prevailing party there, and endeavour to prove to them that he has qualifications calculated to procure them a redress of grievances, (of which men in all countries have *quant. suff.*); or that he has discovered the only true religion. If after due trial and perseverance, he is not placed on a throne, he will certainly become eminent as the chief of a party, which is as near being made a king as possible. Suppose a man desires to possess great wealth; this he may attempt in three ways; by a saving of income and gain of time; that is, by denying himself the usual gratifications of food, clothing, and rest, and laying out at compound interest what is gained by these deprivations; by gambling speculations in property; and by marriage. The first mode is slow but certain, the second is dangerous, and the third doubtful.

Suppose a man wishes to become an eminent poet; he may not become such a poet as Burns or Lord Byron, because the clay of which he is formed may be originally of inferior quality to that of these men; but if his natural faculties are of the average quality, he may become a poet of respectable rank. First, let him read all the poetry that has been written in such languages as he understands; next let him by the aid of books on rhetoric, and on the art of poetry and criticism, analyze all the best poems, and treasure up in his mind all the figures, metaphors, &c. that are made use of in them. Then let him, according to the line of poetry which he chooses to pursue, place himself in circumstances favourable to its study, and persevere till he produces at least, a new combination of known figures, joined, if possible, with some which, as Addison has expressed it, are both "new and strange." No self-convicted sinner ever yet failed of being converted; nor any persevering lover of getting possession of his mistress.

After these remarks on extravagant desires, and the possibility of attaining ends generally considered as depending on fate, original genius, or predestination, it will not be necessary to hint at the practicability of any man's attaining eminence as an artist of any description; as a literary character, natural or experimental philosopher, mathematician, divine, lawyer, or physician. To attain eminence in any of these departments, it is only necessary to have a powerful desire for it, and to apply unceasingly to the subject, and to that alone. All may not acquire by the same degree of labor, the same degree of eminence; but any man by labor may attain a knowledge of all that is already known on any subject, and that degree of knowledge is respectable; what many never attain to, and what few go beyond.

The grand drawback to every kind of improvement is, the vulgar and degrading idea that certain things are beyond our reach; whereas the truth is, every thing is attainable by the employment of means; and nothing, not even the knowledge of a common laborer, without it. There are many things which it is not desirable to wish for, and which are only desired by men of extraordinary minds; but let no man fancy *any thing* is impossible to him, for this is the bane of all improvement.

Let no young gardener, therefore, who reads this, even if he can but barely read, imagine that he may not become eminent in any of the pursuits of life or departments of knowledge, much less in that of his profession: let him never lose sight of this principle, — that to desire and apply is to attain, and that the attainment will be in proportion to the application.

Sect. II. *Of the Professional Education of Gardeners.*

2299. In order that a professional man should excel as such, every other acquirement must be kept subservient to that of his profession. No branch of knowledge should be pursued to any extent, that either of itself, or by the habits of thinking to which it gives rise, tends to divert the mind from the main object of pursuit. Something, it is true, is due to relaxation in every species of acquirement; but judicious relaxation only serves to whet the appetite for the vigorous pursuit of the main object. By the professional education of gardeners, we mean that direction of their faculties by which they will best acquire the science and manual operations of gardening: and we shall suppose the young man to be instructed, to have no other scholastic education than some knowledge of arithmetic, and the first problems of geometry and land-surveying.

The sort of garden which ought to be the scene of the days of apprenticeship, should, if it can be so foreseen and arranged, be that which the learner is ultimately intended to possess or manage. As the great majority of young men who learn this art, are intended for serving-gardeners to private families; a private garden, where every department is respectably conducted, is the best to begin with. Here, or in any other garden in which he may be placed, he will have to learn, the names of things; their uses in gardening; how to use them in the best manner singly; and how to combine their use in performing the different operations of gardening.

We may previously observe, that the grand foundation for every kind of acquirement, is the cultivation of the faculties of attention and memory. Unless we pay attention to what is addressed to us, whether by the eye or the ear, it is impossible we can remember, because the sight or sound has made no impression on the memory, and without memory, there can be no knowledge.

Many pass through life without seeing or hearing any thing but what immediately concerns their avocations. It is a common thing for a person to walk out and return without being able to describe, or even mention, any one thing he has seen; or to read a newspaper without being able to tell what he has read, farther than to give some vague idea of the subject. All this is the result of neglecting to rouse and exert the faculty of attention; or of limiting our attention to one single object or class of objects.

One of the first things, therefore, that a young man should do is, to cultivate the faculty of attention, which he may do every hour of the day, by first looking at an object, and then shutting his eyes and trying whether he recollects its magnitude, form, color, &c.; whether he would know it when he saw it again, and by what mark or marks he would know it or describe it. When he goes from one part of the garden to another, or is on a walk or journey, let him pay that degree of attention to every thing he sees and hears, which will enable him to give some account of them when returned from his walk or journey;

and let him try next day, or some days afterwards, if he can recollect what he had seen then, or at any particular time and place.

The attention to be exercised in such a way as to impress the memory, and enable the observer or hearer not only to *recollect objects*, but to describe them, must be exercised systematically. A thing or a discourse must be attended to, not only as a whole, but as a composition of parts; and these parts must be considered not only as to their qualities of dimension, color, consistency, &c., but as to their relative situation and position.

To be able to give an account of a town or village, for example, the first thing is to get a general idea of the outline of its ground-plan, which may be done by looking from a church-tower or adjoining hill; next, its relative situation to surrounding objects; as what hills, or woods, or waters join it, and in what quarters; next, the direction of the leading street or streets must be noticed; then the intersecting or secondary streets; the principal public buildings; the principal private ones; where the lowest houses and narrowest streets are situated; and what is the character of the greater number of houses composing the whole assemblage.

Even to be able to recal to mind or to describe the figure of any person before us for the first time, it is necessary to attend to height, either absolute, by estimation in feet and inches; or comparatively with our own, or that of any other person or object present at the time; to figure or shape generally, as whether tending to excellence or defect; then to hands and feet, gait, manner, &c.; and, above all, to the form or outline of the countenance, the complexion, and other details of the face.

One untutored person looking at another with a view to recollect or describe him, would only stare; but an attentive and systematic observer would survey both the party generally and in detail, and in such an order as would readily occur to the mind on reflection. He would not, for example, after estimating the height, proceed next to the color of the eyebrows, but would take the breadth and shape, as more congenial to the accustomed train of ideas. The young gardener will apply these hints to recollection of parks, pleasure-grounds, walled-gardens, hot-houses, and also to the study and recollection of individual plants.

In attending to written or oral discourses, with a view to recollecting and relating what has been read or heard, the same general principles will apply; the first thing is to attend to the object in view, and next to the order or form, in which the whole is proposed to be treated of or delivered; lastly, to the manner in which the details are filled up.

Natural history, by its systematic arrangement, and the precision of its details, is well adapted for improving the faculties of attention and memory, and its study is the most effectual way of learning to attend to, and recollect single natural objects; and that of drawing, to attend to them in combination. Hence, the importance of a gardener's attending to botany and drawing, even with a view to general improvement, independently of their special utility in his profession.

Thus far as to exerting the attention with a view to recollecting objects and discourses; the next thing is to recollect *names and numbers.* Names are either descriptive; that is, when they consist of a word, or are composed of words which describe something of the object to which they are applied; as Longtown or Hillhouse; or they are arbitrary, meaning nothing, or nothing now known or definable; as morse, ganus, &c. The first are of easy recollection, because, even though the object may never have been seen, its image may be presented to the imagination by the name, as a town of great length, and a house on a hill top; the second are only to be recollected by seeing the objects to which they are applied, and then associating in the mind the name with the thing; or by seeing the description or portraiture of the objects, and associating the name with these; or by finding a resemblance between the new name and a known name, as morse horse, ganus janus, &c.

The principal names which a gardener has to recollect are those of plants; to assist him in this knowledge, the etymologies of all the generic names, and of the specific names, which are substantives, is of great advantage; the ordinary specific names being adjectives, are easily understood and recollected. The generic names of plants and animals are of three kinds; those composed of words indicating something of the nature, or appearance, or uses, of the plant; as Gypsophylla, Helianthus, Linum, &c.; those composed of the name of some eminent individual, as Hellenia, Gordonia, or after some town, as Colchicum; and those composed of native or local names, as Ellettari, Açacia; the first are of easy recollection, because the natural soil, the sight of the flower, or the recollection of its image or its uses, will recal to mind the name; the second may be recollected by considering who the name-father was, and by associating his figure and some action of his life, real or imaginary, with a specimen of the plant. Thus Gordon was a nurseryman at Mile-end, a short, lame, sailor-looking man, who dressed in blue trowsers, chewed tobacco, and was without offspring; it is easy to imagine his wife reproaching him with the last circumstance, while he holds out to her a plant of Gordonia, as a substitute for a son and heir. Elettari being extensively cultivated as a spice by the natives of Coromandel, we may imagine a group of these Indians arriving after death at the gates of Paradise, each with a bundle of the plant. The porter may be supposed, on first opening the gate, to be about to shut it in the faces of these poor black fellows, till they all shout out, "Elettari." "What then," says the porter, with surprise, "you are, *elect-are-ye !*" and lets them in. Elettari is the only native generic name in Monandria Monogynia; the native specific names in the same class and order are Allughas, Zerumbet, Casumunar, and Mioga, which may be easily likened in sound to Hallelujah, Strumpet, Cheesemonger, and Maijocchi.

All those names, whether of science, or those which occur in the common intercourse of life, as of persons and places, are to be recollected on the same principle; that is, either by the name itself calling up an image, by its resemblance to some other name already known, or by forming an association between it and some known or familiar visible object; and the more ludicrous the association, the better will it be recollected.

In forming these associations, it is essential that the object employed to aid the memory be one capable of being seen; to associate any particular object with a sound, smell, touch, or taste, would give little aid to the memory; and to associate it with abstract nouns or ideas, none at all. "If I am told that the Dutch merchant Schimmelphenninck was a very wealthy or religious man, that will not assist me in recollecting his long name; but if I say to myself there is some resemblance between Schimmelphenninck and *skim-milk-pen-and-ink*, the resemblance may enable me to do so; or if I have recourse to a Dutch dictionary, and discover that *schimmel* is grey, and *phennick* a penny, I have greypenny, as a synonym, which, with the operations the mind has undergone in getting at it, will most probably impress the original name on the memory. If a Highlander tells me his name is Macpherson, I immediately interpret it *mac-person* — *mac parson*, — son of a parson, — sun of a Catholic priest and a Highland maid; and I lament the depravity of human nature in degrading the sacred office; and instead of implanting in the youthful mind a love of virtue, and nourishing that love by proper motives, to sow there the seeds of "folly, sin, and shame." *

There are no class of men who have a more ready and certain source of recollecting *figures* than gardeners. For all numbers not exceeding 24 they have only to associate the figure with the name of the corresponding Linnean class, or with one of the plants of it. Thus, if a lad in a nursery is sent to the fruit-tree ground for plants of number 19 and 21 of pears, he has only to think of Syngynesia and Monœcia. For all numbers exceeding 24, and under 250, he may make use of the terms of the first ten orders, in addition to the 24 classes; and thus, No. 241 will be Cryptogamia monogynia, 249 Cryptog. enneagynia, 208 Gynandria octogynia, and so on.

To any one but a gardener or a botanist, this mode of recollecting numbers has no advantages over any ordinary system of artificial memory; but as there can be no gardener to whom these classes and orders are not perfectly familiar during the whole period of his life, or at least of his practice as a gardener, to him it is superior to all the artificial systems. It is easy to add to the certainty of remembrance by associating the figure of any known plant or plants belonging to the class or order; thus, for 24 he may think of Osmunda regalis, for 245 Osmunda regalis, and Daucus carota, or a fern frond and a carrot-leaf, for 16,213 he may think of a nosegay composed of a Canna glauca, Narcissus triandrus, Olea fragrans, and Rosa provincialis, or he may fancy himself planting these plants in a row or in a pot.

Numbers may also be recollected by gardeners by their going through the operation in imagination, of cutting them on a number-stick, either by the common, (*fig.* 75.) or by Seton's method, (*fig.* 77.) Names may be recollected in like manner, by their going through the operation mentally, of writing or printing them, or writing them in some particular hand, or imagining how some particular friend, with whose hand-writing they are acquainted, would write them. They may be supposed to be written on any scrap of paper, or against the day of the month in a common pocket-book, or what is preferable, after the last entry made in the pocket memorandum-book 2301, to be afterwards described.

The memory, both as to figures and words, may also be materially assisted by studying the postures of the human figure, corresponding to the first ten Italic numerals, and the letters of the Roman alphabet. Plates of these are to be had in the juvenile libraries.

Some useful hints on the subject of memory will be found in Feinagle's work on the subject, and especially in a tract by G. Jackson, in which Feinagle's system is greatly improved; but the machinery of both systems, though they enable a student to recollect an astonishing deal in a short time, yet, like other complicated machinery, it soon goes out of order when not in constant use. It is, therefore, unfit for practical men.

Thus far as to recollecting things and their names; the next thing which a gardener has to acquire is, their *uses and history*. The uses of the implements, tools, utensils, and machines of gardening, he will acquire by manually exercising them in performing the labours and operations of gardening under the direction of his master. He should not only know how to use them, but how to use them in the best manner; and also the history of each implement or machine, derivation of its name, why one form is preferable to another; in short, he should know the rationale of the formation and operation of all of them. The essential part of this he may acquire by reading Part II. of this work, and the rest from the study of the principles of mechanics, and by conversing with intelligent carpenters, millwrights, and engineers.

The uses of the commoner garden plants he will find in the third part of this work (Books I., II., and III.); something more he will find in Book IV., and for the rest he must have recourse to books on cookery, medicine, chemistry, and farming, which go more into detail.

2300. The study of *systematic and physiological botany* must go hand in hand with practical acquirements; for which, and also for forming an herbarium, he will find general information in Part II., Book I., and for more minute details, he may consult the authors there referred to. Some idea of vegetable chemistry and geology he will obtain from the same Book, and Book II. of Part II.; and of the different insects and vermin which are enemies to gardens and garden productions, under the heads of the different plants which they more especially annoy. The study of landscape-gardening, as being the highest part of the profession, should not be attempted till the apprentice has made himself master of the three departments which precede it.

An important part of what a young gardener ought to acquire is, a knowledge of the weather and the seasons, so as, in some degree, to be able to predict them from signs. Our observations in Part II. Book II. Chap IV. Sect. 4. will aid him in this study, and he should also keep a weather book, or naturalist's journal, such as we have already suggested. (1063.)

2301. The last thing we shall here recommend to the young gardener is, to keep a *pocket memorandum-book*, for taking notes of every thing, whether professional or general, which strikes him at the time as interesting. He should begin this sort of memorandum-book with his leaving school; and he will probably find it useful to continue it all his life after. Its size should be small octavo, to suit the pocket; it requires no ruling, but a line across the page half an inch from the top. In writing on one page, the opposite one should always be left blank for corrections and additions, for sketches, or for taking down temporary memorandums in pencil. The following may be considered as a specimen, in which it is to be particularly observed, that a margin is left on the written page, on which margin each article is begun with a word written or printed in large letters. These words, thus conspicuously placed, serve as an index to each article, and in future reference will be found of material use. Any thing to be inserted, should always be done instanter, or never later than the same day. If it is done out of doors, it may be written on the blank page in pencil, and afterwards copied on the opposite page in ink.

Pocket Memorandum-Book of J. Gott, Apprentice, at Aubrey Hall.—January 27th and 28th, 1821.

27th.	
PEAS.—Last night's frost and this day's sun have killed the peas in the south border: but those sown in the north side of the wattled hurdles escaped, being shaded from the sun.	These were covered with drill hand-glasses, and the crop is now, June 2d, fit to gather.
LIZARD.—Caught a new species, and took it to Twigg. It had no tail, which convinced him it must be a distinct species.	*N.B.*—It turned out to be only the common lizard, (*Lacerta vulgaris*, Linn.) which had lost its tail by some accident, and the wound had healed over.
28th.	
ROSES.—Idea of a conic iron tree, covered with any of the climbing roses, all over inoculated with monthly roses.	
PARSNIPS.—Gurkin O'Doolittle caught distilling parsnip whiskey in the tan-shed: discharged without a character. His still two old watering pots, placed top to top, and closed with a wet cloth: the top kept cool by pouring water on it.	
NEW IDEAS.—Torriel Joss, the parson, called; says there are two ways of getting new ideas: by shuffling what ideas we have together, like a pack of cards, (which is to be done by a free glass of wine or narcotics,) when new combinations may occur to the mind accidentally: or by a studied selection of ideas suitable to the subject on which it is desired to invent.	Cobbler's name White, lives two doors from the Cat and Fiddle.

2302. It is a common thing to require apprentices to keep a *written journal* of work done in the garden for their own use, and this may be advisable in cases where no regular books are kept by the master; but where such books and tables are kept as we have recommended (1057. to 1065.), the apprentice performing his part in making entries in, and daily seeing them, need keep no other books for his own improvement than a Naturalist's Kalendar (1063.) and the journal or memorandum-book just described.

An apprentice, besides studying his art in the garden of his master, should, as often as may be, visit those of his neighbours, and observe what is going on there. His apprenticeship completed, he should move to a different part of the country, performing the journey leisurely on foot; botanizing and collecting insects and minerals, and visiting every distinguished garden on his way. When he settles, it should be in a different kind of garden to that in which he was before, and there he should continue a year, and then remove and travel to another part of the country, and settle there a year, and so on as already suggested (2062.) till he attains his twenty-fifth year, when he may undertake the situation of master. During the whole period in which he is journeyman, he should be steadily and unceasingly employed in improving himself, first in his own art, and the branches of knowledge, as botany, natural history, chemistry, weather, &c. on which it more immediately depends; and next, if his ambition permits, on general subjects of literature, arts, and sciences.

Sect. III. *Of the intellectual Education which a Gardener may give himself, independently of acquiring his profession.*

2303. No gardener, in our opinion, ought to be employed as a master under the age of twenty-five. Suppose him, therefore, to be put an apprentice at fifteen, he has ten years in which to acquire his profession, and generally to improve himself. In that period he may not only acquire his profession, but, according to the extent of his ambition and application, a considerable degree of knowledge on almost every subject. Every thing, as we have more than once observed, depends on his ambition; without this he will not even acquire his profession, and at all events will find no leisure time for any other kind of improvement. When we consider, however, that the labor of a gardener is not severe, and that it is only during the hours of day-light, the time he has for self-improvement is very considerable. It may surprise some when we state, that this time equals (taking the whole year), that employed in study by professional students at colleges. A gardener, in the shortest day, begins work at eight o'clock and leaves off at four o'clock; which, allowing two hours for breakfast and dinner, gives six hours of labour. In the longest day he works only ten hours, and therefore it will not be far from the truth to consider eight hours per day as the average duration of his labor throughout the year. Dividing the twenty-four hours which compose the day, in three equal parts, we have eight hours for rest, dressing, and undressing; eight hours for labor, and acquiring the practice of gardening; and eight hours for refreshment and study. On comparing this time for study with that which is usually devoted to it by young men at college; not the generality of young men, but those even who attain to eminence; we will find the difference very inconsiderable. The student requires the same time for rest, and at least two hours more for dressing and undressing (say ten hours); for breakfast he requires an hour; dinner and tea, at least three hours; and for exercise (which if he neglects he will soon be unable to study at all), at least two hours; in all, for exercise and refreshment, six hours; which added to ten of rest and dressing, gives eighteen hours, leaving exactly the same number of hours for study which every gardener has, taking the average of the year. It is true the eight hours of the gardener are subject to the time employed in eating; but that may well be considered as compensated by the knowledge of botany he acquires in the garden during his hours of labor. Add also, that the gardener may (unless his health forbid) draw still more time than we have mentioned from the hours of sleep; we think it will not be denied, that, taking all circumstances into consideration, he has as much time as studious men, taking the average of the year, usually *devote to study*.

2304. Having ascertained that a gardener may find time for intellectual improvement, the next question that occurs is, what are *the branches which best deserve his attention?* As one branch of knowledge is as much as any person ever does or can excel in, and as that branch, in the case of every professional man, ought to be his profession, it seems to us that a gardener ought not to attempt to excel in any one branch of knowledge besides that of gardening; but rather to make himself acquainted, to the degree that circumstances may permit, with the whole cycle of human knowledge. If he attempts any thing else, it is impossible, isolated as he must be, in comparison with others who study the same subject, among abundance of books and fellow-laborers, that he can attain to the highest degree of eminence. It is impossible, for example, that he can arrive at great perfection, even in the study of botany, from not having an opportunity of consulting the herbariums and books which are only to be found in the metropolis. He may, however, and ought to, attain a respectable degree of knowledge, not only in botany but also in the other branches of natural history: such for example as will enable him to refer any natural production to its place in the Linnean system, and describe scientifically any new production. But that he should be expert at chemical analysis, dissection of animals, solving problems in any of the higher branches of mathematics, or excel in painting, music, or poetry is what we by no means propose, or think practicable; though we are convinced he may know something of all those subjects, and of all others on which there are published books.

The source from which he is to derive his general knowledge, it may easily be conceived, is chiefly from books; with such aid as opportunity offers from professional men, public lectures, men of talents and learning wherever he has an opportunity of conversing with them; artists, artizans, and manufacturers of every description; and also manufactories, engines, mines, dock-yards, and all other works displaying human skill. But the grand source is books, and the question is how a journeyman gardener, whose wages are less often than those of a common laborer, is to procure them? Our answer is, borrow them; and make it a fixed rule to purchase no books excepting grammars, dictionaries, and other elementary works; and of these used or cheap copies. The head-gardener will always be able and willing to lend his apprentices and journeymen a certain number of books; and the patron under whom they serve, will generally be found equally liberal.

The sorts of books desirable to borrow, independently of those connected with professional acquirements, such as Treatises on Chemistry, Zoology, Mineralogy, &c. will depend on the degree of advancement of the student. But that which we are of opinion cannot be dispensed with, is a good Encyclopædia. One systematically instead of alphabetically arranged, would be the best; but as most country libraries are now stocked with the Encyclopædia Brit. or Ree's Cyclopædia, these must be taken till a well executed one on the plan of the Encyclopædia Metropolitana, now publishing, (but badly executed,) finds its way into general use.

The next thing is *to determine the studies* to be commenced with. It is necessary to premise here, that the mind, before it can derive much improvement from reading, must undergo a certain degree of culture. To improve by reading it is not sufficient to be able to read; we must be able to analyze language and discourse; to recognise the real or apparent object of the writer; and to trace the order of his ideas from the commencement to the conclusion. The foundation of this is the exercise of the faculty of attention, already dwelt on; and essential aids to it is the study of grammar, and of languages. Another excellent help is the study of systematic natural history; a circumstance highly in favor of gardeners who are desirous of improving themselves in general literature; since, if they know their profession at all, they must have a tolerable knowledge of systematic botany, which gives the mind an orderly and systematic mode of thinking. It is not uncommon, for example, to hear gardeners, who have no pretensions to general literature, applying the terms, genera, species, subspecies, and varieties to manners of thinking, as to religion, or to weather, forms of governments, &c.

For want of this preparation of the mind, there are many persons who read a great deal, and derive very little benefit from it. Their minds are not competent or not habituated to view the subject which they read as a whole, and to take a view of its general scope and tendency. All they see of it is the parts as they pass before their eyes, their relation and connection they think nothing of, and the whole passes as it were through the mind, instead of remaining on it. Reading to such men, in comparison with those whose minds have been prepared by elementary studies, may be said to resemble pouring water on ground with a hardened surface, in comparison to pouring it on soil which has been loosened with the spade.

Under these circumstances we would recommend commencement with English grammar and a foreign language. Another excellent aid to forming the mind to precision and accuracy is the knowledge of quantities; for which reason we would join to the study of languages, those of arithmetic and geometry. These, with a portion of general reading, some species of personal accomplishments, and the requisite professional studies, are all that we would have an apprentice commence with, and this only in a certain order to be afterwards described.

With respect to personal accomplishments, we would have dancing, fencing, boxing, wrestling, the infantry manual exercise, whist, backgammon, chess, the flute, and fiddle, attended to as far as opportunity offered; considering dancing, boxing, and the fiddle as the most essential objects. In most country-places these and all the other acquirements may be learned from retired valets, old soldiers, or from some of the servants in a great family, at an easy rate. Swimming and horsemanship should not be neglected if opportunity offers. The acquirement of some knowledge of some or all of these accomplishments will occupy very little time; once attained, they are resources for self-defence, for social entertainment, or of relief from *ennui* when alone. Dancing and the manual exercise are particularly useful as improving the gait, and habituating to good postures both in standing and sitting. To a man who has no other resources for advancement in life than such as are personal, every exterior acquirement is of the utmost importance. — These remarks will to many appear sufficiently extravagant; but we would ask, whether there is any young man who does not, to a certain extent, possess most of these acquirements as it were accidentally? Why then may he not improve them by art, if opportunity offers; or, if they are of use, why should he not seek occasion both to improve and extend his knowledge in this department?

In study, as in every thing else, much depends on *the economy of time*; the march of time is regular and constant, and as there is only a certain portion of the twenty-four hours which a gardener can devote to study, every thing depends on his employing every moment of that portion. To be convinced of what is lost by delay, let two persons commence walking along a road in company; then let one of them stand still for half a minute while the other walks on; at the end of the half minute the distance at which the former will find himself from the latter will be found astonishing. Again, supposing them walking together, and that one, instead of walking along the road with the other, deviates and diverges from it—the distance at the end of half a minute, at which the deviator is found from the one who walked straight on, will be still more astonishing, and is greatly more ruinous, because not only is the time required to return to the direct road equal to that taken to diverge from it, but when returned, the deviator will be a whole minute's walking behind the other. These two simple experiments it would be well for two young gardeners to try, in order that the results may make a strong impression on their minds; and let them ever afterwards think of them when they feel inclined to be lazy or dilatory, or to depart from the line of duty.

To aid in the economy of time, it is desirable to form some *plan of study*; where there is no regular plan much time is lost in hesitating what to begin with; and both lost and misapplied by fatiguing the mind with too long intense application to one thing; by which means a proportional relaxation is required, and the memory, being irregularly charged, will be less faithful. By a well-ordered pre-disposition of studies, the time which would be lost in considering what would be done next, is gained, and the one study becomes a relaxation as it were from the other. We shall here suggest a general plan for a young gardener's employment of time during the few years he has to pass previously to becoming master, and leave him to fill up the details in his own way. We by no means offer this plan as the best; others may be equally good; but the grand point is to fix on some plan, and to adhere to it strictly.

We shall suppose the apprentice, and indeed every gardener under thirty, to rise at five o'clock throughout the year; a necessary habit in the gardener, both for the hot-house fires and for study. He will thus have nearly an hour in summer, and from one to three hours in winter before he goes to work. These we would devote to languages throughout the ten years; on no account would we study any thing else at that time, and on no account would we study any language during the rest of the day. Latin and English grammar may be taken on alternate mornings till the latter is acquired; and afterwards Latin may be taken two mornings, and Greek the third morning. In two or three years the fourth day may be devoted to French; and in the seventh year, or earlier, according to circumstances, Latin, Greek, French, German, Dutch, and Italian may be taken in succession, one morning to each. The object being such a knowledge of English as to be able to write it correctly; of Latin and French to translate them with ease; and of the other languages to be able to make out their meaning by the occasional help of a dictionary. There is nothing to hinder any person of even inferior organization, to attain this knowledge in ten years, at the average rate of one and a half hour's study every morning. The great thing is not to omit a single morning, unless from illness; for even in the case of absence from home, or during a journey, a grammar or any polyglott book, such as a Testament or a Commenius may be carried in the pocket.

If at any time, through business or over-sleeping, but a few minutes can be got in the morning, still these few ought to be applied in the usual channel; even half a minute is worth something, for in that time a noun may be looked over, or a rule read and reflected on during the walk to the place of working. If no time is left, even while dressing, a dictionary may be opened and a word looked at, and recollected, and even a word per day gained is worth something.

It is impossible to gain any end either in self-improvement or any thing else at once, for nothing is lasting but that which advances by degrees. The independence which even a very moderate knowledge of languages confers on the possessor, whether in general reading, or in reading foreign books, is invaluables, and amply compensates the trouble requisite to acquire them. To any person going abroad for profit or improvement, they are essential. It is a common thing to suppose, that a certain long number of years are requisite to acquire Latin, which may be the case with children who learn it by compulsion, and is more or less the case as to every thing they are taught; but with a grown-up and voluntary learner the case is widely different. We have known men in this country acquire one or two languages, after having attained their fortieth year; and the thing is quite common among migrating tradesmen on the Continent.

In purchasing the grammars, that of Cobbet or Lindley Murray may be selected for the English; and for the other languages, any that can be got cheapest; the last remark will apply also to the dictionaries. To impress rules and words on the memory, read them aloud, sing, or chant them, or write them down. Books in most languages may be had at book-stalls for a trifle; or by applying to a subscriber to the Bible Society, he will procure a New Testament in any living language, and also in Latin, Greek, and Hebrew, for two shillings or half a crown. Used copies of the Janua Linguarum of Commenius, containing Greek, Latin, French, &c. are to be had even cheaper.

The spare time after breakfast and dinner we would devote to botany for the first three years, and the seven years afterwards to botany and other branches of natural history, gardening, and farming books. Thus the early part of the day is disposed of for the whole ten years: the next thing is to arrange for the evening. For this the arrangements must vary according to circumstances, as it does not all depend on the will of the student; thus lectures can only be attended, when and where given; and those who may have undertaken to give instructions in fencing or fiddling, must be received at such evening hours as suits their convenience, &c. We would, however, never break in on the day-studies with these acquirements; and as far as possible devote two hours at some period of every working-day evening, during the first three years, as follows: of the first evening to drawing plans and architectural subjects; the second to arithmetic, mensuration, and land-surveying; the third, to drawing landscape and figures; the fourth, to Euclid's Elements; the fifth, to drawing plants, flowers, insects, and minerals; and the sixth to mechanics and experimental philosophy. The remainder of each evening to be disposed of in writing essays and letters, both with a view to improvement in the style, and in penmanship; to miscellaneous reading, if possible, from an encyclopædia, assigning a due proportion to each kind of study or acquirements.

A holiday, when it occurs, we should recommend to be commenced with a language, as usual, and to be included in the general rotation for that branch; but the remaining part of the day we would dispose of in portions of one, two, or three hours, in bringing forward those evening studies which we had been least successful in during the week, or found ourselves most in want of for actual use. Holidays are also particularly adapted for drawing, which, though it ought not to be neglected with artificial light, yet goes on best with that of the sun. Nothing can be more mechanical than copying drawings, or drawing from nature, and there is nothing (but want of will) that can hinder every gardener from being a good draughtsman in all the three departments. To paint in oil, or make highly-finished drawings, valued as such, is quite a different thing, and not to be attempted but by such as have much leisure, or adopt that pursuit as a profession.

The books necessary for these studies are, any authors on arithmetic, mensuration, and land-surveying, who are pretty full; any used copy of Euclid, and of Young's Lectures on Natural Philosophy; or study the articles on the last subject in a good encyclopædia. There is no very good drawing-book for self-instructors, but some one may be borrowed, and those parts of the Encyclopædia consulted which treat on the subject. For the miscellaneous reading, all the books required are to be borrowed, and chiefly, if possible, the Encyclopædia, which ought to be read through volume by volume, and notes taken in the pocket memorandum-book (2301.) of such parts as are considered best worth remembering.

A great deal more might be said on this subject, did our limits permit; suffice it to add, that if a student only wills and exerts himself, every thing will be found possible; difficulties may occur, and may retard for a time, but they will finally be overcome. The great thing is to be convinced of the importance of incessant application, by which any man may attain to eminence, and without which eminence was never yet attained. The profession of a gardener is, more than any other, favorable for mental acquirements; his labor is easy; his patron has a library; he has frequent opportunities in improving his language and manner, by being asked questions by his patron and his family, and other superiors who are educated and polished. He may also render himself useful to clergymen, medical men, and schoolmasters, by collecting and preparing objects of natural history for them, for which in return he will receive useful hints, and the loan of books. A great object is, to accomplish all this, and yet have some spare money for travel and accidents, which is to be done by great simplicity (avoiding what is meagre) in food and dress; by neglecting the use of such luxuries as tea, sugar, spirits, and such other articles as are much taxed; by purchasing used clothes, and never new ones before having arrived at the degree of head-gardener, for the best dress; and by having, for daily use, dresses of coarse grey stuff, not enhanced in price by much ornamental manipulation, or by taxes.

Though, in making these remarks, we have had in view chiefly young men, yet there is no period of life at which improvement may not be commenced, and attempted with a degree of success that will amply repay. At any period under thirty, every thing we have proposed may be attained; a great deal, even at forty, and enough to meliorate and humanize life, beginning even at the latest period. Let the gardener never forget that, though something will depend on the nature of his organization, yet, that much the greater part depends on education — on his desire of raising himself, and on incessant application. To desire any thing ardently, is, in truth, to be divinely inspired with the power of attainment.

Sect. IV. *Moral, Religious, and Physical Education of Gardeners.*

2305. The subject of morals, (*moralis*, *Lat.* manners,) regards the conduct of man towards others; that of religion, (*religio*, *Lat.* devotion, devoted to) his opinions as to the nature of things; and that of physical education (*physica*, *Lat.* the knowledge of nature) instructs him in the art of preserving health.

Morality and *religion* are usually treated as depending on each other; the latter is considered as the principal foundation of the former, and man is taught to be sober and honest, not only to avoid the punishment awarded by the laws of his country, but to avoid still greater punishment in futurity.

Those who treat morality apart from religion, say that truth, justice, and honesty, are essential to the existence of regular society. Debauchery of every kind is attended with the loss of reputation, and more or less of bodily health; those who despise, and affect to treat with contempt or ridicule, the opinions of the respectable part of society, are themselves despised and excluded from society in return. In the intercourse of society, a man always receives according as he gives; and as he treats others so is he treated himself. If he wishes to be dealt with honestly, he must be honest; and if he wishes to be respected by respectable men, he must respect them, and their conduct and principles. In short, it is necessary to be moral, in order not to be disreputable; and worth while to be highly so, in order to ensure confidence and respect. Whatever theory therefore the young gardener may adopt, there is only one practice which he will find to answer his expectations; and that is, the strictest regard to truth, honesty, sobriety, decency, and purity in himself; and respect for others, in proportion as these virtues appear in their conduct and conversation.

2306. The moral law of all countries is essentially the same; because, in the rudest forms of society, it is found necessary to enforce justice and honesty; but among rude nations, and even among those in a comparatively advanced state, the more *refined laws of morality* are neglected. Thus in Russia, where the people, from the boor to the czar, are the most religious in Europe, it is no discredit to a gentleman to lead a debauched life, or to pilfer trifling articles from another; but in a refined and luxurious state of society, such as that in Britain, the enjoyment of every individual depends not only on a strict, but a refined morality; and men must not only be civil, but polite. *Politeness* may be considered the ornament or finish of morals or manners; and though it is commonly thought to belong chiefly to the higher classes, yet it will be found both attainable and useful in a high degree, by every class, and by none more than the gardener. Polite and amiable conduct, like a good figure and address, recommend themselves at sight, and make at once an impression in favour of the man who possesses them. "Civility," Lady M. W. Montague observes, "is a sort of current coin which costs nothing and buys every thing." The greatest genius and abilities will never procure a man advancement, without a good address. We recommend the perusal of what Lord Chesterfield has written on the subject, guarding against those slips of the pen where he seems to recommend impurity and deception. If these suit the character of a modern ambassador, they are practices which a poor man cannot afford to deal in.

The foundation of all true politeness is a desire to please others; though some mistake for it a display of their own acquirements; and others, a cringing acquiescence to the opinions of others. The two last errors are to be avoided, the first as immediately, and the second in a short time, incurring contempt. To be polite with permanent advantage it is necessary to be sincere; and any degree of vanity, pride, or arrogance, is certain of proving offensive.

To please others, one of the first things requisite, is to be, or appear to be, pleased ourselves. A man may show his pleasure or displeasure, by his action, by his speech, and by his features. An easy, graceful, and yet manly action, is to be attained by the practice of dancing and the manual exercise; a gracious and polite manner of speaking by much reading, and by attending to the language of ladies and gentlemen, frequenters of polished society; and the features of the face may be *set* to satisfaction, discontent, anger, or ill temper, according as either of these states of mind are adopted. If the muscles of his face are put in training by a gardener at the commencement of his apprenticeship, almost any thing may be done with them, as may be proved by the case of comedians. A gardener's object should be less the power of varying them, than of giving them a *set* expressive of animation joined to a degree of satisfaction: this medium or central disposition he can occasionally alter to that of pleasure on the one hand, or disapprobation on the other, as circumstances may require.

2307. An essential part of politeness is the art of rendering ourselves agreeable in society by *conversation*, and by taking part in the current amusements of the time and place. The art of conversation, like all other arts, is only to be acquired by reflection and experience. The first thing is to store the mind with ideas on every subject by reading, and especially with anecdote, history, and biography; the next thing is to adapt our conversation to the society in which we happen to be; and the last requisite is to endeavour to discover the precise part and quantum of conversation which we ought to supply.

The art of conversation is as little understood by the great bulk of mankind as the art of chemistry: and the consequence is, that in ordinary society it consists in tiresome relations, as to the party or their affairs; attempts to obtain victory in argument, to display knowledge or acquirements; or something which may give superiority over the others present; or of criticisms on the absent; the source of all which is unrefined selfishness. Polite conversation is a totally different thing from disquisition; or mere talking about any one thing, whether relating to ourselves or others. In disquisition, the object is to ascertain truth; in conversation, to pass the time in an interesting and agreeable manner. The object of every one who takes part in a polite conversation ought to be to please; whatever cannot be said on any subject entered on, without giving offence to some one present, or to truth or decency, ought to be avoided. By common consent, the party will pay due respect to the master of the house, as to the president of the assembly; and though all will contribute their share, those rich in talent and experience will naturally contribute the most.

Every master of a family ought to instruct the members of it in the art of conversation, and to advise them more especially to avoid all subjects that lead to argument and discussion. These are of little service to truth or instruction; because men are seldom convinced by arguments carried on in society. No man is willing to be publicly convinced of any thing, and especially if he who has the better side of the argument happens to be younger or of an inferior rank. Men may be willing to be instructed, who would not submit to be convinced; and some will consent to receive information, who would feel hurt at the idea of instruction. Elderly persons, however, and such as are of acknowledged experience and acquirements, may both instruct and inform: but even these must be cautious as to the manner in which they correct, or contradict, or criticise; lest, as is often the case, they appear more eager to display their own superiority, than to improve and oblige the party addressed. The love of self is liable at every moment to break in upon and spoil every thing; and therefore the grand object is to keep that feeling continually under restraint by keeping alive the idea, that the object of all conversation is to please.

Three or four young gardeners, all eager for improvement, might practise conversation on this principle, by assembling occasionally, and either conversing as equals, or for the sake of variety and improvement, assuming characters. Two, for example, may take the part of the parents of a family; one or two as strangers on a visit to them, and the rest as children, and so on. The party might first produce that sort of family wrangling and snarling, which commonly occurs at fire-sides, as the conversation to be avoided; and next, a conversation as it ought to be, or as each gardener would desire to have it in his own family.

For the purpose of being able to join in the amusements of society, we have already recommended the study of whist, chess, &c. These are essential personal accomplishments of every man who would find his way in society in England, where conversation is not nearly so well understood as on the Continent, and therefore less relied on for passing the time agreeably.

2308. There are two things in conduct which the gardener ought most particularly to avoid, *familiarity* and *cupidity*. When these qualities discover themselves either in manner or conversation, they are a certain mark of low birth and breeding. A low, ignorant man, if he receives the slightest civilities from a superior, immediately conceives the latter has a particular friendship for him, and soon endeavours to turn this friendship to advantage, by asking to borrow money to forward himself in business; or requesting a place under government or a pension. If a gentleman, or indeed any man, notices a low familiar woman, the latter immediately concludes he is in love with her; if she has daughters, he has come to marry one of them; and at all events, he is a particular friend to be boasted of and relied on in time of need, who will certainly advance the family in some way or other. Such is the self-love and ignorance of mankind betrayed by the vulgar; for familiarity proceeds from that sort of gross selfishness that puts no restraint on wishes, that it does not consider grossly criminal; and indulges in the most absurd hopes, merely because, if realised, they would tend to their profit.

A well-informed and polite man is not familiar with any one, because he knows that if he were to lay bare every thing respecting himself he would lessen respect; and he does not show an impertinent curiosity after the circumstances of others, because it might hurt their feelings to expose them. Cupidity is out of the question with him, because he knows mankind too well, to suppose they will give him a valuable thing merely because he asks it; but even if there was a chance of getting it in this way, still he would not ask, because he might be asked for something still more valuable in return. In this way politeness becomes highly useful as a check upon gross selfishness; and by serving to keep up a mutual respect between man and man, it restrains the offensive passions, ameliorates the temper, and promotes social enjoyment. A man of sense and experience will not be very familiar with his most intimate friend. Respect is always lessened in proportion as familiarity takes place; and without respect there is nothing to hinder individuals, even the most intimately connected by ties of blood, affection, or interest, from proving very offensive to each other. Where a weaker and stronger party, as man and wife, parents and children, masters and servants, cease to act in such a way as to maintain a mutual respect, the stronger party is obliged to have recourse to the principle of fear,— becomes of necessity a domestic tyrant, and is obeyed and hated, instead of being obeyed and respected.

The want of mutual respect is the cause of many evils among the lower classes; it is the origin of almost all family quarrels, and of most of those between individuals; the cause, familiarity, ought therefore to be avoided, by all who would be respected; and a salutary restraint placed on all their feelings, both of love and hatred, curiosity and communicativeness. Judicious restraint is every thing as to overcoming bad or vulgar qualities; a man properly under its influence may be compared to a well-trained tree; and as this figure is familiar to the young gardener, it may be well for him frequently to ask himself, whether, supposing he were a cherry-tree, he would be reckoned one finely spread against a wall, or an unpruned standard.

2309. *Religion* is a subject which we leave every gardener to arrange with his own conscience.

2310. It may be supposed superfluous to say any thing to gardeners in respect to *health*. But the truth is, that since the general introduction of hot-houses, the profession of a gardener has become in some degree different from what it was; and he is now subject to heats and colds, which are liable to bring on inflammatory and rheumatic complaints. Being heated excessively in a hot-house, and cooled to a very low degree in the open air during winter, or in an ice-house (which is now in almost daily use in good gardens for preserving fruits and vegetables) during summer, do not of themselves injure the constitution; but the evil arises from the partial operation of either extreme by which one part of the frame is cooled or heated sooner than another. By this the circulation and perspiration are unnaturally accelerated or diminished in these parts, and of course the action of the whole system deranged. When this takes place, the consequences are fever, costiveness, and often St. Anthony's fire, ague, rheumatism, &c. If taken in time, opening the bowels and the hot-air bath of the hot-house, taking care either to go at once from it to bed, or to the dry stove and green-house, so as to cool gradually, will restore the system to order; if neglected, time, opening and sudatory medicines, and probably the doctor, will be required.

The principal danger is to be dreaded from the excessive heat and perspiration produced by working in the bark-stove or in pits, such as during shifting, syringing, &c. To guard against these, the operator should limit his dress at the time to a loose flannel shirt and wooden shoes, and when finished, should wipe himself perfectly dry before putting on his ordinary clothing.

The foundation of all health is regularity in the time and quantity of food taken, and in the common evacuations. If these are strictly attended to, every thing will go on well: if suffered to become irregular, every thing will go wrong. The stomach is the *primum mobile*, as it were, of the constitution; the cause, when disordered, of the most afflicting diseases, and the first thing to be restored in order to their cure.

A strict attention to personal propriety and sober habits need hardly be mentioned, with reference to young gardeners who mean to advance themselves; to suppose, indeed, that they would indulge in inebriety, or in alehouse society, is so entirely out of the question, that we shall not enter on the subject.

Sect. V. *Of Economical Education, or the general Conduct and Economy of a Gardener's Life.*

2311. A gardener, who has attained his twenty-fifth year, and has carefully employed the leisure time of the preceding ten years in improving himself, will now have formed his judgment on most subjects; and be able to determine a general plan for the future economy or management of his life.

A man may be learned, or have genius and taste in his profession, without having that taste or judgment as to the economy of life which leads to fitness and propriety of conduct, and will induce him to fix on an object to be acquired, and devise and pursue rational means of obtaining it. Bad taste in the common business of life may lead to bad plans, to a desire to acquire property too rapidly, to gambling, to match-making, to quackery, and, probably, even to crime and disgrace. The principal cause of this bad taste is, that, what is called education, is much too limited in its objects; or that part which is commonly left to parents or masters is but very imperfectly supplied. A youth ought not only to be instructed in the different laws, by which the conduct both of individuals and society is regulated, but also in the art of forming a plan for the management of his talents, so as they may best contribute to his happiness. Nothing is more conducive to happiness, than fixing on an end to be gained, and then steadily pursuing its attainment.

Though some things in every man's life, and often the most important things, are the result of accident; yet here, as in every other case where a multitude of actions are to be performed with a view to an ultimate object, a plan must be of importance for their arrangement. No man is born in possession of the art of living, any more than of the art of gardening. The one requires to be studied as well as the other; and a man can no more expect permanent satisfaction from actions performed at random, than he can expect a good crop from seeds sown without due regard to soil and season. The greater part of mankind enter on life without any fixed object in view; or, if they form some general notion of acquiring wealth or distinction, they form no plan by which it is to be accomplished; the consequence is, that such persons, after blundering on through their best years, arrive at the end without having gained any thing but experience, now of no use to them.

When we look round, and observe the quantity of misery in the world; the greater proportion is, or seems to be, the result of a want of plan, or of a bad plan of life. How many parents are unsuccessful in their struggles to maintain a large family; the result of too early marriage, and a thoughtless and unmeasured procreation. How many find themselves arrived at old age, with no other resource for support but charity; the consequence of want of foresight in expenditure. And how many among those not born to inherit property, who, at no period of their life, have any other alternative between hard labour and deficient food, than disease and want.

Want of plan may not, in every case, be the cause of all this misery; because accident enters into life for something, both in the unfavorable as well as the favorable side of the question; but we have no hesitation in asserting, that want of plan, as a cause of misery, is as ninety-nine to a hundred. Any plan at all, even a bad plan, is better than none; because those who set out on any plan will, in all probability, sooner discover its errors, if a bad one, and correct them, than those, who set out on no plan, will discover the want of one, and form a good plan. — Plan, in short, is predestination, as conduct is fate.

The young gardener, who is just setting out in life, may well tremble at the consequences of proceeding on the journey without the guide of a judicious plan. This plan he must form himself: because he alone knows the nature of his talents and resources; — all that we can do is to offer a few hints.

In order to be able to form a plan, it is previously necessary to determine the object to be obtained by it. Happiness is the object of every action of human life, and consists in the gratification of certain wants and desires; some of these desiderata are peculiar to youth, and others to old age; but many, as clothing, food, rest, relaxation, entertainment, &c. begin with the earliest, and continue to the latest period of life. All these gratifications are procured by labor; in savage life, by hunting, fishing, and gathering fruits, till the man, no longer able for these labors, is obliged to lie down and die of want. In civilised society they are also obtained by labor; but here, what is called property exists; and man, in the vigor of his days, when the supplies of his labor are greater than the demands of his wants and desires; or, when he chooses not to gratify the latter to the full extent admitted by the former; can, as it were, embody a part of his labor to be made use of when he is no longer able to perform it with ease. A man, in this case, is said to arrive at independence; instead of want, as in the case of the savage; or of beggary, as in the case of the improvident. The grand object, therefore, which not only a gardener, but every man destined to live by the exercise of his labor or talents, ought to have in view, is independence. At certain periods of life, when the imagination is vivid, and health and spirits in their utmost vigor, some may prefer glory, high literary or professional reputation, or even present pleasure; and it is a noble attribute of our nature to prefer these to mere accumulation of money; but a great warrior, poet, or painter, arrived at old age and want, if the latter be brought on by common improvidence, will not find himself surrounded by many marks of distinction; and, though it may be some consolation to him, that the three or four letters composing his name will be sometimes pronounced together after he is dead, yet it will not be much.

The only legitimate mode in which a gardener, or any person properly educated in a profession can pursue independence, is by the exercise of that profession. Only extraordinary circumstances can justify a change of profession; in common cases it indicates a want of steadiness of character, or a want of success; and the latter is commonly attributed to want of skill. It is better, therefore, to pursue unremittingly the profession to which we have been educated, even though we should not be very successful in it, than to risk an infringement on character by adopting another.

The practice of gardening, as we have already seen (2060.), is carried on by three different classes, serving, tradesmen, and artist gardeners. The greater number of young men cannot do better than commence in the first branch. To begin in the second, unless an established business is purchased, a partnership in a respectable firm procured, or some situation discovered where there is an effectual demand for produce, would, to a young man without connection, be attended with at least a loss of time, if not with greater losses. As to the third branch, the demand is so very limited, that it can never be recommended in a general way. It remains, therefore, for the young gardener to look to the serving branch, as that by which he will the more certainly attain to independence.

Of serving gardeners, there are two species, with their varieties; the public gardener and private gardener. The latter is the only species to be recommended in a general way; but whichever a young gardener adopts, it would be well if he could previously procure himself to be sent abroad for a year or longer, as gardener or collector to some expedition; or even if he could, at his own expence, visit Amsterdam, Antwerp, Leyden, and Paris. All this he may do at present, proceeding by sea to Rotterdam, either from London or Edinburgh, for less than twenty-five pounds; and a judicious young man, even though so much devoted to improvement as we suppose our young gardener to have been, ought to have saved that sum by his twenty-fifth year. In times of war it may be more expensive, or impossible.

Though it be seldom that a gardener can choose a situation for himself, it may be proper to mention, that by far the best in the world are in England; there are some good situations in Scotland, and a few in Ireland; and there are occasionally good offers to go abroad as gardeners to the governors of British colonies, or to eminent merchants there. The principal foreign openings for British gardeners, however, are in Russia, where the emperor employs nearly a dozen head-gardeners, generally British; and where the same, or a greater number, are in the service of the first-rate nobility. The salaries given are not very great; but the accommodations and accessary advantages are sufficient to admit a frugal man's saving the greater part of the salary. Great care is requisite, however, to have a written arrangement before leaving this country, including a permission to return at pleasure, as no confidence can be placed in the verbal agreements of most of even the highest Russian nobility. We know of no other foreign situations worth notice. If a gardener thinks of going to America, or any of the colonies on his own account, he will, of course, require a certain capital, and must also reckon on spending his days there.

Supposing a young gardener to have obtained a tolerably good situation at home, and to have proved it for a year or two, he should, in our opinion, set about two things; the first is saving money, and the second is entering into the married state. The first is absolutely essential to the scheme of being independent in old age; the second nearly equally so to passing through life comfortably.

2312. With respect to *saving money*, we shall not attempt to state the proportion of neat wages that may be yearly saved; nor how the money may be best laid out; as these depend on circumstances. All we need suggest, is the necessity of keeping the ultimate object, and its great advantages, continually in view, and to prefer security of principal to high interest. As some data to enable the reader to estimate the accumulation of money saved, and put in a savings' bank, or in the funds, we shall suppose a gardener to begin saving at the age of 27, and to continue saving till he attains his 50th year; laying out every year's savings at only 4*l.* *per cent.*, adding half yearly the interest to the principal; and at the end of that period purchasing an annuity for his own life, or the joint lives of himself and wife, with the accumulated sum; then —

	£		£	s.		£	s.
if he saves	10	a-year, it will amount, in 23 years, to	366	5	which will purchase an annuity for a person aged 50 years, or for two lives of that value, of	29	0
	15		549	5		43	10
	20		732	7		57	17
	25		915	9		72	5
	30		1098	10		86	15
	40		1465	1		115	15
	50		1830	18		144	14
	60		2197	1		173	14
	70		2563	5		202	9
	80		2929	8		234	7
	90		3295	12		260	6
	100		3661	16		289	4

By commencing master-gardener, at twenty years of age, and beginning to save at that period, a gardener, or even a common laborer, may attain the same advantages as to independence; but with inferior domestic comforts, as he cannot afford to spend so much annually; and with less enjoyment from literary and intellectual sources, because his time for previous improvement is reduced one half; and in the after part of his life, as he will only be able to obtain inferior situations, he must calculate on labouring personally. If he begins at twenty, however, and saves till he is fifty, the additional time will bring his smaller sums to very nearly the same totals as those of the more accomplished gardener: thus —

	£		£	s.		£	s.
If he saves	5	a-year, it will amount, in 30 years, to	280	8	which will purchase an annuity for a person aged 50 years, or for two lives of that value, of	22	2
	8		448	12		35	6
	10		560	16		44	5
	15		841	4		56	9
	20		1121	12		88	11
	25		1402	0		110	15
	30		1682	8		132	17
	35		1962	16		155	0
	40		2243	4		177	2
	50		2804	0		221	10
	60		3364	16		255	15
	65		3645	4		288	0

These calculations being made at the rate of 4 per cent. interest, and the Northampton valuation of life (by which a man at 50 is estimated to live 18 years longer, while in London only 16 years,) must be considered as low rather than otherwise.

2313. The vulgar reason why a young man ought to save money is, that he may get together as much as may enable him to collect some furniture and get *married*. This, however, may be called saving to produce want and misery. A young couple will not be very nice in the quantity or quality of their furniture. All they consider necessary is accordingly often acquired before either are twenty. Housekeeping is commenced; and thus the foundation laid of a life of hard labor, scanty food, and their attendants, bad temper, and often disease. After twenty-five years of bustle and distraction, nine or ten children have been produced, and are most probably growing up in rags and ignorance; and all that this couple can say is, that they have struggled hard to create nine times as much misery as that by which they are oppressed. If the man had limited himself for twenty-five years to making the heads of pins, he might have accumulated as much as would have made him independent and comfortable, and still had sufficient time before him to marry, and enjoy the comfort and solace of a wife and children. But the use of a wife to a gardener, and to every man who is not independent, ought to be chiefly as the operative partner in his domestic establishment; to prepare his food, and keep in order his lodging and clothes. If, in addition to these duties, she has cultivated, or will cultivate her mind so as to become interesting as a companion, so much the better; and if the parties further think that they can attain their object of independence, and rear one or two children, let them do so. Universal sources of happiness should never be rejected, when they can be retained.

KALENDARIAL INDEX.

The *almanac time* in this kalendar is calculated for the meridian of London; but as *a kalendar of nature* is given for the metropolitan district, the almanac time may, in every part of the empire, be varied to suit the local climate and vegetation.

In general, other circumstances being alike, four days may be allowed for every degree, or every 70 miles north or south of London; in spring, operations may be commenced earlier in that proportion southwards, and later northwards; but in autumn the reverse, and operations deferred as we advance southwards, and accelerated as we proceed to the north. In every case allowing a due weight to local circumstanees.

JANUARY.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.	REMARKS.
London	35 9	6	29 56	1·957 inch.	A cold January is reckoned seasonable. The gardener, during this month, does not labor in the garden more than five hours a-day; allowing one hour more for early and late attendance on hot-house fires, and seven hours for sleep, there remains eleven hours for personal improvement. Let the young gardener, who is ambitious of distinguishing himself from the common clay of his profession, not let one of these hours run to waste, 2304.
Edinburgh	34 5		29 194	2·994	
Dublin	39 92		29 721	2·697	

1. Kalendar of Animated Nature round London.

In the first week: shelless snails (*helix*), and earth-worms (*lumbricus terrestris*) appear.

Second week: redbreast (*motacilla rubecola*) whistles, nuthatch (*sitta europæa*) chatters, misel thrush (*turdus viscivorus*) sings, and wagtails (*motacilla alba et flava*) appear.

Third week: the common lark (*alauda arvensis*) congregates.

Fourth week: snails (*helix hortensis*) and slugs (*limax ater et hyalinus*) abound in sheltered parts of gardens; the hedge-sparrow (*motacilla modularis*) whistles, the large titmouse (*parus major*) sings, and flies appear on windows.

2. Kalendar of Vegetable Nature round London.

In the first week: some plants accidentally in flower; and others, as the lauristinus, continued from December.

Second week: winter aconite (*eranthis hyemalis*), Christmas-rose (*helleborus fœtidus*) in flower, and hazel (*corylus avellana*) catkins beginning to appear: common honeysuckle (*lonicera periclymenum*) buds begin to appear.

Third week: primrose (*primula vulgaris*) flowers in sheltered places; daisey (*bellis perennis*), and chickweed (*alsine media*) begin to flower.

Fourth week: mezereon (*daphne mezereon*) begins to flower; and sometimes spurry (*spergula arvensis*), pansey (*viola tricolor*), white scented violet (*viola odorata*), archangel (*lamium rubrum*), and coltsfoot (*tussilago purpurea et odorata*) shew blossoms.

3. Kitchen Garden — Culinary Vegetables.

Sow (923.) early frame and Charlton peas about the beginning, and some dwarf marrowfats about the end of the month. (1311.) Early mazagan and long-pod beans in the first week (1312.) and the last (1312.) In the last fortnight, on a sheltered border, sloping to the south, the hardy green Egyptian, early and brown Dutch lettuces. (1352.) On a similar border, in the first and second week, early dwarf short-topt radish; in the last fortnight, the salmon-colored. (1329.)

Protect (1020.) *by temporary coverings*, newly-sown seeds, as lettuce, endive, celery, &c.

Transplant (928.) strong plants of the brassica tribe for cabbaging. (1301.)

Dig and trench (797.) vacant ground in dry weather.

Prepare (864.) composts and manures. Attend (1067.) to neatness, by picking up all dead leaves, and removing all plants killed by the frost, &c. (1071.)

Insects, &c. (1030.) Destroy slugs, set traps for mice, and remove all larvæ, webs, eggs, &c.

4. Hardy Fruit Department.

Plant (926.) fruit-trees in general, in open weather.

Protect (1020.) newly-planted trees from frost and drought by mulching (944.); fig-trees by fronds or mats, if you have neglected this busines in October. (1493.)

Prune (950.) apples, pears, plums, cherries, gooseberries, currants, and raspberries, preferring mild weather, or only moderate frosts. Prune first such trees as stand in quarters or borders that you wish to dig or dress (1420.); apricots in the last fortnight, if very mild. (1449.) Loosen the extremities of the shoots of such trees as it is not proper to prune at present, and wash them with soap-suds and sulphur, or scalding water if insects are suspected. (1030.)

Dig (797.) and stir the earth round trees which have been pruned; trench ground intended for trees.

Stake newly-planted trees.

Clean trees from moss, misletoe, &c. (1030.) Guard against hares, by tarring or lime-whiting their stems, or tying thorns round them. (1854.)

Destroy (1030.) insects by washes, or hot water, applied both to walls and trellises, and to the trees.

Fruit-room and cellar. (709.) Look over the fruit in open boxes or shelves, and pick out decayed or tainted ones; but do not touch the casks of fruit in the cellar. (710.)

5. Culinary Hot-house Department.

Glass-case without heat. (625.) Sow radishes, lettuce, carrots, small-salads (1287.); and peas and beans for transplanting. (1311.)

Hotbeds and pits. (626.) Prepare for making up hotbeds for early cucumbers (1251.), and melons (1263.), if you have not begun in November. Sow early radishes, and small-salading on slight hotbeds. (1287.) Sow carrot on a slight hotbed, to produce a crop for drawing in April and May. (1322.) Kidney-beans, peas, potatoes (1283.), &c. may be sown and planted on slight hotbeds in small pots to fit them for transplanting. (1282-1313.) Force asparagus (1280.), sea-kale (1344.), and tart-rhubarb (1393.), on hotbeds, or in pits, or in the open garden.

Pinery. (1166.) Give air and water sparingly to pines; sow kidney-beans; take in strawberries.

Forcing-houses. (1215.) Give air and water, and, according to the progress your trees have made, increase your stimuli of every description. Attend to kidney-beans and strawberries, wherever you have any stove-room. (1277.)

6. Flower Garden — Open Ground Department.

Plant (926.) dried roots of border-flowers, if not done before; but defer planting bulbs of the finer florists' flowers till February, unless the weather is very mild. (1626.)

Transplant (928.) daiseys, thrift, and other edgings, if the weather is fine, and it was not done before. (1673.)

Protect (1020.) choice plants by matting, litter, cases of wicker-work, old bark, and all other proper means, observing to do it with due attention to neatness in this department of gardening. (1067.) Attend to the finer sorts of tulips, which will emerge from the ground by the end of the month; hoop them over, and apply mats. (1628.) Ranunculuses and anemones, which have been planted in November, will require a similar attention. (1629-30.)

7. Flower Garden — Hot-house Department.

Glass-case without heat. (625.) Attend to alpines (1679.): they should have air every dry day, and must, in very severe weather, be protected by mats, and even litter, to imitate their native snow-covering at this season. Mignionette and other prolonged annuals, as stocks, sweet peas, &c. will require similar attention. (1661.) Look to choice auriculas (1641.), and polyanthuses (1642.); keep them plunged in frames in old tan, or, what is better, saw-dust, or ashes. In general, never attempt to keep a potted plant through the winter in a cold frame, unless it be plunged, or the pots be standing very close together. (1704.)

Hotbeds and pits. (626.) Begin to force roses (1688.), and other shrubs, and hardy flowers, as well as bulbs, if you have not begun in November: put bulbs in blowing-glasses. (1657.)

Greenhouse. (1595.) Minim. temp. for this month, 40 deg. max. at fire-heat, 44 deg. See that the most delicate plants be in the warmest part of the house, in so far as is consistent with other arrangements: give air freely in fine weather, and water at all times sparingly. (1721.)

Dry-stove. (1599.) Min. temp. for this month 45 deg. max. 50 deg. with fire-heat; water very sparingly, but give air every fine day. (1730.)

Bark, or moist-stove. (1494.) The minimum temperature for this department, with fire-heat, may be 58 deg. and maximum 70 deg.: water and give air with discretion. (1740.)

8. Pleasure-ground and Shrubbery.

Plant (926.) most sorts of deciduous trees in fine weather, and deciduous hedges. (1860. and 1804.)

Prune (950.) native and naturalized deciduous shrubs and trees (1831.); cut deciduous hedges (1880.); attend to the weather: only the very hardiest natives are to be cut during frosts and snows. (1831.)

Digging. (797.) Continue this operation in the interior of masses and groups, as well as in the shrubberies and other skreen plantations. Where the exterior abounds with flowering shrubs and plants, it should have been dug in autumn, and must not be deferred till next month. (1829.)

Dress turf (946.), and gravel (862.): the former may be done in moist, but the latter only in dry weather. (859.)

Form and repair (946.) lawns and turf verges, in mild weather. (945.)

9. Trees — Nursery Department.

Lay out (848.) ground for a nursery, if not done in autumn; gather all manner of tree-seeds. (1879.)

Dig and trench (797.) vacant ground between the rows of plants, which are to stand a year longer: fill up any vacancies as you go along. (1875.)

Lift (929.) plants fit for planting out.

Prune (950.) nursery plants before planting: do this in sheds, and keep the roots covered with matting or moss. (1880.)

Gather (1034.) cones of the larch and other firs, and of the pine tribe. (1879.)

Protect (1020.) beds of germinating seeds with straw or litter; put other tender seedlings in pots under frames, or mats and hoops, from birds, mice, snails, and other vermin. (946.)

Rotting ground (1876.): turn over the different layers frequently, and see that none of them are soaked with water.

Seed-loft and cellar (708.): look to all the sorts of seeds in these departments; whether buried in sand, or in heaps, layers, baskets, drawers, or bags.

Destroy (1030.) vermin, and, in bad weather, cut and paint talleys and prepare parchment labels, number-sticks, hooks for laying, &c. (707.)

10. Trees — Permanent Plantations — and Park Scenery.

Prepare (1802.) ground for grove or skreen plantations; for useful strips; for detached, and for hedge and row-trees: and planting in general. (1802.)

Plant (926.), in dry weather, deciduous trees, and Scotch pine and larch firs. (1879.)

Prune (950.) deciduous trees, and also larch, fir, and Scotch pine groves (1836.), hedge-row trees, and indeed deciduous forest-trees in every form (1832.); cut and plash, repair and renovate, and complete hedges of deciduous plants or trees. (1849.)

Inclose and fence (1804.) ground intended to be planted (1805.) by posts and rails in all weathers (1804.); by dry stone walls in all weathers (1804.); but by mortar walls, in mild weather only. (1804.)

Fell (1868.) timber-trees, where the bark is no object.

Thin (1846.) crowded plantations, distinguishing between such as consist of sorts fit for barking, or transplanting, and sorts for consumption in any of the usual forms of young trees, or coppices (1846-1849.), and otherwise prepare for planting the more extensive (799.) sites. (1813 to 1818.)

Excavate and remove ground for forming pieces of water, &c. (853.)

FEBRUARY.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.	REMARKS.
London -	42 3	5	29 94	0·873 inch.	This month (the spring or sprout kale month of the Saxons) is usually subject to much rain, or snow; either is accounted seasonable: the old proverb being, "February fill dike with either black or white." Early forced articles, and especially cucumbers and peaches, require great care during this month; when the sun does not appear for several days danger is to be apprehended from damps, and at other times from chills.
Edinburgh	36 6		29 556	1·269	
Dublin -	45 78		30 091	2·24	

1. Kalendar of Animated Nature round London.

In the first week: bees (*apis mellifera*) come out of their hives, gnats (*culex*) play about, insects (*insecta*) swarm under sunny hedges, and the earth-worm (*lumbricus terrestris*) lies out; hen-chaffinches (*fringilla*) flock, and the song-thrush, or throstle (*turdus musicus*), and common lark (*alauda arvensis*) sing.

Second week: the buntings (*emberiza alba*), and linnets (*fringilla linota*), appear in flocks; sheep (*ovis aries*) drop their lambs; geese (*anas anser*) begin to lay.

Third week: rooks (*corvus frugilegus*) begin to pair, and resort to their nest-trees; house-sparrows (*fringilla domestica*) chirp, and begin to build; the chaffinch (*fringilla cælebs*) sings.

Fourth week: the partridge (*tetrao perdrix*) begins to pair, the blackbird (*turdus merula*) whistles, and the wood-lark (*alauda arvensis et arborea*) sings; the hen (*phasianus gallus*) sits.

2. Kalendar of Vegetable Nature round London.

In the first week: the snowdrop (*galanthus nivalis*), whin (*ulex europæus*), white deadnettle (*lamium album*), polyanthus (*primula veris*) flowers; and the elder (*sambucus nigra*), and some roses and honeysuckles begin to expand their leaves.

Second week: common crowfoot (*ranunculus repens*), dandelion (*leontodon taraxacum*), and the female flowers of hazel (*corylus avellana*) appear.

Third week: *veronica agrestis* in flower; many of the poplar and willow tribe shew their catkins; and also the yew (*taxus baccata*), alder (*alnus communis*), the tulip (*tulipa*), crown imperial (*fritillaria imperialis*), and various other bulbs boldly emerging from the ground.

Fourth week: the erica carnea, wood strawberry (*fragaria vesca*), some speedwells (*veronica*), the groundsel, and sometimes the stocks and wall-flower (*cheiranthus*) in flower. Some sorts of gooseberries, apricots, and peaches, beginning to open their buds.

3. Kitchen Garden — Culinary Vegetables.

Sow (923.) radishes at twice or thrice (1329.); round-leaved spinach twice (1330.), lettuce for succession (1352.), peas and beans in the beginning and end of the month (1311-12.); some early cabbages to replace any plants of the last August sowing: at the end of the month, red cabbage. (1302, 1304.) In the last week savoys (1305.); in the last fortnight dill, chervil, and fennel (1379), early Horn carrot near the end of the month (1323.), early Dutch turnip in the last fortnight (1322.), small salads every fortnight (1368.), onions for a full crop in the last week, and a few leeks at the same time. (1336-7.)

Temporary coverings. (1020.) Cover with litter fronds of spruce and silver fir, mats, and other means, as circumstances may require.

Plant. (926.) Jerusalem artichokes (1321.), chives, garlic, shalots (1338. to 1341.), horse radish, liquorice, and potatoes. (1375. 1400. 1315.)

Propagate, by rooted offsets (877.), mint, balm, sorrel, pennyroyal, tansey, tarragon, fennel, and burnet. (1369. 1379.)

Transplant (1928.) for seed, if it was not done in autumn, the brassica tribe, onions, carrots, turnips, beet, celery, endive, parsnips, and leeks. (1361.)

Dig and trench (797.) vacant ground in moderate weather, and perform all other operations of this kind only in fine dry weather.

Destroy insects by the usual means. (1030.)

Store-room. Look over onions, and other dried roots. (709.)

Tool-room. See that tools are always cleaned before being laid by at this season. (712.)

4. Hardy Fruit Department.

Plant (926.) all sorts of fruit-trees, when the weather is fine (926.): strawberries towards the end of the month. (1476.)

Protect roots of new planted trees by mulching (944.); tops of apricot, plum, peach, and nectarine-trees coming into blossom. (1020.)

Prune (950.) apricots, peaches, and nectarines, before the blossom-buds are much swelled (1449. 1442. 1448.); apples and pears before the end of the month (1421. and 1433.). finish vines (1482.), and nail them, and also gooseberries, currants, and raspberries. (1466. 1470. 1471. 1474.)

Prepare (864.) ground for planting; spring-dress strawberry-plants; dig and dress ground where the trees are pruned, support newly planted trees with stakes (944.); clear the bark of trees of moss, &c.; fence orchard-trees where sheep, cattle, or hares may be expected.

Destroy insects. (1030.)

Fruit-room. (709.) Keep continually examining the fruit, whether in the open shelves, close drawers, or in jars: remove all tainted specimens.

Fruit-cellar. (709.) Such fruit as is put up in close casks, and sealed or plaistered up to exclude the air, will require no farther attention than keeping out extreme frosts, and so as the temperature may stand as near 32 deg. or 40 deg. as possible.

5. Culinary Hot-house Department.

Glass-case without heat. (625.) Sow lettuce, small salads, &c. as in last month (1287.), plant potatoes. (1283.)

Hotbeds and pits. (626.) In the first week begin to force cucumbers and melons: in general, the beds now set to work produce finer fruit than those put in action sooner. (1251. and 1263.) Continue sowings of salads (1287.), and kidney-beans (1282.); begin or continue to force asparagus, potatoes, sea-kale, tart rhubarb, &c. (1280.); sow a few seeds of early cabbage and cauliflower plants for early planting.

Mushroom-beds. Protect established beds, and spawn new ones (1288.): keep up the heat of all hotbeds by linings. (864.)

Pinery. (1116.). Attend to the proper temperature (1166): they want little air or water at this season. See that suckers on dung-heat are not too moist.

Forcing department. (1215.) If you have not begun before, this is a very good time to commence with most sorts of fruits, peaches, cherries, vines, &c. Set in strawberries and other plants in pots, also fruit-trees and shrubs, and plant kidney-beans; apply stimuli by degrees, but, having once begun to excite, do not decline, otherwise you produce an injurious check to vegetation. See to the stems of vines which are outside the forcing-houses and stoves which are at work.

6. Flower Garden — Open Ground Department.

Sow (923.) a few hardy annuals in the last fortnight, if the weather be fine: most of the sorts are better deferred till the end of March. (1661.) Mignionette and ten-weeks' stocks, in a warm border, to be protected in severe weather. (1654. and 1659.)

Propagate hardy plants from the root and herb; but September or March are better seasons. (877.)

Plant dried roots, when the weather is open and dry. (926.)

Transplant (928.), if the last fortnight be fit weather, the hardier biennial and perennial border-flowers. (1654.)

Shelter and protect (1020.) by all the usual means: but take care not to exclude air and light a moment longer than is absolutely necessary.

Prepare vacant ground for plants and trees, also composts for plants in pots. (864.)

Bees. Feed such hives as are weak. (736.)

7. Flower Garden — Hot-house Department.

Glass-case without heat. (625.) Dress select auriculas, and cover them at nights to promote their growth (1641.); sow ten-week stocks, and mignionette, for a successional supply. (1654. and 1659.)

Hotbeds and pits. (626.) In the last week, prepare for tender annuals, continue to force bulbs, and the usual sorts of border-flowers and Dutch roots in dung-beds and pits heated by fermentable substances, steam, or smoke flues. (1657.)

Green-house. (1595.) Minimum heat for this month, 40 deg. maximum, with fire-heat, 44 deg. Give air freely in fine weather, but water sparingly; the alternate drying by fire-heat, and then macerating by watering, is a sure way of killing tender plants in small pots.

Bark, or moist stove. (1594.) Give air whenever the thermometer rises to 70 deg. or under it, if the sun shines, keeping up your fire and bottom heat. Begin to propagate by the usual modes: attend to neatness and routine culture.

Dry-stove. (1599.) Min. 45 deg. max. with fire-heat, 50 deg. Give water and air as in January.

8. Pleasure-ground and Shrubbery.

Plant (926.) deciduous trees and hedges, as in January; deciduous shrubs after the middle of the month. (1880. 1804.)

Prune (950.) as before, finishing most sorts by the middle of the month, if possible. (1831.)

Dig (797.) as before, and include the flower and shrubbery borders towards the end of the month. Sweep and roll gravel-walks and lawns (945.); trim the edges of verges with a weeding-iron; remove mosses and weeds every where. (1067.)

Form and prepare lawns and gravel walks, as directed for last month. (945.)

9. Trees — Nursery Department.

Fruit-trees. Sow kernels and fruit-stones (1880. and 1884.); lay quince, walnut, and mulberry-trees; plant cuttings of the gooseberry, currant, elder, berberry, hazel-nut, filbert, and elderberry. (1460. and 1476.) Preserve cuttings of the vine and fig in dry earth (1482.); plant suckers of the raspberry; prepare for grafting. (892.)

Ornamental shrubs. Sow hardy deciduous sorts; lay and plant cuttings, and take off suckers for propagation; plant out in nursery rows, and prune deciduous kinds. (1682.)

Forest-trees. (1875.) Sow mountain ash, hornbeam, wild cherry, hawthorn, ash-keys, hazel-nut, acorns, walnuts, Spanish and horse chestnuts, &c.; holly and yew in the last fortnight. Plant cuttings of poplar, elder, and willow; lay in seedling larches; gather pine and larch cones. (1879.)

Fork-dig (797.), or *trench* between nursery-rows, not intended for removal this season (1880.); weed and remove decayed leaves, attending as much as possible to order and neatness (1067.)

10. Trees — Permanent Plantations and Park Scenery.

Plant (926.) fences of deciduous trees (1802); forest-trees of all the deciduous sorts, in mild weather; ornamental deciduous sorts, not very tender, in fine weather.

Prune (950.) deciduous sorts, excepting such sorts as are apt to bleed, as the wild cherry, birch, and sycamore, or the resinous and evergreen tribe, which are best pruned in summer, autumn, or late in spring.

Thin and fell timber and young trees, as for last month: remember not to touch bark-woods this month. (1846. 1868.)

Operate (853.) on ground, with a view to forming roads, pieces of water, and other effects of landscape gardening.

MARCH.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.	REMARKS.
London -	46 4	4	30 20	0·716 inch.	The beginning of March usually concludes the winter; and the end of the month is generally indicative of the succeeding spring; according to the proverb, "March comes in like a lion, and goes out like a lamb." The Saxons called this month "the lengthening month," in allusion to the increasing of the days. The most laborious period of the gardener's year is the last half of this month; and the first fortnight of April.
Edinburgh	41 7		28 886	1·455	
Dublin -	44 09		29 707	2·361	

1. Kalendar of Animated Nature round London.

In the first week: the ring-dove (*columba palumbus*) coos; the white wagtail (*motacilla alba*) sings, and the yellow wagtail (*motacilla flava*) appears. The earthworm (*lumbricus terrestris*), and the snail (*helix*) and slug (*limax*), engender.

Second week: the jackdaw (*corvus monedula*) begins to come to churches; the tomtit (*parus caeruleus*) makes its spring note; brown wood-owls (*strix ulula*), hoot; and the small tortoise-shell butterfly (*papilio urticae*, L.) appears.

Third week: the marsh titmouse (*parus palustris*) begins his notes. Various flies (*muscae*) appear. The fox (*canis vulpis*) smells rank. The turkey-cock (*meleagris gallo-pavo*) struts and gobbles.

Fourth week: the yellow hammer (*emberiza citrinella*), and green wood-pecker (*picus viridis*), sing; rooks, ravens (*corvus*), and house-pigeons (*columbi*) build; the goldfinch (*fringilla carduelis*) sings. Field-crickets (*scarabeus*) open their holes; and the common flea (*pulex irritans*) appears.

2. Kalendar of Vegetable Nature round London.

In the first week: various species of the pine, larch, and fir tribe in full flower; the rosemary (*rosmarinus officinalis*), the willow (*salix*), and bay (*laurus nobilis*) in blossom; various trees and shrubs beginning to open their buds.

Second week: the common honeysuckle (*lonicera periclymenum*), and some roses in leaf; crocus vernus, and other subspecies, and some scillae in flower. Pilewort (*ficaria*), and creeping crowfoot (*ranunculus repens*), hepatica and elder (*sambucus nigra*), sometimes in leaf.

Third week: *saxifraga oppositifolia*, *draba verna*, *daphne pontica*, and *collina*; and *lonicera nigra*, in flower.

Fourth week: the peach and nectarine, apricot, *corchyrus japonicus*, *pyrus japonica*, crown imperial, *saxifraga crassifolia*, *buxus sempervirens*, and other plants in warm situations in flower, or just advancing to that state.

3. Kitchen Garden — Culinary Vegetables

Sow (925.) the main crops of most esculents. Drumheaded and Scotch cabbages for field culture. (1302.) Peas (1311.), beans (1312.), lettuce (1352.), spinach (1330.), and small salads every fortnight. (1387.) Indian cress (1376.), a few savoys (1303.) for an early crop; and towards the end for a full crop. Onions (1336.) for a full crop; and leeks (1337.), some red and white cabbage (1302. 1304.), full crops of carrots (1323.) and parsnips. (1324.) Asparagus in the third week. (1545.) Cauliflower in the last fortnight, for a full crop (1308.); borecoles (1307.), and Brussels sprouts for autumn and winter crops. (1306.) In the last fortnight, sea-kale (1544.), cardoons (1346.), turnips (1322.) celery (1342.), alisanders (1348.), and most culinary aromatics, as parsley, dill, fennel, &c. (1369.) In the last week, summer savoys (1184.), and mustard for seed. (1356.)

Plant (926.), in the first fortnight, horse-radish (1375.), liquorice (1406.), chives, shallots and garlick (1338.), old store onions, as scallions or small bulbs for a full crop of large bulbs. Jerusalem artichokes and sea-kale, and in the last fortnight, potatoes for a full crop. (1315.)

Temporary coverings (1020.): continue these as in last month.

Propagate edible perennials by slips and offsets. (877.)

Transplant the brassica tribe, lettuce, and asparagus. Fill up vacancies. (928.)

Dig, &c. as in last month (797.) from composts and earths in heaps or hills. (864.)

Destroy insects. (1030.)

Store-room. Remove decaying articles, and admit plenty of air, &c. (709.)

4. Hardy Fruit Department.

Plant (926.) fruit-trees in general. The fig (1493.) and mulberry may now be planted. (1461.) Finish planting gooseberry-trees before the middle of the month, and currants and raspberries by the end. (1166. 1470. 1471. 1474.) Alpine and wood strawberries may be planted, though autumn is preferable. (1476.)

Protect roots by mulching (944.), and trees coming into blossom by the usual means. (1020.)

Prune (950.) till the middle of the month; but finish then if possible. If not, apricots may be pruned till the 5th. (1449.) Peaches and nectarines till the 15th (1442.), gooseberries to the 7th, red and white currants to the 10th or 12th, and the black currant by the 20th. (1472. 1473.) Finish pruning vines as early as possible. Prune the fig and mulberry till the middle of the month. (1493. 1461.)

Dig and Dress between rows of currant trees, and other fruit-trees where this operation has not been done before. Dress any strawberry beds you have not been able to do before. (797.)

Destroy insects. (1030.)

Fruit-room. (709.) Examine the fruit in the room; take care not to leave open the door of the cellar so as to raise its temperature above 40 degrees.

5. Culinary Hot-house Department.

Glass-case without heat. Sow kidney-beans to receive a few weeks' protection. Remove frames from cauliflower plants. (625.)

Hot-beds and pits. (626.) Go on with hot-beds for cucumbers and melons. (1251.) Sow a few turnips on a gentle hot-bed to come in early. (1522.) Sow all sorts of culinary annuals. Give air and apply linings to maintain the proper temperatures. (868.) Attend to pine suckers and crowns; shift any that may require larger pots, and examine the roots of such as are sickly. (1166.)

Pinery. (1116.) Keep sowing kidney beans, and filling spare corners with strawberry-pots for succession. See that your bark-pit be in proper heat, and attend to the temperature for this month, and the other points of routine culture. Pines are now generally shifted. (1166.)

Forcing department. (1215.) Attend to the culture of each particular kind; and generally to keep down insects by watering; promote setting of fruit by air, and encourage growth by steaming or filling the house with vapours by powerful fires and waterings over the leaves and every part of the house.

6. Flower Garden — Open Ground Department.

Sow (923.) hardy annuals (1661.) in the second, third, and last week; and some of the more robust half-hardy annuals about the end of the month. (1662.) Such biennials as flower the same year, as honesty, scabious, bastard rocket, sweet allyson, clary, Chinese hollyhock, and Indian pink. (1659.) Biennials in general, and also perennials towards the end of the month. (1654.)

Propagate by rooted slips and offsets; but next month is preferable for rootless slips and cuttings. (877.)

Plant dried roots: finish with the anemone and ranunculus in the first fortnight. (1629. 1630.)

Transplant annuals from the patches in the borders, and biennials and perennials from the flower-garden nursery, into their final sites. (928.)

Shelter choice border and all florists flowers in severe weather. (1020.)

Dig, dress, hoe, rake, &c. only in dry weather. Clean up all borders, and prepare vacant ground. (797.)

Bees. Feed weak hives as in last month. (736.)

7. Flower Garden — Hot-house Department.

Glass-case without heat. (625.) Take care of alpines and prolonged annuals, remove all weeds, and be discreet in your waterings. (1679.) Cover auricula frames in very severe nights (1641.); by keeping them rather warm at this season they will come up with fine tall stalks to support their magnificent trusses. Sow half-hardy annuals for transplanting, they will come into flower as soon as those sown in the open air last month. (1663.) Take care of the hardy succulents. (1706.)

Hot-beds and pits. (626.) In the first fortnight sow half-hardy annuals on a slight hot-bed for transplanting to come in first. (1663.) Sow tender annuals at any period of the month. (1749.) Plant tuberoses in pots for forcing. (1638.) Force roses and other flowering or odoriferous shrubs and all desirable hardy flowers in pots. Sow seeds of green-house and hot-house plants to be propagated in this way. Plant cuttings for the same end. (1710.)

Green-house. (1575.) Make no fires unless the thermometer, in the open air, falls to 35 deg. — 45 deg. with fire heat will be a good medium heat in this month. Begin to propagate by cuttings. (1710.)

Dry-stove. (1599.) A good medium heat for this month will be 55 deg. which may be kept up with very little fire heat. Give water moderately, but see that what you do give wets the earth, and does not escape between the ball and the edge of the pot. Give air freely in fine weather.

Bark, or moist-stove. (1594.) Give air in general, as in last month. If you wish to promote a vigorous growth, shift your plants into a rich compost, water over the top about three o'clock, and shut the house close up for the night. Do this only when the temperature has been up to 80 deg. (1619.)

8. Pleasure-ground and Shrubbery.

Plant (926.) deciduous trees and shrubs, also deciduous hedges — finish as early as possible, unless the season be unusually backward. Evergreens of the hardier sorts towards the end of the month. (1693.)

Prune (950.) deciduous trees and cut hedges, and finish this work as early as possible. In pruning plants, where the chief object is their flowers, attend to their mode of bearing these. In short, never begin to cut a tree before having a clear and distinct idea of what you wish to attain — is it health, shape, size, leaves, shoots, flowers, or roots?

Dress winter and autumn dug shrubberies. Mulch, stake, water, and attend to neatness. (944.) Dress and roll turf and gravel; attend to the margins with an edging iron. (1067.)

Form and repair gravel walks. In some situations gravel-walks require to be turned every two or three years. (860.)

9. Trees — Nursery Department.

Fruit-trees. Sow kernels for stocks; lay the vine and the fig (1482. 1493.), plant cuttings and eyes of the vine in the open air, or in pots, to be placed in a moist heat. Graft towards the middle of the month, or sooner or later, according to the season. Plant out seedling stocks in nursery rows. (1891.) Head-down newly budded and grafted trees not intended to be removed. (951.)

Ornamental trees and shrubs. Sow seeds of the hardier sorts. Evergreens may be sown in the last week. Finish laying deciduous kinds, plant cuttings and suckers, and graft some rare sorts towards the end of the month. Plant out layers, cuttings, and suckers in nursery rows. (926.)

Forest-trees. (1879.) Sow nuts, keys, and berries, and also birch and alder seed. In the last fortnight begin to sow evergreens. Plant cuttings, suckers, &c. as in February. Plant out from the seed-bed or cutting border in nursery lines. Dig between the rows of trees and shrubs not intended to be removed this season.

Weed, hoe, rake, and stir the surface in fine weather. Dig between nursery lines, where the plants are not to be removed. (796. to 812.)

Shelter and protect from cold, birds, and vermin. (1020. 1030.)

10. Trees — Permanent Plantations and Park Scenery.

Plant all sorts of deciduous trees and shrubs, and Scotch and larch firs. (1879.) Towards the end plant most sorts of evergreens. (1693.) Hedges of evergreens. Fill up blanks in plantations of two or more years' standing.

Head-down trees intended to stole for underwood, or to produce single leaders for timber trees or poles. (796.)

Fell and thin trees and copse; but only the barking sorts at the end of the month, when they will part with the bark. (1868.)

Sow forests and woods — about the middle of the month is a good time, as the crows, rooks, and other vermin will be less likely to annoy the seeds, having the farmer's progeny to attack. (1879.)

Operations on ground, and building may now go on with the utmost vigor; the days having attained a sufficient length, and the weather being generally dry.

APRIL.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.	REMARKS.
London -	49 9	3	29 77	1·460 inch.	The weather of this month is distinguished by the rapidity of its changes. It is generally stormy, interspersed with gleams of sunshine, hail, snow, some frost, and occasionally violent storms of wind. Fruit-tree blossoms and half-hardy plants require protection and particular attention during this month. The young gardener, while at work, may study the budding and foliation of trees, and the gaiety and delicacy of their colors.
Edinburgh	46 3		29 873	2·414	
Dublin -	51 125		92 909	2·561	

1. Kalendar of Animated Nature round London.

In the first week: the viper (*coluber berus*), and woodlouse (*oniscus asellus*) appear; the misseltoe-thrush (*turdus viscivorus*) pairs; frogs (*ranæ*) croak and spawn, and moths (*phalenæ*) appear.

Second week: the stone curlew (*charadrius œdicnemus*) clamours; young frogs (*rana temporaria*) appear. The pheasant (*phasianus*) crows; the trout (*salmo fruita*) rises, and spiders (*araneæ*) abound.

Third week: the crested wren (*motacilla regulus*) sings; the blackbird (*turdus merula*), raven (*corvus corax*), pigeon (*columba domestica*), hen (*phasianus gallus*), and duck (*anas boscha*) sit; various insects appear; and the fieldfare (*turdus pilaris*) is still here.

Fourth week: the swallow (*hirundo rustica*) returns; the nightingale (*motacilla luscinia*) sings; the bittern (*ardea stellaria*) makes a noise; the house martin (*hirundo urbica*) appears; the blackcap (*motacilla atracapilla*) whistles, and the common snake (*coluber natrix*) appears.

2. Kalendar of Vegetable Nature round London.

In the first week: the daffodil (*narcissus pseudo-narcissus*), the garden hyacinth (*hyacinthus orientalis*); the wallflower (*cheiranthus cheri*), the cowslip (*primula officinalis*), the periwinkle (*vinca*), sloe (*prunus spinosa*), and various other herbs and trees in flower.

Second week: the ground-ivy (*glecoma hederacea*), gentianella (*gentiana acaulis*), *pulmonaria virginica*, the auricula, *iberis sempervirens*, *cynoglossum omphaloides*, and most of the common fruit-trees, and fruit-shrubs in flower.

Third week: some *robiniæ*, *andromedæ*, *kalmiæ*, and other American shrubs; *daphne laureola*, *ulmus campestris*, *chrysosplenium oppositifolium*, *mercurialis perennis*, and other plants in flower.

Fourth week: the beech (*fagus*), and elm (*ulmus*), in flower; ivy-berries drop from the racemes: the larch in leaf, and the tulip and some white narcissi and fritillerys in flower.

3. Kitchen Garden — Culinary Vegetables.

Sow sea-kale for a full breadth; lettuce, small-salads, and radishes, twice or thrice in the month. Peas and beans (1344. 1311. 1312.), brocoli thrice (1309.), borecoles in the first week (1507.), cabbages and savoys twice (1301.) spinach for succession (1330.), turnips twice (1322.), silver-skinned onions every three weeks during summer for drawing: onions, leeks, and cardoons in the first week, for a general crop (1336.); celery, in the first fortnight, for a general crop. (1342), mustard for seed (1356.), carrots, in the second or third week, for a main crop (1323.), kidney-beans, in the second week for an early, and in the last week for a late crop (1313.); asparagus and parsnips, in the first or second week, but not later (1343.); red-beet, in the third week, for a full crop, and also nasturtiums, salsafy, scorzonera, and skirret. (1315.) Sow culinary aromatics and herbs, if not done in March. (1379.)

Propagate by bulbs and dried roots. (877.) Finish planting the main crops of potatoes. (1315.)

Propagate perennial culinary plants by slips and offsets, as all the potherbs, aromatics, &c. (877.)

Transplant lettuce, cabbages, sea-kale, celery, and cauliflowers. (928.)

Dress artichoke and asparagus beds, or quarters (1345. 1343.) Hoe and thin spinach, onions, turnips; earth up cauliflowers and cabbages, sea-kale for blanching, peas, beans, and potatoes. Stick peas, tie up lettuces, destroy weeds, and stir the ground in fine weather. (797.)

Attend to insects, and to the *store-room.* (1050. 790.)

4. Hardy Fruit Department.

Plant cherries, plums, apples, and pears till the 10th; apricots and gooseberries till the 5th; peaches and nectarines till the 15th; but defer till autumn what you cannot accomplish by this period, unless the season is unusually backward. (926.)

Protect as in last month. (1020.)

Prune, if you have delayed it; but expect vines to bleed, and stone-fruits in general to be much injured by the operation, if not performed very early in the month, and even that is too late. In the last days of the month, rub off the buds of vines which appear where you do not wish shoots. (950.)

Routine culture. Water, mulch, stake, and fence. Weed strawberry-beds, and pinch off runners, where you do not wish to have young plants.

Destroy insects, and especially the thrips, which will begin to appear on forward peach-trees: pick off caterpillars. (1030.)

Fruit-room. Turn, pick, wipe, and air the more choice desert fruits; and look also to the baking apples and pears. (709.)

Fruit-cellar. Attend to the temperature, and never break open a cask till you are in want of its contents. (710.)

5. Culinary Hot-house Department.

Glass-case without artificial heat. If the season is backward, sow in the first week kidney-beans, to be protected till the weather is mild. (625.)

Hotbeds. Continue preparing a succession of beds for ridging and hilling out cucumbers and melons. Sow, transplant, shift, &c. all esculents, or potherbs, which are tender annuals, as gourd, basil, love apple, capsicum. Maintain the proper degrees of heat by linings. See to pine-suckers. Plant crowns, and suckers taken off in the winter. (1322. 1166.)

Pinery. Attend to routine culture: shift the plants, reinforce the bottom heat, water and give air as judgment founded on experience, reflexion, and vigilant attention shall direct. The pine is a very difficult plant to kill, but it requires constant and powerful heat and rich loamy soil, and also water more abundantly than is often given to it, to produce large, well-flavored fruit; attend to minor articles grown or forced in the pinery, as vines, fruit-trees in pots, cucumbers, kidney-beans, and strawberries. (1014.)

Forcing department. All that it is proper, in our opinion, to say here, is "guard against supineness: there is much less danger from your ignorance than from your indifference or want of vigilance." (1014.)

6. Flower-garden — Open Ground Department.

Sow annuals; all the sorts for a main crop, or for a succession, if you have sown them in March (1661.) Half-hardy annuals in warm borders there to remain (1662.) Biennials and perennials should be sown as early in the month as possible.

Propagate by rooted and unrooted slips and offsets (877.)

Transplant all sorts from the nursery to the borders (128.); tender and half-hardy annuals from the hotbeds to the borders (1662.)

Routine culture. Weed, hoe, rake, stir the surface, remove all decayed leaves and stalks as soon as the plants have done flowering, unless you select a stalk or two occasionally for seed. Never leave all the flower-stems for this purpose, and seldom all the pods or seed-vessels which are on a stem, as that would weaken the plants.

Defend (1020.) your auriculas from the extremes of every description of weather: if placed on a stage facing the north, or set on a shaded paved platform about three feet high, they will be better than if continued in the frames.

Destroy insects, and especially pick the grubs from the leaves of rose-trees: if you do not attend to this, you will have no blow worth looking at. (1019.)

7. Flower-garden — Hot-house Department.

Glass-case without artificial heat. Alpines may now be entirely uncovered, and also prolonged annuals and most half-hardy sorts; a few half-hardy annuals may still be sown, if not done in proper season. (1679.)

Hotbeds and pits. Shift frequently such tender annuals as you mean to come to a handsome size, more especially balsams (1749.) Sow more seed, if you have not enough of plants; plant out some in the borders to grow strong broad plants, especially balsams and combs in very warm situations. Plant tuberose roots, and shift those which are coming forward, if they appear to be stinted in their growth. (1638.) Attend to pots of cuttings, and seedlings from either of the following departments. (1626.)

Green-house. Fire-heat may generally be dispensed with in this month. Go on propagating by all the methods in use; this is the fittest season of the year: a good deal depends on taking off, making, and putting in the cuttings, but nothing will answer, if constant attention is not paid to keep them in a medium state as to air, heat, and moisture afterwards. (1771.)

Dry-stove. No fire will here be necessary, excepting when the thermometer in the open air is under 40 deg. or 42 deg. Propagate by the usual means, which in general for succulents is cuttings; attend to bulbs now coming into flower. (1599. 1735.)

Bark or moist stove. Go on, as in last month, shifting, propagating, and stimulating as the nature of the different hot-house plants require, and as your views or duties inculcate: never forget neatness, and removal of dust, insects, &c. (1594. 1619.)

8. Pleasure-ground and Shrubbery.

Plant (926.) such sorts of deciduous shrubs as you deemed too tender to plant last month: but finish this work in the first week. Plant a few roses as late as you can, in order to retard their coming into bloom: or, if you can afford the time and room, place potted roses in the ice-cold cellar in autumn, and do not take them out till August following, by this means you will have a fine shew in October and November (1687.) Evergreens, the hardiest sorts at the beginning, and the less so at the end of the month (1693.)

Prune such deciduous shrubs as you have neglected last month; evergreens from the middle to the end of the month. (950.)

Form and repair lawns, by procuring and laying turf, and by sowing grass-seeds. Where it is desired to destroy moss on extensive lawns, fold sheep till it be trod down and killed by pressure and manure: on small lawns, roll. In shady, damp situations, however, moss makes a better lawn than grass, and it should be encouraged by forming the surface of lawns of bog-earth in all situations where grasses do not thrive, as in towns, under close trees, &c. Mow established lawns twice a month; attend to gravel and margins. (860.)

9. Trees — Nursery Department.

Fruit-trees. (951.) Finish sowing kernels for stocks, or new varieties. Plant cuttings of the vine, fig, gooseberry, and currant, if it has been unavoidably delayed till this unfavorable season. Graft the pear, plum, and apple. (1420.) Attend to newly-grafted trees, and repair cracks in the clay, or renew such balls as may have dropped off; eradicate all suckers, and pinch off shoots that protrude below the grafts.

Ornamental trees and shrubs. Finish sowing deciduous sorts, as early as possible. Sow cedars, cypresses, and other ornamental evergreens about the end of the month. Sow in pots or boxes, or in shady borders of soft peat earth. Transplant evergreens. (1880. to 1891.)

Forest-trees. Finish sowing common tree-seeds, and commence with the resinous tribe, the larches, firs, and pines; the cypresses, arbor vitæs, &c. Finish planting deciduous trees in nursery-rows, as early as possible. (1880.) Evergreens may be transplanted during the month. Kiln-dry the cones of the cedar and fir tribe, but not of the pine tribe; and get the seeds out in time for sowing the end of this month or beginning of next. (1693.)

10. Trees — permanent Plantations and Park Scenery.

Sow for forests and woods, and all sorts of profitable plantations in masses. Observe it is rather late for nuts, berries, and keys, but this is the proper season for small seeds. 1880.)

Plant evergreen trees, as pine, fir, cedar of Lebanon, holly, and yew during the month; but finish planting deciduous sorts as early as possible. (1693.) Wherever the plants are to be, or have been long out of ground, take good care to dry up their roots, by exposing them as much as you can to the sun and air; do not be nice in planting, but do and say with Twigg's uncle:

> "I rams them in,
> Now thick now thin;
> What cares I
> If they grow or die."

Routine culture. Begin to hoe and clean the ground in plantantions, which have been made on prepared ground. Crop the ground in newly-made plantations, where cropping is intended.

Operations on ground or rocks may now be prosecuted with vigor. This is also one of the best months for building. Road-making, draining, fencing, &c. are advantageously performed during this and the two preceding months. But improvements can neither be well designed nor executed after the trees are covered with leaves, and the ground's surface and qualities disguised by luxuriant herbaceous vegetation.

MAY.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.	REMARKS.
London -	56 61	2 5	30 02	0·794 inch.	Vegetation now goes on with great vigor, though there are often very cold and even frosty nights, which materially injure exotics, natives of the warmer climates, such as the potatoe, dahlia, kidney-bean, &c. The human animal, in common with most others indigenous to our climate, are generally in high spirits and vigour during this month. Woe to the young gardener who exhausts his spirits in any other way than in self-improvement.
Edinburgh	50 4		29 585	1·945	
Dublin -	52 193		30 061	1·812	

1. Kalendar of Animated Nature round London.

In the first week: the titlark (*alauda pratensis*) sings, the cuckoo (*cuculus canorus*) is heard; the gudgeon (*cyprinus gobio*) spawns; the redstart (*motacilla phœnicurus*), swift (*hirundo apus*), white-throat (*motacilla sylvia*), and stinging-fly (*conops calcitrans*) appear.

Second week: the turtle-dove (*columba turtur*) cooes; the red-ant (*formica rubra*), the laughing wren (*motacilla curruca*), the common flesh-fly (*musca vomitoria*), the lady-cow (*coccinella bipunctata*), grasshopper lark (*alauda locustæ voce*), and willow-wren (*motacilla salicaria*) appear.

Third week: the blue flesh-fly (*musca vomitoria*) appears; black snails (*helix nigra*) abound, and the large bat appears.

Fourth week: the great white-cabbage butterfly (*papilio brassicæ*), and dragon-fly (*libella 4-maculata*) appears, the glow-worm shines, and the fern-owl, or goat-sucker (*caprimulgus europæus*) returns.

2. Kalendar of Vegetable Nature round London.

In the first week: geum urbanum, artemisia campestris; lily of the valley (*convallaria majalis*), water-violet (*hottonia palustris*), tulip-tree (*liriodendron tulipifera*), and numerous other plants in flower.

Second week: the oak, ash, sweet chestnut (*fagus castanea*), hawthorn (*mespilus oxyacantha*), the common maple (*acer campestre*), horse-chestnut (*æsculus hippocastanum*), barberry (*berberis vulgaris*), and the *ajuga reptans* in flower.

Third week: the water scorpion-grass, or forget-me-not (*myosotis scorpioides*), lime-tree (*tilia*), milk-wort (*polygala vulgaris*), nightshade (*atropa belladona*), and various American shrubs in flower, and rye (*secale hybernum*) in ear.

Fourth week: oaks, ashes, and beeches now generally in leaf, and the mulberry (*morus nigra*) beginning to open its buds. The cinnamon rose, and some other hardy roses in flower; and also the bramble (*rubus fruticosus*), moneywort (*lysimachia nummularia*), columbine (*aquilegia vulgaris*), and various other trees and shrubs in blossom.

3. Kitchen Garden — Culinary Vegetables.

Sow hardy aromatic herbs, if not done last month. Small salads four times in the month for a complete succession. Radishes and lettuce thrice. (1344. 1312.) Pease and beans once a week. (1312.) Spinach once a fortnight. (1330.) Carrots, for late drawing, twice in the month. (1323.) Borecole, in the first week, for a second main crop. (1307.) Dwarf kidney-beans in the first week for a full crop in July: — in the last fortnight for crops in August and September. (1313.) Borecole and Brussels sprouts for the last crop, and German greens to come in for spring. Savoys for the last crop. (1305.) Onions for drawing, young leeks to be late transplanted, cauliflowers in the second and third weeks for a Michaelmas crop. (1308.) The less hardy aromatic herbs, and pumpkins, the last fortnight. (1301.) Cucumbers for picklers on a dry warm border, in the last week. (1300.)

Protection. Continue this, nightly, for kidney-beans and tender plants transplanted from hot-beds. (1020.)

Propagate by bulbs and dried roots. If abundance of potatoes have not been planted, effect this as early as possible: in late situations they may be planted till the middle of June. (1315.)

Plant slips and offsets.

Transplant the brassica tribe, lettuce, cellery, radishes, and other plants for seed. (928.)

Routine culture. Stick peas, top early crops of beans, and also of peas; earth up cabbages, beans, peas, potatoes, &c. Thin, weed, hoe, and stir the surface among seedling crops. Water in dry weather, support stems, pinch off all decayed leaves, &c.

Destroy insects and vermin. (1030.)

4. Hardy Fruit Department.

Plant strawberries, if it has not been done last month. (1476.)

Prune what trees you have neglected and run the risk of losing, or leave them unpruned till autumn as a proof of vigilance and skill. (1071.) Summer prune vines, peaches, and other early shooting trees against walls, and such gooseberries as are planted then to produce upon early fruit. (950.) Remove all suckers, excepting selected ones of raspberries, and pinch off strawberry runners as directed for last month. (1478.)

Routine culture. Mulch, protect, and water where necessary. Water strawberries over the herbage, and especially after the fruit is set. (944.)

Destroy insects, especially snails and caterpillars. On the first symptom of the leaves rolling up, unroll them and pick out the grub before it does further mischief. Take special care it does not get at the petals of apple and pear blossoms. (1030.)

Fruit-room. Look over the fruit of every description which the increase of temperature will now cause to taint rapidly. (708. 709.)

Fruit-cellar. Open a few casks of such desert apples and pears as are now wanted for the table. Close them as soon as you have taken out the proper quantity, and let them still remain in the cellar. (709. 710.)

5. Culinary Hot-house Department.

Glass-case without artificial heat. Remove glasses from cauliflowers and kidney-beans, according to the weather. Sow capsicum, under frames or hand-glasses in a warm border. (1406.)

Hot-beds. Go on with hot-beds for frames for melons, and build dung ridges for growing cucumbers under hand-glasses. (1320.) Sow cucumbers and melons for late crops, and attend to the various particulars in their culture. Attend to air, water, shade, insects, &c.

Pinery. Attend particularly to your fruiting plants, give abundance of heat and water, and keep down all manner of dirt, insects, &c. (1116.) Attend to minor articles cultivated in the pinery, and to routine culture of every kind. Think and act for yourself; kalendars too often mislead the ignorant who rely on them implicitly, not considering that no two cases are ever to be found alike. (1014.)

Forcing department. Produce the required temperatures, and attend to all the parts of good culture and neat management. (1014.)

6. Flower-garden — Open Ground Department.

Sow annuals of all sorts for succession. (1651.) Biennials in the nursery compartment for a stock for next year. (1654.)

Propagate, especially by cuttings from the stalks, as of wall-flower, rocket, &c. (877.)

Take up bulbs and tuber roots, as crocus, hyacinth, lily, &c. (1657.)

Transplant, as directed for the last month, stocks and other sorts in pots for winter. (928.)

Defend tulip-beds and all rare florists' flowers from the mid-day sun, the rain, and the winds. (1020.)

Routine culture. Hoe, rake, stir, weed, and clear away dead leaves. Do not neglect, whenever rain has battered the ground, to stir it up and refresh it as soon as it is nearly dry. Stir the surface round close patches of annuals, and refresh and top-dress all pots of prolonged annuals, now in full flower or in seed. Keep all the primula tribe rather dry at this season, and in the shade of a north wall. Plunge the pots in ashes or saw-dust.

Destroy insects and pick the grubs off roses. Detach seed-pods from all plants you do not wish to ripen seeds. Water, thin, and shade with judgment, and keep a vigilant eye to order and neatness. Shut yourself up in your room for two entire days, or go from home a similar time, and when you return and look over the garden you will see many things that would have escaped you, had you gone on plodding day after day. Remember that such things are seen by others, and that though all may appear to you in good order, to another there may be much slovenliness and confusion.

Store-room. Lay up crocus and other bulbs and roots till wanted in the autumn.

7. Flower-garden — Hot-house Department.

Glass-case without artificial heat. These will now be chiefly employed with annuals in pots, for prolongation and in striking from cuttings, &c. (625.)

Hot-beds. (626.) Go on as directed last month with your tender annuals. Plant a few tuberoses for succession. (1638.) Attend to cuttings and seedlings from the hot-house and green-house departments. Shift and transplant as occasion requires. (1710.)

Green-house. Give abundance of air every day, and in mild nights leave some all night: water over the top, and shut up the house in the afternoons when you water. This invigorates growth wonderfully.

Propagate as before. Shift most of the plants, examining their roots.

Dry-stove. (1599.) Give abundance of air. Fires will not now be wanted. Look to bulbs, as soon as they have done flowering. Shift all such as require it, putting them into larger or smaller pots, according to their state, and your object.

Bark, or moist-stove. (1594.) Give abundance of heat, air, and water, if you wish the plants to grow and flower vigorously. (1740 to 1745.)

8. Pleasure-ground and Shrubbery.

Plant deciduous trees and shrubs, but only to fill up a vacancy, or to cause a check for the purpose of late flowering. Immediately after performing the operation, mulch, shade, and water. (926.) Evergreens, especially the more tender sorts, but finish by the middle of the month. (1693.)

Prune (950.) evergreens, finishing by the middle of the month. (1693.)

Routine culture. Hoe, rake, weed, water, stake, shade, shelter, &c. as circumstances require. Roll and mow once a week, if showers are frequent, but once a fortnight will do in dry weather.

Lay down turf, if not completed before, water well and roll immediately afterwards. (860.)

Gravel walks may still be formed and repaired, but the work should have been completed last month. Roll well with a heavy roller. (861. 862.)

9. Trees — Nursery Department.

Fruit-trees. (931.) Look over grafted trees.

Ornamental trees and shrubs. Sow the seeds of evergreens and American sorts, in the first and second weeks of the month. Lay and graft the tenderer sorts of evergreens and Americans. Plant out tender evergreens and Americans in nursery rows, or in pots, for more convenient removal. (1682.)

Forest-trees. Finish planting out evergreens, seedlings, and nurslings as early as possible. Sow poplar and willow seeds as soon as gathered. These seeds will not come up if kept a very few days out of the ground. (1895.)

Protect from all sorts of garden enemies, and attend to order and neatness. (1020. 1071.)

10. Trees — permanent Plantations and Park Scenery.

Planting, evergreens may still go on, if the weather is dull and moist, but the sooner it is finished the better. (1682.)

Pruning. Sang recommends this as a good season for pruning old oaks, because the wound heals quicker while the sap is flowing.

Fell oak woods and coppices, and other barking trees, but complete the operation about the middle of the month, as before. (1068.)

Routine culture. Attend to planted ground under, or to be put under, light culinary crops. (1829.)

Prepare ground for autumnal planting or forming of plantations by sowing, as the tree seeds ripen. (797.)

Operate on ground for water, or other territorial improvements. Continue to build and execute plans determined on at an earlier season.

JUNE.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.	REMARKS.
London -	63 22	2	29 93	0·332 inch.	The weather is sometimes cold at the beginning, but is generally agreeable and steady towards the middle of the month. By observing the column indicating the greatest variation of the thermometer in each month, it will be seen that it varies, in London, only two degrees in June, which is less than in any of the preceding months. In July and August the variation is the same; but in March and October it is twice as much.
Edinburgh	57 2		29 666	1·935	
Dublin -	58 76		30 06	0·860	

1. Kalendar of Animated Nature round London.

In the first week: the sedge-sparrow (*passer arundinacea*), the fly-catcher (*muscicapa atricapilla*), the wasp (*vespa vulgaris*), and several species of bee and butterfly appear.

Second week: the burnet moth (*sphinx filipendulæ*), and forest-fly (*hippobosca equina*) appear; bees swarm.

Third week: several flies, butterflies, moths, beetles, and other insects appear.

Fourth week: insects abound; and singing-birds begin to retire to the woods, and leave off singing.

2. Kalendar of Vegetable Nature round London.

In the first week. water-lilies (*nymphæa, et nuphar*) flower; also iris, pseud-acorus, anthemis cotula, polygonum persicaria, malva rotundifolia, and numerous other plants.

Second week: the vine, raspberry, and elder in full flower; also various Scotch roses (*rosa spinosissima*), broom (*spartium*), nettle (*urtica*), and wheat in the ear.

Third week: the orchis, epilobium, *iris xiphium* and *xiphioides*, the hardy ixias and gladioli, and a great variety of garden and field plants in flower; also the wheat and many of the pasture grasses.

Fourth week: some black and red currants ripe, strawberries in abundance; young shoots of trees and shrubs have nearly attained their length. Oats and barley in flower; blue-bottle, scabious, (*centaurea cyanus*); and numerous others in bloom.

3. Kitchen Garden — Culinary Vegetables.

Sow peas and beans once a week or ten days. (1300.) cucumbers for picklers. (1312.) Gourds in the first week.

(1391.) Small salads and lettuce every week or ten days. (1314.) Radishes and spinach in the first week. (1330.) Kidney-beans every fortnight, for succession. (1333.) Endive about the 10th or 24th, for the main autumn and winter crops. (1359.) Chervil twice in the month for summer use, also purslane. (1379.) Cabbages, of quick growing sorts, for summer and autumn consumption, about the beginning and middle of the month. (1301.) Turnips in the first week, for succession; and in the second and third week for a full autumn crop. (1322.) Carrots (1323.) twice, for drawing young. Broccoli and borecole, in small portions, for succession, late in spring. (1307. 1309.) Onions, to be drawn young.

To save seed. Mark out cauliflowers, lettuces, &c. and let them send up their flower-stems. (1306.)

Protect when and where necessary. (1020.)

Propagate by bulbs, roots, offsets, slips, in showery weather. (877.)

Transplant (928.) the brassica tribe, cardoons, endive, lettuce, and other plants and herbs, also plants reared in hot-beds.

Routine culture. Tie up garlic and recambôle leaves in knots to prevent their running to seed (Abercrombie). Stick and top peas; top beans; earth up finochio to blanch; also white beet. Thin, hoe, weed, and stir the ground as before. Support with stakes and water as far as practicable; in dry weather.

Taking crops. (1052.) Cut and dry herbs for winter use. Gather ripe seed. Discontinue cutting asparagus at the end of the month.

4. Hardy Fruit Department.

Prune and train the summer shoots of all descriptions of wall and trellis trees. (950.)

Thin out the summer shoots of fruit-shrubs, and of all fruit-trees, excepting high standards, which do not require this nicety. (1122.)

Routine culture. Mulch, water, fasten by stakes, weed, hoe, and rake where wanted. Throw nets over cherry-trees and protect the fruit from the birds. Water strawberry plots every day in dry weather, desisting a little as the fruit begins to ripen.

Destroy insects. Strew sulphur over the mildew, water for the acarus; direct a stream of tobacco smoke against the aphis and thrips, but depend on your fingers for the thorough eradication of grubs, which, at this season, are by far the most mischievous of garden enemies. (1030.)

Fruit-room and cellar. As in last month. (710.)

5. Culinary Hot-house Department.

Glass-case without artificial heat. Raise hand-glasses over cucumbers on props, and train out the runners, in the second or third week. Ridge out melons in good earth, in the last fortnight; cover with mats till the end of the third week. (1499. 1583.)

Hot-beds. Keep up adequate temperatures for ripening the fruits by linings. Reinforce melon ridges with linings. Train, prune, and impregnate, as circumstances require. Attend to air, water, shade, and even nightly coverings after cold days. Keep up proper linings to your beds of pine suckers.

Pinery. Attend to what was stated last month. If you want extraordinary large fruit, and do not mind losing the suckers, apply the usual means, viz. heat, water, and removal of all stem and root suckers. (1115.)

Forcing department. See last month. Keep up successive supplies of kidney-beans, strawberry, and fruit trees in pots. (114.)

6. Flower-garden — Open Ground Department.

Sow a few hardy and half-hardy annuals for succession, as before. (1661. 1662.)

Propagate, by cuttings, such plants as are proper for this purpose, as they go out of flower. Pipe and lay pinks and carnations towards the end of the month. (1646. 1647.)

Take up bulbs and other tuberous roots, dry them in the shade and remove them to boxes or drawers in the store-room, wrap the finer sorts in papers. (1657.)

Transplant (928.) annuals in the borders and in pots for autumn and winter flowering. Biennial and perennials may also be transplanted into nursery rows at this season, or even where they are finally to remain.

Routine culture. Mow, weed, hoe, rake, thin, stir, and dress: and keep up as complete an appearance of polish and high keeping as your strength of men and other means will permit. (1014.) Shade, shelter, water, and attend to carnations coming into flower. Destroy earwigs and all manner of insects. (1014. 1020.) Go round the garden frequently and examine every thing minutely, and reflect on what might be done to promote its growth and beauty. To aid you, imagine it to be a garden which you were sent to criticise, and to be paid according to the number of faults you found. Or imagine it your neighbour's garden, or the garden of some one you hate. (1014.)

7. Flower-garden — Hot-house Department.

Glass case without artificial heat. Propagate the dianthus tribe by pipings under hand-glasses and frames. (1646. 1847.)

Hot-beds and pits. Put pots of carnations and pink pipings in gentle heat, it will facilitate their striking. (1646. 1647.) Do not forget to give head-room to your balsams and other tender annuals, which should now be noble looking plants. Attend to pots of cuttings and seedlings; also to young stove-plants put into this department for more rapid advancement.

Green-house. As soon as the mulberry comes into leaf remove the plants to a fit situation in the open air. Some plunge them in ashes; but the major part set them on scoria gravel or pavement, in a partially shaded situation, a cold bottom, and a certain degree of shade are essential to their well-doing. (1710.)

Dry-stove. (1599.) Give abundance of air night and day, but be moderate as to water. Cease to water bulbs soon after they have done flowering; let them go slowly into a state of hybernation, and then take them out of the pots and dry them.

Bark, or moist-stove. Encrease your heat with the lengthening day, and prolonged sun, and by consequence increase the concurring agents of vegetation. Propagate by the usual means; save seeds where you can; destroy insects and attend to neatness. (1014. 1594. 1619.)

8. Pleasure-ground and Shrubbery.

Prune and regulate summer shoots, and take off suckers where not wanted to extend the bush or propagate the species. (950.)

Routine culture. Weed, hoe, rake, stir the surface, support climbers, regulate the shoots of creepers, &c. Water and roll any new-laid gravel to combine it properly with the rest. Dress, roll, and mow lawns and turf in every form. Keep your eyes open to every part of the grounds at this season; for now perfect neatness and the utmost polish and high keeping is expected. Do not trust to what you are told to do in kalendars, but think for yourself: kalendars too frequently make mere machines of gardeners; for though man is a thinking animal, yet he is also a lazy imitative animal, and will not exert himself in any way, and not even think unless urged on by some strong motive. All your faults will be discovered, sooner or later, and rely on it you will receive a proportionate disgrace from your neighbours or visitors; if you are attentive to your duty your merits will be discovered in like manner, and you will receive appropriate credit and reputation, which is your capital stock in trade, on which you depend for your livelihood. (1014.)

9. Trees — Nursery Department.

Fruit trees. Begin budding during the last fortnight. Look over all your newly-grafted and all other trees; rub off superfluous, irregular, or ill-placed shoots and suckers, and tie weak grafts and dangling shoots from budded stocks to neat stakes. (901.)

Ornamental trees and shrubs. Lay the summer shoots of roses, hard-wooded evergreens, and other sorts which are proper to be propagated in this manner. Put in cuttings of young wood properly ripened at the lower end. Bud rare sorts. (1891.)

Forest-trees. Collect and sow elm seed in the third or fourth week; or if you do not wish to sow it, lay it in the store-loft. (1890.) Seedlings of the more choice pines may be thinned where too thick, and the thinnings planted and shaded about the end of the month. (1879.) Gather elm seed from the middle to the end of the month. (1890.) Attend to kitchen crops among transplanted trees, and in vacant places in general. (1829.)

10. Trees — permanent Plantations and Park Scenery.

Fell oak coppices, if it has not been done before. The middle of this month will prove a better time, as to the trees, than the middle of May, as they will not bleed so much: but the bark will not peel so well. (1861. to 1867.)

Prune and thin the side shoots of the present season, from established trees. (950.)

Routine culture. Stake newly-planted tall hedge-row trees, where not done before. Attend to weeds every where, and to ground under-crop. Prepare ground for autumn sowing or planting.

Operations on ground and buildings are carried on at this season with less advantage than in the four preceding months. The ground is hard and difficult to penetrate; and the moisture in new-built masonry dries too rapidly.

JULY.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.	REMARKS.
London -	66 3	2	29 89	2·194 inch.	This was called *hay month* by the Saxons, and in it are more plants in flower than during any other. The young gardener should now devote a considerable portion of his time to collecting and drying specimens, duplicates, and triplicates, in order to afford a stock to exchange with brother gardeners or naturalists; or with booksellers, apothecaries, students, schoolmasters, and clergymen, for the loan of books, and for aid and instruction in study.
Edinburgh	60 6		29 445	2·546	
Dublin -	61 13		29 929	2·614	

1. Kalendar of Animated Nature round London.

In the first week: the cuckoo (*cuculus canorus*) leaves off singing; the stone-curlew (*charadrius œdicnemus*) whistles occasionally late at night, and the golden-crested wren (*motacilla regulus*) now and then chirps.

Second week: the quail (*tetrao ferrugineus*) calls; the cuckoo-spit, or frog-hopper (*cicada spumaria*) abounds.

Third week: young frogs migrate. Hens moult.

Fourth week: the great horse-fly (*tabanus bovinus*) appears; and partridges fly.

2. Kalendar of Vegetable Nature round London.

In the first week: enchanter's nightshade (*circæa lutetiana*) lavender (*lavendula spica*) in flower. and pinks and carnations in full bloom.

Second week: the fallen star (*tremella nostoc*) appears; also puff-balls (*lycoperdon bovista*), and sometimes the common mushroom (*agaricus campestris.*)

Third week: raspberries and gooseberries ripe, potatoes in flower, asparagus in berry, the liliums in perfection.

Fourth week: the truffle (*tuber cibarium*) now hunted, or dug up in commons and forests, nightshade (*solanum nigrum*), devil's bit (*scabiosa succisa*), burnet saxifrage (*pimpinella saxifraga*), and a great number of plants in flower.

3. Kitchen Garden — Culinary Vegetables.

Sow (923.) salads and lettuce in shady situations, for successional crops. Turnip radish for an autumn crop. (1329.) Kidney-beans, in the first week, for a late full crop. (1313.) Peas and beans, in the first week, and a fortnight afterwards try a small sowing for a late crop. (1311.) Endive, in the first week, to come in in the close of autumn, in the third week, for a winter crop. (1355.) Broccoli, before the 10th, for a late spring crop. (1309.) Finnochio, for succession, in the first fortnight. (1379.) Round-leaved spinach, in the first week, in a shady border for a succession. (1330.) Triangular-leaved, or prickly spinage, in the last week, in poor ground to stand the winter. (1330.) York and sugar-loaf cabbages, in the first week, for autumn use, and, in the last week, for winter and spring. (1302.) Carrots, in the first week, in a shady border. (1323.) Turnips twice or thrice, in showery weather. (1322.) Welch onions; for autumn onions, sow the bulbing sorts in the last week to stand the winter. (1336.) Coriander and borage for young crops. (1379.)

To save seed. Mark out the brassica tribe, and other esculents in perfection, and let them shoot up flower-stems.

Propagate by slips, offsets, &c. where not done before, and where plants have completed their inflorescence, and are to be cut down as some potherbs, &c. (877.)

Transplant (928.) as before, and include celery and celeriac, endive, &c.

Routine culture. Stick and top peas and kidney-beans, top common beans, train cucumbers and gourds, earth-up the leguminous crops and potatoes; hoe, thin, and stir the surface wherever necessary, among all descriptions of crops; water, as far as your time will permit, and particular crops require.

Taking crops. (1032.) Take up shallots, and dry them for winter use; also rocambole and garlic when ready. Gather ripe seeds and onions, and cut herbs in blossom, drying and storing both. Gather the fruit of young gourds for pies, stews, and pickling.

Destroy insects, and ward off vermin. (1020.)

4. Hardy Fruit Department.

Plant strawberries in the open garden; and in pots for next winter's forcing. (1476.)

Prune, train, thin, and regulate all the summer shoots of wall and espalier trees, and dwarf and tall standards. (950. 1071.)

Routine culture. Hoe and weed fruit-tree borders. Hang up nets, water and mulch where necessary. Water alpine strawberries, which will now be in full bearing, every third or fourth day, unless in a shady situation.

Destroy (1080.) insects: keep earwigs ants, boys, and idle women from fruits, as cherries, &c. approaching to a state of ripeness.

Fruit-room (709.) This will now be empty; clean and wash every part of it, and air it well for occasional summer and next winter's use.

Fruit-cellar. (710.) If you have attended properly to casking up keeping-apples and pears, you will still have a supply, and even of grapes in some cases. If the cellar gets too warm, the casks should be removed to the ice-house.

5. Culinary Hot-house Department.

Glass-case without artificial heat. Plant out melons and cucumbers, shading and watering, &c. (1231.)

Hot-beds and pits: Prune melons and cucumbers; give air and water, and attend to shading and weeding; collect mushroom-spawn; attend to young pines. (1166.)

Pinery. You will now begin to cut fruit in abundance. See to the stools: earth them up, so as to cause the suckers to strike root: put them into a brisk bottom-heat, and give proper supplies of water. You will thus gain much time, and profit from the expiring strength of the parent plant as long as possible. This is the true way to fruit a pine plant in eighteen months or even less time. Suckers thus treated will, next spring, be equal to two-years' old plants. (1166.)

Forcing-houses. Expose those houses, where crops are taken, to the natural climate, by removing, as far as possible, the roof, and even the ends and front, if they are moveable. (1215.)

6. Flower-garden — Open Ground Department.

Sow a few annuals, for succession, and prolongation in pots through winter. (1661.)

Propagate (877.) from cuttings of plants going out of flower; from rooted slips of such as are ripening their seed, as auriculas and the primula tribe; go on piping and laying the dianthus tribe. (1646.)

Take up bulbs as they go out of flower: this work should generally be completed by the end of the first week, unless for the lily tribe, the colchicum, and a few others.

Transplant late sowings of annuals, and also biennials, and perennials into nursery rows. (1662.)

Routine culture. Eradicate all weeds the moment they appear: keep the surface always fresh, and rather rough, never smooth and battered. It is better to have little clods and knots of earth, than to have a naked or dug surface as smooth as a table. The clods and knots make variety of light and shade, and are besides more favorable for the admission of air, heat, and water to the roots. Shade, shelter, and water. Gather seeds as they ripen, and dry them in the seed-room, or lofts, the windows being open. Destroy insects; cut out broken stalks, and diseased parts of plants. Cut down stalks which have done flowering, and remove all decayed leaves.

Gather flowers neatly with a knife, and so as not to disfigure the plant. (1032.) Gather in general from the reserve garden, so as not to disfigure the borders.

Store-room. (710.) Look over your bulbs now and then, to see that none get mouldy. See also to your newly put-up seeds.

7. Flower-garden — Hot-house Department.

Glass-case without artificial heat. (625.) Most of these, at this season, are given up to the kitchen-garden, or used to protect at nights the tender annuals, some of which, as the humble and sensitive plant, cannot so well be put out in the borders. (1679.)

Hot-beds and pits. (626.) Little use is now made of them by the florist, unless for propagation of stove plants. Attend to cuttings from whatever department. If you are endeavouring to flower the more delicate aquatics, see to the keeping up a regular heat.

Green-house. (1595.) This will now be filled with pots of tender annuals, which only require shifting now and then till of a certain growth; and then only common routine culture.

Dry-stove. (1599.) Some set out a part of the succulent tribe at this season. If you do, let it be in a very warm situation: heavy and continued rains prove very injurious to succulents in the open air.

Bark or moist-stove. (1594.) Increase the temperature with the increase of light, and add air and water accordingly. Attend to all the minor points of culture. See that the floors or paths of your stoves are swept every day: and wash your plants well with the engine, otherwise they will soon get unsightly. Be sure to dash this water on all plants in blossom, in order to curtail their beauty, and lest they should set fruit.

8. Pleasure-ground and Shrubbery.

Prune (940.) as in last month: box-edgings and evergreen hedges in the last week of this month, if the season is a forward one. (1831.)

Routine culture as in June.

Lawns. (945, 946.) Attend to these, according as the weather may be showery or otherwise. In dry weather, set your men to mowing at three o'clock, and let them rest from eleven till three o'clock: in moist weather the time of the day is of less consequence. In France and Italy, the working gardeners, during summer, may be said to do the principal part of their work early in the morning, and latr in the evening.

Gravel-walks. Weed and roll these in moist weather. When dry, and the gravel becomes loose, water and roll. (859.)

9. Trees — Nursery Department.

Fruit-trees. Attend to budding, and look over your grafted trees; pinch off all obtruding shoots and suckers. (1890.)

Ornamental trees and shrubs. Continue laying summer shoots, and planting cuttings and buddings as in last month. (1682.)

Forest-trees. Sow elm-seed; attend to weeding and cleaning all beds and rows of seedlings, or other nurslings, and of transplanted trees. (1875.)

10. Trees — permanent Plantations and Park Scenery.

Prune (950.), evergreens in the last week, if the summer has been so favorable as nearly to ripen the wood.

Routine culture. Attend to kitchen, or field-crops, among young plantations; and to large weeds every where. Do not forget hedges and other fences: keep all sorts of fences at all times in repair. (1829.) Few operations in landscape gardening can now be commenced; but some, as excavating for water, &c. may go on.

AUGUST.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.	REMARKS.
London -	65 85	2	30 06	0·824 inch.	This is the barn, or *harvest month* of the Saxons; many seeds of herbaceous vegetables ripen in this month, and most sorts of culinary crops, raised in the open garden, are now in perfection. Insects, especially the winged tribes, now abound; and the young gardener should be assiduous in collecting them for the same object as he collects specimens of plants. By carrying a small box in his pocket, he may pick them up while at work.
Edinburgh	60 6		29 828	1 996	
Dublin -	62 82		30 172	5·458	

1. Kalendar of Animated Nature round London.

In the first week: flying ants (*formica*) appear; bees kill their drones; and the swallow-tailed-butterfly (*papilio machaon*) appears.

Second week: young martins (*hirundo urbica*), and swallows (*hirundo rustica*) begin to congregate, and swifts (*hirundo apus*) to depart; the whame, or burrel-fly (*œstrus* eggs on horses.

Third week: the black-eyed marble butterfly (*papilio semele*) appears. Various birds reassume their spring notes.

Fourth week: the nuthatch (*sitta europæa*) chatters, the stone-curlew (*charadrius œdicnemus*) whistles at night, the goat-sucker (*caprimulgus europæus*), and young owls (*strix ulula*) make a noise in the evening; robin-redbreast (*motacilla rubicula*) sings, and rooks roost on their nest-tree.

2. Kalendar of Vegetable Nature round London.

In the first week: melilot (*trifolium officinale*), rue (*ruta graveolens*), yellow succory (*picris hieracioides*), burdock (*arctium lappa*) in flower. The bread-corns ripe.

Second week: wild clary (*salvia verbenacea*), meadow-rue (*thalictrum flavum*), ploughman's spikenard (*conyza squarrosa*), and various other natives in flower.

Third week: the mallow (*malva*), *lavatera*, hollyhock (*alcea rosea*), and lobelias, among the garden-flowers, and the polygonums and potamogetons among the wild plants now in blossom.

Fourth week: the autumnal crocus (*colchicum autumnale*), aster, solidago, *senecio paludosus*, teasel (*dipsacus fullonum*), and various other plants in flower. The earlier varieties of all the hardy kernel fruits ripe.

3. Kitchen Garden — Culinary Vegetables.

Sow (923.) turnip for a main crop, in the first week: but sowings made after the 15th seldom fully succeed (1329.); make frequent sowings of small-salading, radishes, and lettuce (1352.): the latter for autumn and winter crops. Parsley may now be sown for winter and spring use, this being the most natural season for sowing biennials. (1369.) Some of the large sorts of cabbage, in the first week, to come in in autumn of the following year and subsequent winter; and early sorts in the first week, for coleworts next winter and spring. Spinach, in the first or second weeks, for a main winter-crop. (1330.) Carrots, in the first and third weeks, for drawing young in spring. (1323.) Endive and corn salad for winter and spring; chervil for a late crop; onions for a full winter-crop; angelica, fennel, scurvy-grass, and blessed thistle for next year. Cauliflowers twice, in the third and fourth week, for crops, to stand over the winter, in sheltered borders, or under frames. American cress, in the last fortnight, for a spring crop.

Propagate (877.) by slips and cuttings, where necessary.

Transplant (928.) as in last month, and include leeks, perennial herbs, &c.

Routine culture. Displace the suckers from such artichoke heads as you would grow to the greatest magnitude; stick peas and runner kidney-beans; earth-up the brassica and leguminous tribes, and potatoes in so far as requisite. Land-up celery, endive, white-beet, finnochio, &c. for blanching. Hoe, thin, weed, stir the surface, water, and attend to neatness and order; water and shade, and clear off all crops the moment they are done with.

Taking crops. (1032.) Take up the alliaceous tribes as before; gather pickling cucumbers; cut herbs; gather ripe seeds.

Destroy insects. (1030.)

4. Hardy Fruit Department.

Plant (926.) strawberries, as directed for last month.

Prune (950.), regulate them, train, and otherwise arrange the summer-shoots of all fruit-trees as directed for last month.

Routine culture. Hoe, rake, weed, and stir the surface under gooseberry quarters, and in general under and around all fruit-trees. Where fruit is beginning to ripen, be very moderate in thinning the leaves. Mat up small fruits on north walls, intended to be preserved till late in autumn; water spring-planted trees in dry weather, also strawberry plants in blossom and fruit. Dress strawberry-beds that have done bearing. (1476.)

Take (1032.) gooseberries and currants, with the fruit-scissars or tongs. Apricots and such wall-fruit as is ripe with the fruit-gatherer. See *figs.* 65. to 68.

Destroy (1030.) insects; the acarus will now be your greatest enemy.

5. Culinary Hot-house Department.

Glass-case without artificial heat. Sow long prickly cucumbers for a late crop, to receive the aid of artificial heat in October and November. Sow in pots, or make layers or cuttings for the same purpose. (1500.)

Hot-beds and pits. (626.) Recruit the linings of melon-beds, and prune, train, weed, water, and impregnate all the cucumis tribe.

Mushrooms. Search for spawn, in cow-pastures more especially, and take care of it when got. (1288.)

Pinery. See last month.

Forcing-houses. (1215.) Most of the forced peaches will now be gathered; fully expose the trees, unless you have so great a proportion of grapes under the rafters, or running along the top of your trellis, as to render it worth while to keep the sashes on to ripen them. It is, however, better never to have them together in such contending proportions. Cherry-trees and others in pots, and of which the shoots are ripe, should be put in a state of hybernation, by removal to a cold cellar, or shaded border. This will fit them better for a succeeding early artificial spring.

6. Flower-garden — Open Ground Department.

Sow (923.) auricula and other primula seeds in pots and boxes, so as to admit of winter protection. These seeds come up stronger now than if kept till the following spring; and, though they will not flower sooner than the second spring after sowing, yet they will then flower much stronger than plants just a year old. (1641. 1642.) Minionette, stocks, and other annuals in pots for prolongation through the winter.

Propagate (877.) by all the usual means. This is now the best time for taking off rooted slips of the auricula: the Lancashire florists will never touch these till the third day of this month, when their florist's sales commence. (1611.)

Take up bulbs and tuber roots of the few plants which had not ripened their stalks before, as of the martagon and red and white lily.

Plant dried *offsets* of bulbs, as these, from their small size and tenderness, rather suffer from being long out of the ground. Plant autumn flowering bulbs and Guernsey lily. (1636.)

Transplant (928.) most sorts of biennials and perennials, and your latest sowings of annuals and half-hardy annuals intended for the borders.

Routine culture. Prepare composts. Hoe, dig, rake, stir, weed, thin, shade, shelter, prop, stick sweet-peas, and other climbers. Water, and gather seeds; mow verges and glades where they exist in the flower-garden, according as you find they require it.

Store-room. (710.) Look once a month at your roots and seeds; and gather, dry, clean, and store up seeds as they ripen, attending to name and date each packet or bag accurately.

7. Flower-garden — Hot-house Department.

Glass-case without artificial heat. See last month.

Hot-beds. (626.) Attend to such cuttings as are forwarding in these, and to late crops of tender annuals. Prepare successions of tender annuals for the green-house.

Green-house. (1595.) Attend to your tender annuals; and do not forget creepers, and vines, and such plants as being planted in the ground cannot be turned out. (1710. to 1729.)

Dry-stove. (1599.) About the end of the month, it will be safe to replace such plants as you had ventured in the open air. Any you put in cold pits, may remain a month longer. (1730. to 1735.)

Bark, or moist-stove. (1594.) See last month. Attend to creepers, climbers, and vines, also aquatics, which, if you have a proper aquarium, will now be in great perfection, and highly beautiful. (1750.)

8. Pleasure-ground and Shrubbery.

Plant (926.) evergreens towards the end of the month: water, mulch, and shade, for some days, if very delicate sorts. (1693.)

Prune evergreens (1693.); roses for forcing. (1683.)

Routine culture. Hoe, rake, weed, &c., as before. Prepare ground for planting; dress, gravel and grass as in June and July.

Form and repair lawns, by turfing or sowing. It is now an excellent season for sowing lawns. See that you make use of the proper grasses, according to the soil and situation. (945.)

9. Trees — Nursery Department.

Fruit-trees. (951.) Finish budding of the late varieties of the stove fruits, before the middle of the month (1420.) Look over the grafted trees, and slacken the bandages of your earlier and most advanced grafts and buds.

Ornamental trees and shrubs. Plant cuttings of hardy evergreens, as laurel-bay, privet, box, &c. in the last fortnight. (1880.) Provide heath and bog-earth for American and other sorts. (1894.) Go on with budding rare species.

Forest-trees. Sow elm-seed, if you have not done it before, or do not choose to defer it till spring. (1693.)

Routine culture. Hoe, weed, &c. and keep every part in perfect order; look to your kitchen-crops and ripening-seeds. Prepare ground from which kitchen-crops have been removed for planting.

10. Trees — permanent Plantations and Park Scenery.

Plant (926.) evergreens in the last week, if the weather is moist. Water to settle the roots, and mulch and stake according to circumstances. (1693.)

Prune the birch, wild cherry, and maple tribe, at the end of the month, when the leaves are beginning to fall, as they are apt to bud later or earlier. (1831.) Evergreens at the end of the month. (1831.)

Prepare ground for planting next month, either by ploughing, digging, trenching, or pitting, as the case may be. (1802.)

Destroy ferns, nettles, and other bulky weeds in park-scenery, by bruising their stems with the weeding-pincers (*fig.* 64.), close by the surface: as cutting them over is found a less permanent check to their flowering again……

SEPTEMBER.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.	REMARKS.
London	50 63	3 5	30 09	0·482 inch.	The temperature begins now to decline and to vary; the nights begin to lengthen, and heavy dews and diminished transpiration and evaporation render artificial watering in the open air less necessary, unless against trees on walls, to keep down insects. Many varieties of fruits ripen during this and the former month, which the young gardener ought to study, and, when he can afford time from other studies, he should make drawings of a few.
Edinburgh	54 3		29 739	3·470	
Dublin	59 35		30 239	3·021	

1. Kalendar of Animated Nature round London.

In the first week: young broods of goldfinches (*fringilla carduelis*) appear. The linnet (*fringilla linota*) congregates. The bull (*bos taurus*) makes his shrill autumnal noise; and swallows (*hirundo rustica*) sing.

Second week: common owls (*strix flammea*) hoot. The saffron butterfly (*papilio hyale*), and willow red-under-wing moth (*phalæna pacta*) appears. Herrings (*clupea harengus*) are now cheap.

Third week: the ring ouzle (*turdus torquatus*) appears. The fly-catcher (*muscicapa atricapilla*) withdraws.

Fourth week: the stare (*sturnus vulgaris*) congregates. The wood-lark (*alauda arborea*) sings. The woodcock (*scolopax rusticola*), and fieldfare (*turdus pilaris*) appear; and the swallow (*hirundo rustica*) departs.

2. Kalendar of Vegetable Nature round London.

In the first week: the fungus, balotus albus appears, traveller's joy (*clematis alba*), and parnassia palustris in flower.

Second week: catkins of the hazel and birch formed; blossoms, and green, red, and black berries found on the bramble at the same time. Leaves of the sycamore, birch, lime, mountain-ash, and elm begin to change.

Third week: the ivy (*hedera helix*), laurel (*prunus laurocerasus*), and furze (*ulex europæus*) in flower.

Fourth week: hips, haws, and nuts ripe. Leaves of plane-tree (*platanus*) tawny; of the hazel, yellow; of the oak, yellowish-green; of the sycamore, dirty brown: of the maple, pale yellow; of the ash, fine lemon; of the elm, orange; of the hawthorn, tawny yellow; of the cherry, red; of the hornbeam, bright yellow; of the willow, hoary.

3. Kitchen Garden — Culinary Vegetables.

Sow (923.) small salads twice or thrice on a south border, chervil, corn-salad, cress of sorts may still be sown to stand over winter. (1387.) Radish in the first week, for a late autumn crop. (1329.) Lettuce in the first week for standing the winter under a south wall, and under cold frames. (1352.) Spinach in the first fortnight for use late in spring. (1330.)

Protect cucumbers and melons, at night, by matting or otherwise, as the case may be. (1020.)

Propagate (877.) as in April, culinary herbs and undershrubs.

Transplant (928.) all articles intended for use the current autumn, during the first week. The brassica tribe, leeks, celery, endive, &c. for winter and spring use. Seedling cauliflowers, where you think you can insure their standing through the winter. Try a bed of sandy loam or lime rubbish under a tree or south wall. (1308.) Make plantations of herbs.

Routine culture. Earth up and stir only in dry weather. Stick, stop, support, cut down, blanch, and thin where you see it necessary; no time is to be lost at this season.

Taking crops. (1032.) Take up potatoes, and do it *effectually*. Gather pickling cucumbers, onions, nasturtium seeds, and other pickling articles. Gather herbs and take ripe seed. Remove all decayed leaves, haulm, stems, &c. and the remains of all crops which have been taken, so as to preserve order and neatness, and make way for other crops or winter fallows. (1710.)

Destroy insects and vermin. (1030.)

Store-room and cellar. Dress, sort, and put up seeds which have been well dried. Finish housing edible bulbs of the alliaceous tribe and potatoes. (709.)

4. Hardy Fruit Department.

Plant (926.) strawberries for a main plantation, this being the best month in the year for that purpose. (1476.) Pot strawberries for forcing. (1277.)

Prepare ground for planting, and towards the end of the month, if the wood of young peach and apricot trees be ripe you may remove them.

Prune (950.) and regulate summer shoots, but cut little after the middle of the month. Thin leaves sparingly.

Routine culture. Provide composts for recruiting old borders and forming new ones. Protect choice fruit, especially grapes, from birds and flies. After the crops of wall-trees or quartering borders are gathered, dig and dress the borders. Dress and fork up strawberry-beds.

Take (1032.) peaches, grapes, early apples, pears, plums, &c. the desert sorts, with fruit-gatherer, and sorts for the kitchen, with the hand *gloved*. Chuse, if possible, dry weather for gathering all sorts of fruit.

Destroy insects, especially acarus, and guard against wasps and large blue flies. (1030.)

Fruit-room. (709.) Lay up apples and pears for keeping a few months; in general, the long keeping sorts ripen late in the season.

5. Culinary Hot-house Department.

Glass-case without artificial heat. Sow small salads under hand-glasses or frames in the last week. (1368.) Take off the glasses from cauliflower plants in all mild days.

Hot-beds and pits. Attend to late crops of melons and cucumbers; keep up the temperature and be discreet in the use of water. (1506.) Begin to build mushroom-beds, either in or out of doors. This month, and March, are the two best seasons. Plant suckers and crowns of pines on rotten tan placed on dung, or other fermenting beds or pits.

Pinery. (1116.) You will still have abundance of fruit; attend to what was said in July. Renovate your bark or leaf-beds when necessary, and keep up the full heat till your fruit is chiefly ripened off, or removed (pot and all), to the fruit-room to ripen leisurely. Your young plants will grow faster in this month than in any month of the year.

Forcing-houses. (1215.) Late crops of grapes will be coming in, but most of the forcing-houses will now be in a state of rest. Keep off all the sashes, unless you mean to force very early, in which case cover the house with mats from the sun, and admit air from the north, in order to promote a cool dry atmosphere as best for hybernation.

6. Flower-garden — Open Ground Department.

Sow the primula tribe, if not done last month. (1641. 1642.) The seeds of most biennials and perennials may be sown this month with advantage, provided you can afford protection to them in winter. On the whole, however, it appears better to defer the business till spring, unless with a few sorts which sometimes lie a whole year before they come up, when sown at that season. Among them may be enumerated columbine, agrimony, chelone, &c. If sown now their seeds will come up the following spring, and they will flower the same season. (1653.)

Propagate (877.) by all the modes, but more especially from slips, rooted or unrooted, the stalky part of herbaceous plants being now of a proper texture and maturity for this purpose.

Plant crocus and other bulbs, and such autumn flowering bulbs as you have neglected to plant early in spring. (1636.)

Transplant as in last month. (928.)

Shelter. (1020.) If the end of the month be wet, hoop and mat such plants as will be injured by over much wet. Among these are the primula tribe and tender annuals planted in groups over the borders; also bulbs, as the tuberose and Guernsey lily planted or plunged in the borders.

Routine culture. Prepare ground for florists' flowers. Trench and sift the earth where tulips and hyacinths are to be planted, at least three feet deep.

Store-room. See to roots and seeds. (709.)

7. Flower-garden — Hot-house Department.

Glass-case without artificial heat. (625.) Replace the more tender auriculas in the frames, but keep off the glasses, excepting when it rains.

Hot-beds. See last month. (626.) Most of the green-house and hot-house plants will now be advanced: remove them to cold frames, or to the green-house or dry-stove, according to their natures, to harden them gradually. Some may go directly to the stove.

Green-house. The beginning of this month is a fit time to repair, paint, glaze, and clean the flues, &c. of every description of house not in crop. Replace some of the more tender plants from the open air at the beginning, and the whole in the course of the last week of the month. Dress them properly and set them in natural groups, not in the usual method. See particularly (1595.).

Dry-stove. Replace all the succulents and other plants, which you had put in the open air, and arrange every part of your stage for the winter. If you cannot form natural groups, at least put every genus by itself. (1730.)

Bark, or moist-stove. Begin to lessen the stimuli towards the end of the month, in order to harden for the approaching winter. Plant bulbs which have been taken up and dried. Attend to routine culture. (1594.)

8. Pleasure-ground and Shrubbery.

Plant (926.) Evergreens generally; deciduous species in the last week.

Prune (950.) evergreens all the month; deciduous species when the leaves are dropped,

Routine culture as in last month. Remove all decaying flowers that do not bear ornamental seeds or berries. Dress and mow turf, and roll and clean gravel.

Form and repair lawns, or verges, or grassy glades. (860.)

9. Trees — Nursery Department.

Fruit-trees. (967.) Sow cherry and plum-stones for stocks, also peach and almond stones for the same purpose, or for new varieties. Gooseberry and currant cuttings may be planted in the last week of the month, in sheltered dry situations, where they will not be much damaged by alternate frosts and thaws in winter.

Transplant (928.) stocks from the seed-bed to the lines, where they are to remain to be grafted. Look to the budded and grafted trees. The matting may generally be removed early in the month.

Ornamental trees and shrubs. (1686.) Sow brier and other rose seeds. Plant cuttings of hardy evergreens. Take off layers of the sorts which have been laid two years, or which root well within one season. Plant cuttings of a few of the deciduous shrubs which are most hardy, or of tree currant, ivy, honeysuckle, yellow-berried elder, &c. Take off suckers and plant them in nursery-rows.

Forest-trees. Gather and sow all sorts of deciduous tree seeds. If you do not sow them, take them to the seed-loft, or rot-heap for preservation. Plant and prune evergreens, as also the wild cherry, birch, and sycamore. Gather seeds of all sorts now ripe. (1879.)

10. Trees — permanent Plantations and Park Scenery.

Thin woods and coppices; and where the trees are wanted, take them carefully up; if they are large, they should have been previously prepared a year ago. (1868.)

Plant (926.) deciduous trees, generally, and even the larch, spruce fir, and Scotch pine.

Prepare for planting by fencing and all the subsequent processes. (1802.)

Operate on ground, and recommence building walls or other works belonging to the department of landscape gardening.

OCTOBER.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.	REMARKS.
London -	52 81	4	29 69	2·027 inch.	Grapes and other late fruits ripen during this month, and some main culinary crops are gathered and housed. A few specimens of plants may still be collected, and many species of the animal kingdom. Not one animated being should be neglected from the worm upwards. Collections of spiders are best made during this month, and the young gardener may continue to dissect and study the pulpy fruits.
Edinburgh	49 7		29 339	3·234	
Dublin -	51		29 76	2·798	

1. Kalendar of Animated Nature round London.

In the first week: the red-wing (*turdus iliacus*) arrives. Snakes and vipers bury themselves.

Second week: hooded crows (*corvus cornix*), and wood-pigeons (*columba palumbus*), arrive; hen-chaffinches (*fringilla cœlebs*) congregate, and prepare for migration, leaving their males in this country.

Third week: the snipe (*scolopax gallinago*) appears in the meadows. Wild-geese (*anas sylvestris*) leave the fens, and go to the rye-lands.

Fourth week: the tortoise (*testudo græca*) begins to bury himself in the ground; and rooks visit their nest-trees. Some larks (*alauda*) sing, and the woodcock (*scolopax rusticola*) returns. Spiders' webs abound.

2. Kalendar of Vegetable Nature round London.

In the first week: strawberry-tree (*arbutus unedo*), holly (*ilex aquifolium*), China hollyhock (*alcea chinensis*), and China aster (*aster chinensis*), in bloom.

Second week: catkins of some species of salix formed; leaves of the asp almost all off; of the Spanish chestnut, yellow; of the sugar-maple (*acer saccharinum*) scarlet; of the common birch, yellow and gold; and of the weeping-birch, gold and bright-red coloured.

Third week: *clematis calycina* in flower. Some horse chestnuts and acacias quite denuded of leaves.

Fourth week: various plants, especially annuals, continue in flower. Leaves of marsh-elder (*sambucus ebulus*), of a fine pink; of stag's-horn sumach, of a purplish-red; of the American oaks, of fine shades of yellow, orange, red, and purple.

3. Kitchen Garden — Culinary Vegetables.

Sow (923.) small salads, lettuces, and radishes in the first week. If mild weather continues they will come in about Christmas. Mazagan beans, and hotspur or frame peas (1311.), in the third or last week, to see if they will stand the winter. (1312.)

To save seed. Transplant cabbage, savoy, beet, parsnip, carrot, turnip, bulbing and Welch onion. Mark what is said, 1303. and 1304. as to the danger of bastardy among the cruciferæ family. (1302.)

Protect all newly-risen annuals, and newly deposited seeds, as also parsley on the approach of frost. (1023.)

Propagate (877.) the alliaceous tribe and culinary perennials.

Transplant (928.) Endive and lettuce on warm borders, and cabbages in close rows or in beds, to remain in that state till wanted as plants in spring. Cauliflowers in the last week to receive the protection of frames. (1308.)

Routine culture. Earth-up and stir the surface only in fine dry weather. Hoe, rake, thin, weed, and dress off all beds of winter crops. Protect cauliflowers from heavy rains by breaking a large leaf and folding it over the flower. As crops are cleared, dig and trench the vacant ground.

Take up (1032.) potatoes, Jerusalem artichokes, beet, parsnip, salsafy, scorzenera, skirret, top-rooted parsley, and horse-radish of two summers growth. Preserve them in dry sand.

Destroy insects. (1030.)

Root cellar. See that this is perfectly dry, and that abundance of sand is laid over the roots.

Store-room. Finish cleaning and putting up seeds, and see that all you have, are in a good state, and not attacked by vermin. (709.)

4. Hardy Fruit Department.

Plant (926.) all sorts of hardy fruit-trees as soon as the leaves have dropped off, but not before, as some practice; for in this state neither their shoots nor roots are ripe. Give ample waterings after planting.

Protect (1020.) fig-trees as soon as their leaves have fallen. Shield late grapes from frost by matting. Immerse pots, containing plants intended to be forced, into dry old tan or ashes to save their roots from frost.

Prune (950.) all sorts of fruit-trees excepting the raspberry, elder, and fig, which being trees of much pith, or medulla, are apt to die back from the point of section-cut place, when pruned at this season, and are therefore better left till spring.

Routine culture. Prepare ground for new plantations. Dig and ridge up where the trees are already pruned. Winter-dress strawberry beds.

Take (1032.) grapes, apples, pears, and other fruits.

Fruit-room. (710.) Lay all fruits first here till thoroughly dried, and then barrel up the longest keepers, and remove them to the fruit-cellar.

5. Culinary Hot-house Department.

Glass-case without artificial heat. (625.) Plant lettuces and cauliflowers under frames, to stand the winter. Sow small salads in the second week, and last fortnight under frames or hand-glasses.

Hot-beds and pits. (626.) Keep up the declining heat of such beds as have not yet ripened off their crops. Dress those which have done bearing, and prick in lettuce or cauliflower plants. Prepare mint and other herbs for forcing, by putting them in pots or boxes. Get up mushroom-beds, if not done in September. Plant pine suckers in the open bed or pit, as they are taken off — cover well at nights. (1116.)

Pinery. This is a general time for shifting and renewing the bark-bed. Do not put the plants into very large pots, as they will not grow much in winter. Till the last week of the month your plants will grow rapidly. (1110.)

Forcing-houses (1215.) Prune, and in general cleanse and repair the houses and flues, mend broken glass, and paint the whole, when necessary. (1071.)

6. Flower-garden — Open Ground Department.

Sow (923.) annuals in pots, for prolongation, in cold frames and pits, and some of the hardier sorts in warm borders to come in early next spring, if the winter should prove mild. The sorts fit for this are larkspur, adonis, belvedere, pansey, persicaria, annual stock, and strawberry blite.

Propagate (877.), but chiefly at this season, by dividing the root, as of daiseys and other edging plants, irises, &c.

Plant most of the border bulbs about the end of this month; and you may even plant florists' anemones in properly prepared beds. (1657.)

Transplant (928.) biennials and perennials, in the flower nursery, to stand till the spring. Strong plants may be moved where they are finally to remain. (1659.)

Protect (1020.) auriculas, carnations, and other florists' flowers from heavy rains by mats and hoops, or glass frames. Begin at the end of the month to remove dahlia roots to be dried in an open shed, and then carried to the store-room.

Routine culture as in last month. Prepare composts. Stir the ground only in dry weather. If the season has been very dry, flower borders may be dug over about the end of the month. Attend, above all things, to neatness. Do not trust to any kalendar for directions on this in any point, but endeavour to bring your own brain into work; and try and look at your works with the eye of a critic and an enemy, or even of a stranger. (1071.)

7. Flower Garden — Hot-house Department.

Glass-case without artificial heat. (625.) Begin about the middle of the month to fill frames and pits with pots of mignionette, stocks, &c. for prolongation through the winter.

Hot-beds and pits. (626.) Roses which have been some time in a state of hybernation and in the shade, may now be put in bottom heat, as may hyacinths and some other bulbs. Water glasses may now be brought into use. Observe, in the first place, to plant the bulbs in earth for a week or fortnight, which will make them strike roots more freely, and then take them up and put them in the water-glasses. Force them forward a week or two in frames before you remove them to the drawing-room. Continue to plant some every fortnight for succession. (1657.)

Green-house. (1595.) Replace all your plants, if you have not already done so. All your winter's credit depends on the style in which you do this: give air night and day, unless the thermometer drop to 35 deg. Water sparingly. (1710. to 1723.)

Dry-stove. (1599.) Apply fires towards the end of the night, so as to keep a medium temperature with fire heat of 46 or 48 deg. Arrange the plants for the winter. Pot and set in bulbs of most sorts.

Bark, or moist stove. Lessen your temperature by degrees; and also your air and water. A good medium heat for this month will be 70 degrees, which will require fire heat, even if the bark bed is in full force. (1014. 1594.)

8. Pleasure-ground and Shrubbery.

Plant (926.) all the hardier trees and shrubs where the ground is not apt to be rendered very wet during winter: very delicate sorts leave till spring. This is the best season for planting.

Prune (950.) evergreens, but finish, if possible, the beginning of the month. Deciduous sorts as soon as the leaves fall.

Routine culture. Clear away all refuse, weeds, and decayed twigs or leaves. Roll, mow, sweep, hoe, weed, and remove moss and worm casts.

Form and repair lawns as before. (945.)

9. Trees — Nursery Department.

Fruit-trees. (951.) Sow for stocks as directed for last month. The plum, cherry, almond, medlar, apple, pear, quince, barberry, service-tree, walnut, filbert, and common hazel-nut, may now be sown to greater advantage than in spring, provided you can keep the vermin from them during winter. Lay the mulberry, or any other sort generally propagated in that way. Plant cuttings of elder, but it is rather too late for the ribes tribe. Remove raspberry suckers. Remove fruit-trees to their final situations, as soon as they have lost their leaves. This month, in all dry situations, is the best month in the year for transplanting fruit-trees.

Ornamental trees and shrubs. Sow the seeds of deciduous sorts. Lay deciduous sorts as their wood ripens. Plant out in nursery rows; shelter where requisite. (1561. 1595.)

Forest trees. Sow most sorts, as directed for last month; but take care to guard against vermin. Gather haws, sea and holly-berries, hips, &c. and take them to the rot heap. Lay and propagate by cuttings some of the timber-growing willows and poplars. Plant and prune in the nursery lines as required. (1879. to 1891:)

10. Trees — permanent Plantations and Park Scenery.

Plant (926.) generally as long as the weather is mild: but prefer the spring for very wet, late, bleak situations. (1813.)

Thin, prune, and fell generally, but do not fell barking-trees, or remove thinnings of the oak, larch, &c. so large as to be worth barking.

Prepare for planting, as directed for last month. This is a very fit season for draining, which may be continued in all weathers, when men can work out of doors, till the planting season returns. In this way the men may be kept on without loss either to themselves or you. (1802.)

Operations on ground should now be carried on vigorously; but buildings should be completed, if possible, by the end of the month.

NOVEMBER.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.	REMARKS.
London -	44 44	4	29 68	2·527 inch.	This is the "*windy month*" of the Saxons; it is generally also cold and moist, and one of the most disagreeable for the labouring gardener, but he may console himself with the shortness of the day, and hail the approach of evening, when he may lay aside his wet dress and fortify his mind by converse with books. Roots, fruits, seeds, dried herbs, and insects require looking over, and protecting from damps.
Edinburgh	41 1		29 638	4·514	
Dublin -	43		29 74	0·394	

1. Kalendar of Animated Nature round London.

In the first week: the buck (*cervus caprilus*) grunts.

Second week: the golden plover (*charadrius pluvialis*) appears.

Third week: snails (*limax*), and slugs (*helix*), bury themselves.

Fourth week: greenfinches (*fringillis montifringilla*) flock. The winter moth (*geometra brumaria. Sam.*), and the common flat-body moth (*geometra applana. Sam.*), appear in gardens about the end of the month.

2. Kalendar of Vegetable Nature round London.

In the first week: a few plants in flower, by accident, chiefly annuals, according to the season.

Second week: the fungus (*helvella mitra*), appears. Laurustinus in flower.

Third week; *calycanthus præcox* in flower.

Fourth week: some primroses shew flowers at this season; and some plants, unnaturally in flower, still continue if the weather is temperate.

3. Kitchen Garden — Culinary Vegetables.

Sow (923.) short-topt radishes on a warm border for the chance of obtaining an early spring crop. (1329.) Beans and peas as directed for last month. (1311. 1312.)

Protect (1020.) celery, endive, artichoke, sea-kale, potatoes left in the ground to be taken up as wanted, and any other outstanding, edible roots by litter or leaves. Radishes, and parsley with fronds of fern. Cauliflowers, by hoops and mats.

Propagate (877.) perennial herbs, if not done last month.

Transplant (928.) any thing you have omitted in October.

Routine culture. All operations on the earth, excepting digging and trenching must be performed only in fine dry weather. Dress artichoke and asparagus beds. Take up endive, brocoli, and cauliflower, and lay them flat in dry ground, or in some of the ways described. (1071.) Guard against the damping off of cauliflower plants, and weed all seedling crops. Dig, trench, and manure.

Take up all edible roots, which you intend to preserve, and remove them to the root-cellar.

Destroy (1050.) insects, and particularly snails, at this season.

Root-cellar. (1010.) Keep out the frost, if it sets in severe; and equally so water, from above or below.

Store or seed-room. (709.) Turn over edible roots kept in the dry, as the alliaceous tribe, and pick out decaying bulbs. See to your seeds.

Ice-house. (722.) Fill the ice-house, if the frost is sufficiently strong.

4. Hardy Fruit Department.

Plant (926.) all sorts of fruit-trees, as directed for last month. Choose dry weather. Water to settle the earth. Stake where required, and mulch (944.) both root and stem, where you wish the trees to do well. Mulching the stem is particularly useful for very tall standards, and especially for the pithy-wooded sorts.

Prune (950.) the vine and other very hardy fruit-trees; the apricot, peach, and nectarine had better be deferred till spring.

Routine culture. Dig and dress wherever pruning admits; or where you have not been able to overtake the work last month.

Take (1032.) such apples and pears as still remain on the trees during the first week; dry them well in the fruit-room, and then barrel or jar up the long-keeping sorts for the cellar.

Fruit-room. (709.) Examine such bunches of grapes, and shoots of plums, and currants, as you have hung up to preserve the fruit; and pick off all decaying berries. Look over all the other fruits, and attend to medlars, quinces, &c.

5. Culinary Hot-house Department.

Glass-case without artificial heat. (625.) Sow small salads, and peas and beans, either to transplant or to remain after moving the frames. Transplant lettuces and cauliflowers from frames to be covered with hand-glasses. Attend to air and removing decaying leaves.

Hot-beds and pits. (626.) Sow small salads, force mint, and other herbs. Try sowing of radishes on a moderate hot-bed. Transplant lettuces from the cold frames to force them forward. Begin to force asparagus six weeks before the expected demand. Build mushroom-beds: if under cover, it will be better.

Pinery. (1116.) Moderate every stimulus to vegetation: because for the proper well-being of plants, it is proper they should all go on in harmony. Heat, air, and water, art can supply; but light, in any thing like adequate quantities for vegetation, is beyond the power of man: therefore let your heat, air, and water be in a proportion to your light.

Forcing-houses. Some begin this month; if so, pursue the usual course. Dig and dress the borders; prune, train, paint, and cleanse the house, &c. if not done last month, which is much the best time. (1215.) Set in strawberries. (1277.)

6. Flower-garden — Open Ground Department.

Plant (926.) dried roots of border-flowers. (1654.)

Transplant (928.) biennials at the beginning of the month, if the weather is very fine: but this work is better deferred till spring. (1655. 1657.)

Protect (1020.) tender roots by litter, leaves, tan, ashes, or landing-up trees by mats, or straw covered with mats or nets. Take care of seedlings.

Routine culture. Collect earths, composts, and manures; and, in general, finish digging among herbaceous flowers by the middle of the month. Asters, and such-like plants are often only checked in their growth and flowering by the frosts and rains; attend to them, as they are apt to be blown about, and be disfigured at this season. In cutting them over after the ground is dug, choose a dry day, and obliterate the prints of your feet with a fork. Mow, as occasion requires.

Store-room. (709.) Look at such bulbs as you are keeping for spring planting.

Bees. (736.) See that these are properly protected by straw covers, or by being placed in the bee-house.

7. Flower-garden — Hot-house Department.

Glass-case without artificial heat. (625.) Take care of alpines and the primula tribe. Also of the annuals and perennials intended for forcing. Guard against damps by admitting air; and to do this effectually always remove the sashes in the daytime; or, if the frames in front of stoves do not admit of this, tilt or elevate them in front, as high at least as the plane of the sun's rays at noon.

Hot-beds and pits. (626.) Go on forcing all manner of flowering-shrubs, bulbs, and perennial plants, and take in now and then a few pots of mignionette to keep up a constant supply in full flower for the drawing-room. Blow Dutch roots in water-glasses, as before.

Green-house. (1595.) Medium temperature, with fire-heat, 42 deg., maximum 44 deg. Water sparingly; give air as the weather will permit; and see to neatness. Encourage mouldiness on the surface of the pots, also weeds and decayed leaves: these being great ornaments at this season, and highly useful for the plants.

Dry-stove. (1599.) Minimum temperature, with fire-heat, 45 degrees, maximum 50 degrees. Succulents require very little water at any time, but especially at this season.

Bark or moist-stove. (1594.) Your medium temperature may now be 65 degrees, or less; but never exceeding a minimum of 55 degrees, and a maximum of 75 degrees. Lessen water and air, as light and heat are lessened. See that bulbs receive proper treatment, as these will produce your finest spring-flowers, especially the crinums and amaryllideæ.

8. Pleasure-ground and Shrubbery.

Plant (926.) deciduous trees, and shrubs of the hardier kinds so long as the weather continues dry.

Prune and cut hedges. (1881.)

Protect delicate American trees, as magnolia, and shrubs not yet fully acclimated, as the Chinese rose. Roll, mow, and sweep turf. Attend to falling leaves. (1020.)

Turf may still be laid, but it is now too late to form or repair lawns by sowing grass-seeds. (945.)

Prepare for planting by levelling, digging, trenching, &c. (1802.)

9. Trees — Nursery Department.

Fruit-trees. (951.) Plant only in mild and rather dry weather; mulch, water to settle the earth about the roots, and stake as circumstances require. Forward delayed work as to fruit-trees, for, after the middle of the month, it is better not to touch them till February.

Ornamental trees and shrubs. Complete what should have been done last month, as to planting, laying, taking off layers &c. (1682.) Prune the more hardy sorts in the lines, and protect such as are tender by the usual means.

Forest-trees. Finish sowing the larger seeds before severe weather sets in. Complete all other nursery operations for the season, if possible. Pruning the plants in lines may be the last operation. Gather cones, acorns, mast, nuts, keys, and berries for immediate sowings, or the loft, or rot-heap, according to their natures, and your skill and circumstances. (1883. to 1891.)

10. Trees — permanent Plantations and Park Scenery.

Plant, in all temperate weather, and moderately dry situations. (926.)

Thin, fell, and prune deciduous trees, as in last month. Cut, and plash, and repair hedges; and more especially the hawthorn kind. (1829.)

Dead fences of every description, excepting mortar walls, may now be attended to; but avoid building in December and January, even the simplest wall. Frost is certain at this season, and its effects equally so.

Operate on ground, water, rocks, woods, and timber erections; but by no means on buildings where mortar is used.

DECEMBER.

Weather at	Average of the Thermometer.	Greatest Variation from the Average.	Average of the Barometer.	Quantity of Rain.	REMARKS.
London -	41 4	3	29 64	1·124 inch.	*Winter month, Sax.* Cold but dry. The gardeners operations are chiefly of the laborious kind; but the days are short and the nights long. In the last week the young gardener should examine himself as to his professional and intellectual progress during the bye-past year. If he contents himself with merely excelling his fellows, he is lost; — let him aspire at rendering himself respectable among good and scientific men.
Edinburgh	38 9		29 66	2·596	
Dublin -	38 34		29 725	2·916	

1. Kalendar of Animated Nature round London.

The moles (*talpa europea*) throws up hillocks. The December moth (*eriogaster populi. Sam.*) appears about the beginning, and the yellow-line quaker (*noctua flavilinea. Sam.*), about the end of the month.

2. Kalendar of Vegetable Nature round London.

Some of the last month's plants continue in flower, according to the weather.

3. Kitchen Garden — Culinary Vegetables.

Sow (923.) peas and beans, and a few radishes (1329.), as for last month. Choose the very mildest weather, and consider the final result as extremely uncertain.

Protect (1020.) beans sown thick for transplanting, and parsley intended for daily use, with fern; celery, with litter; any plants with litter which you have not been able to land-up, as artichokes, asparagus.

To save seed. Transplant cabbages, if you have neglected it till so unfit a season.

Routine culture. Attend to this only in the best weather, and chiefly in the middle of the day. Earth up peas and beans, or cover their stems with ashes, saw-dust, or old tan. Earth up celery when dry. Tie up any endive, cardoons, and white beet which has been neglected. Weed, but do not depend on the hoe, and only attempt to stir dry grounds; as stirring clayey lands at this season will do much more harm than good.

Take up edible roots and full-grown vegetables with esculent leaves, as the borecoles, and plant the latter in sand in an open shed for daily use.

Destroy (1030.) slugs, snails, mice, and other vermin.

Root-cellar, seed, and store-room. (709. 710.) See that these, and what they contain, be kept in perfect order.

Ice-house. (722.) Fill this, if not done last month.

4. Hardy Fruit Department.

Plant (926.) the hardier trees, as the apple, pear, gooseberry, currant, &c. in mild weather. (1490.)

Prune as directed for last month; but remit the operation in severe weather. (950.) Partially unnail or untie trained trees, and wash their boughs and shoots as well as the walls and trellises with any glutinous bitter fluid.

Routine culture. Trench, dig, and ridge up the soil, but only in dry weather. Turn over composts, dung, and earth heaps. Prepare borders and orchards, &c. for planting in spring. Recruit exhausted soils by the application or partial substitution of such as is fresh and rich.

Destroy the larvæ of moths and every description of garden enemies, by usual or unusual means.

Fruit-room. Look over the loose fruit every ten or twelve days.

Fruit-cellar. Keep this close to retain an even low temperature, never under 32 nor over 40 deg., till May, the earliest period when it should be opened. (710.)

5. Culinary Hot-house Department.

Glass-case without artificial heat. (625.) Sow small salads, radishes and lettuce; if the weather proves mild they may do some good. Weed, take off decayed leaves, and give abundance of air in dry weather. Protect, in severe frosts, by mats or litter.

Hot-beds and pits. (626.) Begin to force asparagus, sow small salads, and transplant lettuce to be forced forward. Use the transplanter, in order that no check may be given or any occasion for watering produced. Prepare cucumber beds; or, if you have begun, see to them. Light is the grand thing to be attended to, for heat, air, water, and earth, you can command at pleasure. Force mint, attend to mushrooms and compost making; procuring earths, manures, &c. Cover up at nights with all care; but avoid damps, by always giving a little air on fine days, and all night, when there is danger of steam of dung.

Pinery. (1116.) Keep a steady heat; but little air or water will be wanting, excepting to the kidney beans and strawberries which you set in last month.

Forcing-houses. (1215.) Go on with the routine culture, for houses which you have begun to force; and dig and prepare the borders of the others, but it is too late for pruning or repairs.

6. Flower-garden — Open Ground Department.

Protect (1020.) as directed for last month, and be liberal in the use of ashes, rotten tan, litter, &c. to the roots of the more tender plants; as to beds of florists' bulbs, tender and half hardy shrubs, as China roses, hydrangeas, &c. where such plants can be ventured in the borders.

Routine Culture. Prepare composts, manures, and simple soils, and turn them over frequently. Much of the value of all composts and soils, at least for the florist, depends on their being sweet and mellow, which is only to be attained by time and frequent turnings. Attend to neatness in the application of litter, ashes, and other protecting materials.

Store-room. See that the frost is completely excluded. (709. 710.)

7. Flower-garden — Hot-house Department.

Glass-case without artificial heat. (625.) Attend to alpines, and florists' flowers in frames; also to annuals, as directed for last month.

Hot-beds and pits. (626.) Go on forcing shrubs and flowers, and blowing bulbs in water; renovate by linings, where necessary. If you have begun in October to force roses, you will have them, as well as bulbs, in blow by the middle of the month. See to bulbs in water-glasses, and take care to keep up a succession of roses, bulbs, and most popular forcing-flowers and shrubs. (1619. 1626.)

Green-house. (1595.) Minimum temperature 42 degrees, maximum 44 degrees, with fire-heat. Water sparingly; give air freely in good weather, and remove decayed leaves as they appear.

Dry-stove. (1597.) Minimum temperature for this month 45 degrees, maximum, with fire-heat, 50 degrees. The more severe the weather out of doors, give less water within; but give air freely in fine weather.

Bark, or moist-stove. (1594.) Keep a medium heat of 55 degrees or 58 degrees, and lessen water and air. Attend to routine culture; but the grand thing at this season is, to keep the fire-heat as regular as possible; for the ratio of increase of heat from flues after they are heated to a certain extent, is such as often to overheat the house, and scorch or desiccate the plants: hence, in our opinion, one of the many advantages of adopting steam, by which the pipes can never be heated much above 200 degrees.

8. Pleasure-ground and Shrubbery.

Plant as in last month. (926.)

Prune (950.) in fine weather.

Protect as before. (1020.)

Routine culture. Rake up leaves, and sweep them from the lawns and gravel. Repair walks, and roll them; see that water stand on no part of their surface.

Lay down turf, if you cannot help it; but this is not a good season; September and March are the best. (861. 862.)

Prepare for planting by trenching, digging, &c. (797.) Rods and poles for tying up plants, and for twiners, spray, or sticks for sticking climbers, as the sweet-pea, &c. (980.)

9. Trees — Nursery Department.

Fruit-trees. (951.) Complete neglected work as far as weather will permit; but if the season is severe, defer it till February. Prepare talleys, &c.

Ornamental trees and shrubs. (1682.) Finish delayed work, and attend to protecting tender sorts. See to the seeds in store, and prune only in very fine weather. Prepare talleys, labels, sticks, stakes, poles, rods, spray, fronds, and other materials of culture and management. Collect composts, earths and manures, and turn over those you have got, so as the frost may thoroughly penetrate them.

Forest-trees. (1880.) Attend to the rot-heap, seed-loft, and compost-ground; and plant, or take up, or prune only in fine weather: much depends on the season, and other circumstances. (4891.)

10. Trees — permanent Plantations and Park Scenery.

Plant (926.) only in fine weather, unless thorn-hedges; or large trees of common sorts, with balls of earth.

Fell and prune (1829.), where the trees are not for transplanting, nor of the barking sorts.

Thin out for coppice-wood or poles, stakes, &c. (1846.)

Prepare for planting by the usual processes, and by fencing and draining. (1802.)

Operate on ground and rocks, but not on buildings.

GENERAL INDEX.

N. B. *The Numbers refer to the Paragraphs, not to the Pages. Abbreviations; H. Hardy, F. Frame, G. Green-house, D. S. Dry-stove, S. Stove, i. e. Bark-stove, Peren. Perennial, Bien. Biennial, An. Annual, C. B. S. Native of the Cape of Good Hope, Austral. Native of Australasia, N. S. W. New South Wales, N. Holl. New Holland, V. Diem. Van Diemen's Island, W. Ind. West Indies, E. Ind. East Indies, S. Eur. South of Europe, N. Eur. North of Europe, S. Amer. South America, N. Amer. North America, Mex. Mexico, &c. See as an example of the mode of applying these Abbreviations, article Abroma.*

ABLACTATION, (*ablactatio*, to wean,) grafting in such a way as to wean the scion by degrees from the stock; that is, inarching, 889.

Ablaqueation, (*ablaqueo, as*, to lay bare,) the laying bare the bottom of the stem, and the principal roots of fruit-trees, in order to render them more fruitful, 982.

Abermarlais, a seat in Caermarthenshire, 2217.

Aberdeenshire, gardens of, 2239.

Aberdeen nursery, 2239.

Abercrombie, John, a British writer on gardening, 2283. A. D. 1766.

Abroma, polyadel. decan. and malvaceæ, S. tr. E. Ind. and N. S. W., (that is, Bark-stove trees natives of the East Indies and New South Wales,) which grow freely in common garden soil, and are propagated readily by seeds and cuttings. For the general culture of bark-stove plants, — see Bark-stove.

Abrus, wild liquorice, diadel. decand. and leguminoseæ, a S. tr. Jamaica, which grows in loam and peat, and is raised by cuttings, planted in sand, and plunged in the tan-bed, under a hand-glass.

Abele tree, populus alba.

Acacia, polyg. monœc. and leguminoseæ, S. tr. and G. tr. Austral. E. Ind. and C. B. S., which grow in loam peat and sand, and are propagated by cuttings taken off in the young wood, and planted in sand under a bell-glass, and in bottom heat. Most kinds may also be propagated by large cuttings of the roots similarly treated. The H. tr. grow in similar soil, and propagate in the same manner, or by seeds.

Acæna, dian. monog. and rosaceæ, G. peren. C. B. S. and Austral., which grow well in loam and peat, and cuttings taken off at a joint, root freely under a hand-glass. The H. peren. will grow in common garden soil, and are continued by cuttings.

Acalypha, monœc. monad. and euphorbiaceæ, S. and H. an. E. Ind. and N. Amer., the S. an. should be sown in pots in a hot-bed, and the H. an. in the open garden. The soil for both, loam and rotten dung, or leaf mould.

Acanthus, bear's breech, didyn. angios. and acanthaceæ, a S. tr. E. Ind. and H. peren. Eur. Both grow in common soil, and divide readily at the root.

Acarna, syngen. polyg. æqual. and cynarocephaleæ, a H. peren. and H. an. S. Eur. Both thrive well in common soil, and propagate by the usual means.

Acer, maple, polygam. monœc. and acereæ, H. tr. Eur. and N. Amer., which grow in any soil, and propagate by layers or seeds, and some species by cuttings.

Acer, pseudo-platanus, and platanoides, the common and other maples, 1921 and 1922.

Aceras, gynan. monan. and orchideæ, a H. peren. Eng. which thrives best in light loam and chalk, and is only to be raised by seeds.

Achania, monad. polyan. and malvaceæ, S. tr. Jamaica, which grow in common soil, or in loam and peat, and cuttings root in sand under a hand-glass.

Achillea, milfoil, syngen. polyg. equal. and corymbifereæ, H. peren. Eur., which grow in common soil, and are readily increased by dividing at the root.

Achras, sapota, pentan. monog. and sapoteæ, S. tr. Amer. requiring a rich, loamy soil, and cuttings root in sand under a hand-glass.

Achyranthes, pentan. monog. and amaranthaceæ. The S. and G. tr. India, thrive in any rich soil, and cuttings root freely. The an. species should be sown in a hot-bed.

Acidoton, monœc. polyan. and euphorbiaceæ, a S. tr. Jamaica, which will grow in loam and peat, and may be in-

creased by cuttings in sand under a bell-glass.
Acisanthera, decan. monog. and salicareæ, a S. tr. Jamaica, which may be treated like *acidoton*.
Acmella, syngen. polyg. frustran. and corymbiferæ, the S. and S. Amer. an. should be sown on a hot-bed, and the H. an. in the open garden.
Acnida, virginian hemp. diœc. pentan. and chenopodeæ, a H. an. N. Amer., to be treated as such, — see 1662.
Aconitum, wolf's bane, polyan. trig. and ranunculaceæ, H. peren. S. Eur. of common culture, — see 1656.
Acorus, hexan. monog. and aroideæ, H. peren. Brit. and China, marsh plants of easy culture, — see 1670.
Acrostichum, cryptog. filices, and filiceæ, ferns; S. and G. peren. E. and W. Ind. which grow in loam and peat, and are increased by seed or dividing the root.
Acrostichum calomelanos, 1775.
Actæa, polyand. monog. and ranunculaceæ, H. peren. Brit. and N. Amer. of common culture, — see 1656.
Actinocarpus, hexan. polyg. and alismaceæ, G. and H. peren. N. S. W. and Eng. aquatics, which will only thrive in water, and propagate by seeds.
Acynos, didyn. gymnos. and labiateæ, H. bien. and an. Eur. of easy culture, — see 1660. 1662.
Acosta, a Spanish naturalist, 17, 1481.
Accelerating vegetation, operations for, 497.
Achard, professor Francis, 403; his works on gardening, 2283. A. D. 1798.
Acarus tellarius, or red spider, 496. to destroy in the different departments of gardening, —see these departments; in hot-houses, by washing the flues with lime and sulphur, 1625.
Acetarious plants, 1301. 1352.
Accompaniments of landscape, 1996.
Adansonia, sour-gourd. monadel. polyan. and malvaceæ, a S. tr. Senegal, which grows best in rich loam, and cuttings strike in sand, plunged in heat under a hand-glass.
Adelia, diœc. monad. and euphorbiaceæ, a S. tr. Jamaica, which may be treated like adansonia.
Adenandra, pentan. monog. and diosmeæ, G. tr. C. B. S. which grow in sandy peat, and the young tender tops made into cuttings, and planted in sand, will root under a bell-glass without bottom heat.
Adenanthera, decan. monog. and leguminoseæ, S. tr. E. Ind. which grow in loam and peat, and large cuttings with the leaves not shortened, will root in a pot of sand plunged in heat under a hand-glass.
Adiantum, maidenhair, cryptog. filices, and filiceæ, G. and H. peren. Madeira and Brit. ferns, which grow well in loam and peat, and propagate by dividing the root or by seed.
Adina, tetran. monog. and globulariæ, a S. tr. China, of easy culture in loam and peat, — see 1737.
Adonis, polyan. polyg. and ranunculaceæ, a H. peren. and H. an. Eur. of easy culture in common soil, — see 1656 and 1662.
Adoxa, octan. tetrag. and saxifrageæ, a H. peren. Brit. a diminutive plant, which does well in pots in common soil.
Adanson, Michael, a celebrated French botanist, who died in the beginning of the present century, 113. 164. 629.
Adams' needle, — see Yucca.
Adder's tongue, — see Ophioglossum.
Adrianople, gardens of, 103.
Addison, Joseph, 107, as a British writer on gardening, 2283. A. D. 1712.
Addington Place, Surrey, 2140.
Adam's Lodge, of London, a fraternity of gardeners, some account of, 2293.
Adam's Lodge of Aberdeen, 2294.
Ægilops, hard-grass, polygam. monœc. and gramineæ, H. peren. and an. Eur. of common culture, 1656 and 1662.
Ægiphila, tetran. monog. and verbenaceæ, S. tr. W. Ind. which thrive well in light loam, and cuttings root freely under a hand-glass in heat.
Ægle, Bengal quince, polyan. monog. and aurantieæ, a S. tr. E. Ind. which requires a rich loam, and is propagated by ripened cuttings planted in sand, without shortening the leaves, and plunged under a hand-glass in heat.
Ægopodium, goutweed. pentan. dig. and umbelliferæ, H. peren. Brit. of the easiest culture, 1656.
Aerides, air-plant, gynan. monan. and orchideæ, S. peren. China, parasites, which may be hung up in a basket of moss or pieces of bark, or fixed by moss and bandages to the trunk or bark of a tree, — see the Hon. Mr. Herbert's treatment detailed, 1754.
Ærua, pentan. monog. and amaranthaceæ, a S. tr. and S. bien. W. Ind. which grow well in rich, light earth, and cuttings strike freely.
Æschynomene, diadel. decan. and leguminoseæ, a S. tr. W. Ind. which requires rich loam, a good deal of heat, and is propagated by cuttings under a bell-glass in bottom heat. The S. an. and H. an. India and Amer. may be treated in the usual manner, 1749 and 1664.
Æsculus, horse-chestnut, heptan. monog. and acereæ, H. tr. Asia and N. Amer. which prefer light, deep soil, and sheltered situations, and are propagated by seeds or layers.
——— hippo-castanum, the common horse-chestnut, 1937.

Æthionema, tetrad. silic. and cruciferæ, a H. bien. and H. an. S. Eur. of common culture, 1660 and 1662.

Æthusa, fool's parsley, pentan. dig. and umbelliferæ, a H. peren. and H. an. Brit. of common culture, 1655 and 1662.

African almond, brabejum stellulifolium.

——— flea-bane, tarchonanthus camphoratea.

——— lily, — see Agapanthus.

——— marygold, tagetes erecta.

Affaiti, Casimiro, his books on gardening, 2286. A. D. 1787.

Agapanthus, African lily, hexan. monog. and hemerocallideæ, G. peren. C. B. S. which thrive in loam and a little rotten dung, and are propagated by dividing the root, or by seed.

Agathosma, pentan. monog. and diosmeæ, G. tr. C. B. S. soil, a sandy peat; propagated by cuttings in sand under a bell-glass, but not plunged in heat.

Agave, hexan. monog. and bromelleæ, D. S. and G. tr. and peren. S. and N. Amer. soil, a rich loam; propagated by suckers.

Ageratum, syngen. polyg. æqual. and corymbiferæ, G. tr. requiring a light, rich soil; propagated by cuttings under a hand-glass. The H. an. as in 1662.

Agrimonia, agrimony, dodecan. dig. and rosaceæ, H. peren. Eur. and N. Amer. of easy culture, 1656.

Agrostemma, rose campion, decan. pentag. and caryophylleæ, H. peren. and an. of common culture, 1656 and 1662.

Agrostis, bent-grass, trian. dig. and gramineæ, a S. peren. E. Ind. and H. peren. and an. Eur. of the easiest culture.

Agaricus campestris, garden mushroom. See this and various other species of agaricus described, 1417. Culture of the garden mushroom, 1288; what spawn is, 1289; where indigenous spawn may be collected, 1290; procuring spawn artificially, 1291; preserving spawn, 1291; propagating, 1292; methods of raising mushrooms, 1293; ridges in the open air, 1293; preparing the dung, 1293; forming the bed, 1294; moulding, planting, covering the bed, 1294; culture on shelves, in the German manner, as introduced by Mr. Oldacre, 1295; compost, 1295; making, spawning, earthing, subsequent treatment, 1295; renovating old beds, 1295; growing mushrooms in pots, boxes, &c. with dung, 1296; without dung, 1297; culture in melon beds, 1298; in old hot-beds, 1299; in pits in dark frames; — in a cellar, 1299; general details, 1300.

Agrimony, — see Agrimonia.

Agrumi, bitter fruits, especially the orange tribe, 1501.

Agr. Chem. Davy's Agricultural Chemistry.

Agricola, Dr. George Andrew, 50; his works on gardening, 2285. A. D. 170.

Aghinuas, a seat in Tyrone, 2277.

Ailanthus, polyg. monœc. and terebintaceæ, a S. tr. and H. tr. E. Ind. which grow in common soil, and are propagated by cuttings of the roots.

Aira, hair-grass, trian. dig. and gramineæ, H. peren. and an. Eur. of the easiest culture.

Aitonia, monad. octan. and meliaceæ, G. tr. an. C. B. S. soil, sandy loam and peat; propagated by cuttings of young wood, in sand, under a bell-glass, and plunged in heat. Avoid planting too close, and wipe the glass frequently, as they are apt to damp off.

Aizoon, icos. di-pentag. and ficoideæ, a G. tr. an. and bien. C. B. S. and S. Eur. succulents, which grow in lime rubbish, and propagate readily.

Ajuga, bugle, didyn. gymnos. and labiateæ. H. peren. Eur. of common culture.

Air, its nature and properties, 608. 632.

Airthrie-castle, near Stirling, 114.

Aiton, William Townsend, Esq. a British writer on gardening, 2283. A. D. 1810.

Aiton, John Townsend, Esq. a British writer on gardening, 2283. A. D. 1818.

Aimsfield, a seat in East Lothian, 2219.

Airshire, gardens of, 2227.

Air-plant, — see Aërides.

Akee-tree, blighia sapida.

Alangium, polyan. monog. and myrtiaceæ, a S. tr. E. Ind. soil, loam and peat; propagated by cuttings, in sand, under a hand-glass in heat.

Alamanni, Louigi, his works on gardening, 2286. A. D. 1546.

Albonico, J. H. his works on gardening, 2284. A. D. 17[illegible]5.

Albuca, hexan. monog. and asphodeleæ, G. peren. C. B. S. bulbs; soil, light, sandy loam, and vegetable mould; propagation by offsets; or by leàves taken off with a scale of the bulb and carefully planted.

Alchemilla, ladies' mantle, tetran. monog. and rosaceæ, H. peren. and an an. Eur. of common culture, 1656 and 1662.

Alcina, syngen. polyg. necess. and corymbiferæ, a G. an. Mexico, of easy culture, 1664.

Aldbury place, Surrey, 2140.

Aldea, pentan. monog. and boragineæ, a H. peren. Magellan, of common culture, 1656.

Alderley-park, Cheshire, 2193.

Aldworth-hall, Yorkshire, 2185.

Aletris, hexan. monog. and hemerocallideæ, H. peren. N. Amer. requiring a peat soil and shady situation, and propagated by offsets from the roots.

Aleurites, monœc. monad. and euphorbiaceæ, a S. tr. Society Isles; soil, a rich loam; ripe cuttings with their leaves on, strike in sand, under a hand glass.

Alisma, water plantain, hexan. polyg. and alismaceæ, H. peren. marsh plants, and aquatics of easy culture, 1670.

Alison, the Rev. A. his analysis of the principles of design, 1951.

Allamanda, pentan. monog. and apocyneæ, a S. tr. Guiana; soil, a rich loam; cuttings strike freely in moist peat.

Allantodia, cryptogam. filices, and filiceæ, a G. peren. Madeira; a fern; soil, loam and peat, and propagation by dividing the root or seed.

Allerton Manleverer, a seat in Yorkshire, 2185.

Allionia, tetran. monog. and nyctagineæ, H. peren. N. Amer. which grow in common soil, and cuttings root readily under a hand-glass.

Allium, garlic. hexan. monog. and asphodeleæ, H. peren. and bien. Eur. bulbs of easy culture, 1658.

Allium cepa, the common onion, 1336.

——— porrum, the leek, 1337.

——— schœnoprasum, the chive, 1338.

——— sativum, the garlic, 1339.

——— ascalonicum, the shallot, 1340.

——— scorodoprasum, the rocambole, 1341.

Alliaceous plants, 1301. 1336.

Alnus, alder, monœc. tetran. and amentaceæ, the alder, H. tr. Eur. and N. Amer. of common culture, propagated by seeds, 1890.

——— glutinosa, the common alder.

Alkmaar, the town of, in Holland, famous for its tulips, 44.

Aloe, hexan. monog. and hemerocallideæ, D. S. and G. tr. and peren. C. B. S. which grow best in sandy loam, with lime rubbish or gravel, and little water, and are propagated by suckers, or leaves stripped off, and planted shallow in, or laid on the surface of a pot of mould.

Alonsoa, didyn. angios. and solaneæ, G. tr. S. Amer. which grow in rich, light soil, and are increased by seeds or cuttings.

Alopecurus, foxtail-grass, trian. dig. and gramineæ, H. peren. and an. Jamaica and Eur. grasses of the easiest culture.

Aloysia, didyn. angios. and verbenaceæ, a G. tr. Chili, which grows in light, rich soil, and increases by cuttings.

Alpinia, monan. monog. and scitamineæ, S. per. W. and E. Ind. reedy or marsh hot-house plants of common culture, 1752.

Alstrœmeria, hexan. monog. and asphodeleæ, S. and G. peren. S. Amer. which thrive in sandy loam, and peat or vegetable earth, and increase by seeds or dividing the root. A. ligtu is difficult to flower, unless the roots are put into a state of rest by withholding water till the shoots are quite dried up; then give a good watering, and put it in a moist heat, and it will flower abundantly. *Sweet.*

Alstrœmeria salsilla, the edible alstrœmeria, 1540.

Alston-grove, Nottinghamshire, 2179.

Altenburg, Pomological Society of, their annals, 2285. A. D. 1810.

Althorpe, Northamptonshire, 107; described, 2183.

Alternanthera, pentan. monog. and amaranthaceæ, a S. peren. S. bien. and G. peren. E. Ind. and S. Amer. soil, light and rich, and cuttings root freely in the shade.

Althæa, marsh mallow, monad. polyan. and malvaceæ, S. peren. and bien. and H. peren. tr. and an. all of common culture.

Alyssum, madwort, tetrad. silicu, and cruciferæ, a F. tr. and H. tr. peren. and an. Eur. of easy culture in common soil, and readily increased by cuttings.

Alcoves, 766, — see Edifices.

Alcazar, a palace and gardens in Spain, 98.

Alaternus, rhamnus alaternus.

Alder, — see Alnus.

Alexanders, — see Smyrium.

Alexandrian laurel, ruscus racemosus.

Alligator pear, laurus persea.

Allseed, polycarpon tetraphyllum.

Allspice, — see Calycanthus.

Allspice-tree, myrtus pimenta.

Almond, — see Amygdalus.

Althæa frutex, hibiscus syriacus.

Amaranthus, amaranth, monœc. pentan. and amaranthaceæ, a S. an. and H. an. As. Amer. Eur. of common culture, 1749 and 1662.

Amaryllis, hexan. monag. and amaryllideæ, S. G. and H. peren., Eur. Amer. and Afr. bulbs of common culture: some may be treated as aquatics, 1636.

Ambrosia, monœc. pentan. and corymbiferæ, H. an. of common culture, 1662.

Amellus, syngen. polyg. super. and corymbiferæ, a G. tr. C. B. S. soil, loam and peat, and cuttings root freely under a glass; and H. peren. Amer. which grow in common soil, and cuttings root freely under a hand-glass.

Amerimnum, diadel. decan. and leguminoseæ, S. tr. W. Ind. requiring a light loam; and cuttings, not deprived of their leaves, root freely under a hand-glass in a warm situation.

Amethystea, dian. monog. and labiateæ, a H. an. Siberia, of common culture, 1662.

Ammannia, tetran. monog. and salicareæ, a S. an. and H. an. W. and E. Ind. of easy culture, 1749 and 1662.

Ammi, bishop's weed, pentan. dig. and umbelliferæ, H. peren. and an an. Eur. of common culture, 1656 and 1662.

Amomum, monan. monog. and scitamineæ, S. peren. Sierra Leone, reedy marsh plants, 1752.

Amorpha, bastard indigo, diadel. decan. and leguminoseæ, F. and H. tr. Amer.

which grow in common soil, and increase by cuttings planted in autumn, in a sheltered situation.

Amsonia, pentan. monog. and apocyneæ, H. peren. N. Amer. which grow in common soil, and are increased by cuttings or dividing at the root.

Amygdalus, almond, icos. monog. and rosaceæ, a G. tr. and H. tr. Persia and Eur. requiring rich loam, and which may be propagated by seeds, layers, grafting, &c.

Amygdalus Persica, the peach-tree, 1442.

——— var. nectarina, the nectarine-tree, 1448; to force the peach and nectarine, 1232.

——— communis and amara, the sweet and bitter almond, 1452.

Amyris, octan. monog. and terebintaceæ, S. tr. S. Amer. soil, loam and peat, and cuttings root freely in sand under a hand-glass.

American garden, how to form, 1577.

American books on gardening, 2291.

American shrubs, 1689; culture, 1690; final situation, 1691.

Amaranth,—see Amaranthus.

Amber-tree, anthospermum æthiopicum.

American cowslip, dodecatheon meadia.

Amphoræ, *amphora (e)*, a vessel of a foot square, holding nine gallons.

Amateurs of gardening, 3029; their gardens and management, 2100.

Ampthill Park, Bedfordshire, 2156.

Ampton Hall, Suffolk, 2159.

Amos, William, a British writer on gardening, 2283, A.D. 1804.

Anabasis, pentan. digy. and chenopodeæ, a G. tr. Spain, which grows well in loam and peat, and cuttings root in sand under a hand-glass without bottom heat.

Anacampseros, dodecan. monog. and portulaceæ, G. tr. and peren. C. B. S. succulents which grow in sandy loam and lime rubbish, and cuttings root readily in similar soil.

Anacardium, cashew nut, ennean. monog. and terebintaceæ, a S. tr. India, soil a light loam, and cuttings from ripened wood, not deprived of their leaves, will root in sand under a hand-glass.

Anacyclus, syngen. poly. super. and corymbifereæ, H. an. S. Eur. of common culture, 1662.

Anagallis, pimpernell, pentan. monog. and primulaceæ, a G. an. and bien. and H. peren. and an. Eur. all of easy culture, increased either by seeds or cuttings.

Anagyris, bean-trefoil, decan. monog. and leguminoseæ, a G. and F. tr. Spain and Teneriffe, soil loam and peat, and cuttings will root in sand under a hand-glass.

Anarrhinum, didyn. angios. and scrophularineæ, a H. bien. of common culture, 1660.

Anastatica, rose of Jericho, tetrad. siliculosa and crucifereæ, a H. peren. Levant, which will grow in common soil, and cuttings under a hand-glass root freely.

Anchusa, bugloss, pentan. monog. and boragineæ, G. and H. bien. and peren. Eur. and C. B. S. which grow freely in common soil, and are increased by cuttings or seeds.

Andersonia, pentan. monog. and epacrideæ, a G. tr. N. Holl. which grows freely in peat soil with the pots well drained, and not overwatered; young tops made into cuttings root in sand under a bell-glass.

Andrachne, bastard orpine, monœc. gynan. and euphorbiaceæ, a H. an. Italy, of common culture, 1662.

Andromeda, decan. monog. and ericeæ, S. G. and H. tr. N. Amer. E. Ind. and Eur. which prefer peat soil, and cuttings strike in sand under bells or hand-glasses; but the hardy sorts make plants more rapidly by layers, 1689.

Andropogon, polygam. monœc. and gramineæ, S. G. and H. peren. E. Ind. and Eur. grasses of easy culture.

Androsace, pentan. monog. and primulaceæ, H. peren. bien. and an. Eur. which thrive best in small pots in turfy loam and peat, the pots being well drained; they are increased by seeds, or dividing at the root.

Andryala, syngen. polyg. æqual. and cichoraceæ, G. peren. and bien. and H. peren. and an. As. Afr. and Eur.; the greenhouse sorts grow well in light loam, and cuttings root freely under a hand-glass; the hardy sorts are of common culture, 1656. and 1662.

Anemia, cryptog. schismatopterides, and filiceæ, S. peren. W. Ind. ferns of the usual culture, 1755.

Anemone, polyan. polyg. and ranunculaceæ, H. peren. Eur. and N. Amer. which grow in loam rather light and rich as heavy, and increase by dividing the root or by seeds.

Anemone coronaria and hortensis, the common garden anemone, 1630.

Anethum, dill, pentan. dig. and umbelliferæ, a H. peren. and an. Eur. of common culture, and propagated by seed.

Anethum fœniculum, the common fennel, 1372.

Anethum graveolens, the common dill, 1373.

Angelica, pentan. dig. and umbelliferæ, H. peren. and bien. Eur. and Amer. which grow in loamy deep soil, and are increased by seeds.

Angelica archangelica, the garden angelica, 1392.

Anguria, monœc. dian. and cucurbitaceæ a S. peren. Carthagena, soil light and rich; propagation by cuttings or seeds.

Anigozanthos, hexan. monog. and hemodoraceæ, a G. tr. N. Holl. which grows in loam and peat, requires a good deal of water, and is increased by dividing at the root.

Anisomeles, didyn. gymnos. and labiateæ, a S. an. E. Ind. of the usual culture, 1749.

Annona, custard apple, polyan. polyg. and annonaceæ, S. tr. W. Ind. and S. Amer. requiring a rich loam; and ripened cuttings with the leaves unshortened, will root in sand, under a glass in a moist heat.

Anomatheca, trian. monog. and irideæ, a G. peren. C. B. S. a bulb of the irideæ family, 1637.

Anthemis, chamomile, syngen. polyg. super. and corymbifereæ, a G. peren. and H. peren. and an. Eur. and China, of easy culture, and propagated by seeds, cuttings, or dividing at the root.

Anthemis artemisiæfolia, the Chinese chrysanthemum, 1651.

Anthemis nobilis, the common chamomile, 1398.

Anthericum, hexan. monog. and asphodeleæ, G. tr. peren. bien. and an. C. B. S. which grow in light sandy loam, with the pots well drained; the bulbous kinds should have no water when not in a growing state; the shrubby sorts root from cuttings, and most of the species produce seeds.

Anthocercis, didyn. angios. and solaneæ, a G. tr. N. Holl. which grows in loam and peat, and cuttings root readily under a bell-glass in sand.

Antholyza, triand. monog. and irideæ, G. and H. peren. C. B. S. bulbs of the irideæ family, 1687.

Anthospermum, amber-tree, diœc. tetran. and rubiaceæ, a G. tr. C. B. S. which grows well in loam and peat, and strikes readily from cuttings.

Anthoxanthum, spring grass, dian. dig. and gramineæ, H. peren. Brit. and Morocco, of the easiest culture.

Anthoxanthum odoratum, scented vernal grass, 1414.

Anthriscus, rough chervil, pentan. dig. and umbelliferæ, a H. peren. and an. of the easiest culture, 1656 and 1662.

Anthyllis, kidney vetch, diadel. decan. and leguminoseæ, G. and F. tr. and bien. Eur. which grow in loam and peat, and are propagated by seeds or cuttings under bell-glasses in sand. The glasses must be kept wiped, otherwise the cuttings are apt to damp off.

Antidesma, diœc. pentan. and terebintaceæ, S. tr. E Ind. which require a rich loam, and cuttings will root in sand under a hand-glass in moist heat.

Antirrhinum, snap-dragon, didyn. angios. and scrophularineæ, F. and H. peren. and an. Eur. of easy culture, and propagated by cuttings or seeds, 1656.

Anychia, pentan. monog. and amaranthaceæ, a H. bien. N. Amer. of common culture, 1660.

Andrews, Mr. Isaac, an eminent grower of the pine-apple at Lambeth, 1162.

Andrews, Henry, a British writer on gardening, 2283, A. D. 1798.

Anderson, James, LL.D. 130. 140. a British writer on gardening, 2283, A. D. 1777.

Anderson, Mr. William, of the Chelsea Garden, 119. a British writer on gardening, 2283, A. D. 1816.

Anderson and Leslie, nurserymen at Edinburgh, 140.

Anderson, Mr. David, a British writer on gardening, 2283, A. D. 1820.

Andes, or Cordilleras, South American mountains, 507.

Ant,—see Formica.

Anchovy pear, grias cauliflora.

Angelica,—see Angelica.

Angelica-tree, aralia spinosa.

Anise, pimpinella anisum.

Aniseed-tree,—see Illycium.

Ann. Bot. Annals of Botany, by C. Konig and J. Sims.

Animated Nature, in Landscape Gardening, 2001.

Ansley-hall, Warwickshire, 2174.

Anglesea, gardens and residences of, 2206.

Angus, or Forfarshire, gardens and residences of, 2237.

Antrim, gardens of, 2282.

Anderson, Mr. John, a British writer on gardening, 2283, A. D. 1821.

Andry, a French author on gardening, 2284, A. D. 1707.

Angram de Rueneuve, a French writer on gardening, 2284, A. D. 1707.

Antiquities, uses of in gardening, 783.

Antiquity, gardening authors of, 2292.

Appuldurcombe, a seat in the Isle of Wight, 2197.

Aotus, decan. monog. and leguminoseæ, a G. tr. N. Holl. which grows well in sandy loam and peat, and young cuttings root readily under a bell-glass in sand.

Apargia, syngen. polyg. æqual. and cichoraceæ, H. peren., Eur. of the easiest culture, and propagated by seed or division at the root.

Aphelandra, didynam. angios. and acanthaceæ, a S. tr. W. Ind.; requiring rich loam, and cuttings strike freely in a moist heat under a hand-glass.

Aphyllanthes, lily pink, hexan. monog. and asphodeleæ, a H. peren. France, which grows well in peat earth, and is increased by seeds, or dividing at the root.

Apios, diadelph. decan. and leguminoseæ, a H. tr. and peren. N. Amer. both climbers, which grow in common soil; the first is propagated by layers, and the other by tubers from the roots.

Apium, parsley, pentan. digy. and umbelliferæ, H. bien. Eur. · A. petroselinum, or garden parsley, 1369. A. graveolens, or celery, 1342; and A. Americanum, or arracacha, 1545.

Apocynum, dog's bane, pentan. dig. and apocyneæ, a H. peren. N. Amer. which prefers a little peat added to common soil, and increases rapidly by suckers.

Aponogeton, hexan. trig. and naideæ, A. S. peren. and G. peren. C. B. S. bulbs, which are to be treated as aquatics, and are increased by offsets or seeds.

Aphis lanigera, or American blight, 1432.

Aphis, or plant-louse, a hemipterous insect, of which there are numerous species, 1477.

Apple, — see Pyrus.

Apis mellifera, the honey-bee, 723, — see Apiary.

Apiary, a place for an assemblage of beehives, 723. 732. Polish bee-hives, 724; common, 725; of glass, 726; storying, 727; of Paltean, 728; of Huish, 729; Howison, 730. Management of hives, 731; position of the apiary, 732; variety of bee, 733; materials and size of hives, 734; situation for hives, 735; feeding the bee, 736; covering the hive, 738; swarming, 738; taking the honey, 739; taking by deprivation, 740; by suffocation, 741.

Appleberry, — see Billardiera.

Apricot, — see Armeniaca.

Appropriation of scenery by planting, 1777, principles and use of appropriation in landscape gardening, 1959.

Approach-road to a mansion, principles of forming, 1998.

Apprentices in gardening, 2061.

Aquilegia, columbine, polyan. pentag. and ranunculaceæ, H. peren. Brit. of the easiest culture.

Aquarium, for exotics, 1601; for hardy plants, 1668.

Aquatic plants, hardy, 1669; exotic, 1750.

Arabis, wall-cress, tetrad. siliq. and cruciferæ, H. peren. bien. and an. Eur. rockwork plants, of easy culture, and increased by seeds or cuttings.

Arachis, earth-nut, diadel. decan. and leguminoseæ, a S. an. S. Amer. of common culture, 1749.

Aralia, pentan. pentag. and araliæ, S. tr. W. Ind. and N. Amer. which thrive in rich loam, and cuttings strike readily under a hand-glass, in heat: H. tr. which grow in common soil, and ripened cuttings strike in a sheltered situation; and H. peren. of common culture, and increased by seeds.

Araucaria, diœc. monad. and coniferæ, G. tr. Chili and Norfolk Island, which grow in sandy loam and peat, "and cuttings may be rooted, though with difficulty, taken off at a joint in ripened wood, and planted in a pot of sand under a hand-glass, but not in heat." *Sweet.*

Arbutus, strawberry-tree, decan. monog. and ericeæ, G. and H. tr. Eur. which grow best in two-thirds of peat and one-third of loam; they are increased by layers and seeds, and A. unedo commonly by budding or inarching, 1819.

Arctium, burdock, syngen. polyg. æqual. and cynarocephaleæ, H. tr. Brit. of the easiest culture, 1401.

Arctopus, polyg. diœc. and umbelliferæ, a G. peren. C. B. S. which grows in loam and peat, and is increased by seeds.

Arctotheca, syngen. polyg. frustran. and corymbifereæ, a G. peren. C. B. S. which grows in loam and peat, and cuttings root readily under a hand-glass in the open air.

Arctotis, syngen. polyg. necess. and corymbifereæ, G. peren. tr. and an. C. B. S. which grow in loam and peat, and are readily increased by cuttings, or dividing at the root.

Ardisia, pentan. monog. and myrsineæ, S. tr. and G. tr. E. and W. Ind. which grow in loam and peat, and cuttings root freely in sand under a hand-glass in moist heat.

Arduina, pentan. monog. and apocyneæ, a G. tr. C. B. S. which thrives well in peat and loam, and cuttings root freely under a bell-glass in sand.

Areca, cabbage-tree, monœc. monad. and palmeæ, S. tr. E. and W. Ind. palms which grow in light sandy loam, and, like other palms, can only be raised from seeds.

Arenaria, sand-wort, decan. trig. and caryophylleæ, a G. peren. and H. peren. and an. Eur. all the species grow best in sandy loam and peat, and are increased by cuttings or by seeds.

Arethusa, gynan. monan. and orchideæ, a G. peren. N. Amer, a bulb which grows best in two-thirds peat and one-third loam, and requires to be kept moist as a marsh plant.

Aretia, pentan. monog. and primulaceæ, H. tr. Eur. rockwork plants, which grow in loam, sand, and peat, and are increased by dividing at the root.

Argemone, polyan. monog. and papaveraceæ, H. an. Eur. and Amer. of common culture, 1662.

Argenteuil, gardens of, 57.

Aristea, trian. monog. and irideæ, G. peren. C. B. S. bulbs, which grow in loam and peat, and are increased by dividing at the root.

Aristolochia, birthwort, gynan. hexan. and aristolochiæ, S. and G. tr. Ind. and

Amer. climbers and twiners, which grow well in light loam, and cuttings strike freely under a hand-glass: the H. tr. grow in common soil, and are increased by dividing at the root.

Aristotelia, dodecan. monog. and rhamneæ, a H. tr. Chili, which requires a sheltered situation; but will grow in any common soil, and ripened cuttings, planted under a glass, will root freely.

Armeniaca, the apricot, icos. di-pentag. and rosaceæ, H. tr. Eur. of which there are two species, the Siberian, an ornamental shrub, propagated by budding on plum stocks, and the common fruit-bearing tree, prunus armeniaca, 1449.

Armeria, thrift, pentan. pentag. and plumbagineæ, a H. tr. and H. peren. Eur. which grow well in common soil, and are increased by dividing at the root. Armeria vulgaris, the common thrift, is a good edging plant, 1673.

Aranjuez, a palace and gardens in Spain, 99.

Arnica, syngen. polyg. super. and corymbifereæ, H. peren. Eur. which grow best in light loam, and are increased by dividing at the root.

Arnopogon, sheep's beard, syngen. polyg. æqual. and cichoraceæ, a H. peren. and an. Eur. of common culture, 1656 and 1662.

Artedia, pentan. dig. and umbelliferеæ, a H. an. Levant, of the usual culture, 1662.

Artemisia, wormwood, syn. polyg. super. and corymbifereæ, G. F. and H. tr. peren. bien. and an. Eur. and Amer. all of easy culture and propagation.

——— dracunculus, tarragon, 1371.

——— absinthium, wormwood, 1401.

Arthropodium, hexan. monog. and asphodeleæ, a G. peren. N. S. W. soil a sandy loam; and propagation by dividing at the root.

Artocarpus, the bread-fruit tree, monœc. monan. and urticeæ, S. tr. S. Sea Isl. and Ind. which thrive well in light loam, and propagate readily by cuttings, with their leaves entire, 1537.

Arum, monœc. polyan. and aroideæ, S. tr. and peren. and F. and H. peren. Eur. Ind. Amer. all of which thrive well in common soil, and are propagated by dividing the roots; or the woody sorts by cuttings.

Arundo, reed, trian. digyn. and gramineæ, H. peren. Eur. grasses of the easiest culture.

Arracacha, — see Apium.

Arboriculture, 1757.

Arboricultural catalogue, 1900.

Arbroath pavement, 695.

Arbours, 767 and 768.

Armida, gardens of, 118.

Arbor vitæ, — see Thuja.

Archangel, — see Angelica.

Arrow-grass, — see Triglochin.

Arrow-head, — see Sagittaria.

Arrow-root, see Maranta.

Artichoke, — see Cynara.

Architette rustici, 38.

Artisti giardiniere, 38.

Artiste jardinier, 59.

Architecture, origin of the different styles of, 1991.

Arthur's-seat, a hill at Edinburgh, how to improve by a promenade, 2039.

Architect, horticultural, 2084.

Artist, horticultural, 2085.

Arno's-vale, a seat in Middlesex, 2134.

Arundel-castle, Sussex, 2141.

Argyleshire, gardens of, 2249.

Arran, gardens of, 2250.

Ardbraccan-palace, in Eastmeath, 2259.

Armagh, gardens and residences of, 2280.

Arnolde, Richard, a British writer on gardening, 2283. A. D. 1502.

Arkwright, Richard, Esq. a British writer on gardening, 2283. A. D. 1818.

Aristote, a French author on gardening. 2284. A. D. 1677.

Ardenné, Jean Paul de, his works on gardening, 2284. A. D. 1746.

Arrigoni, Stephano, his works on gardening, 2286. A. D. 1763.

Asarum, asarabacca, dodec. monog. and atristolochiæ, H. peren. Eng. and Amer. of common culture, 1656.

Asclepias, swallow-wort, pentan. dig. and asclepiadeæ, G. peren. which thrive best in peat and loam, and cuttings root readily under a hand-glass. The H. peren. are of easy culture.

Ascyrum, polyad. polyan. and hypericineæ, G. tr. and peren. N. Amer. which thrive well in loam and peat, and are readily increased by cuttings taken off in the young wood and planted under a hand-glass.

Asimina, polyan. polyg. anonaceæ, H. tr. N. Amer. which thrive in common soil, and are increased by layers.

Aspalathus, diadel. decan. and leguminoseæ, a S. tr. and G. tr. peren. C. B. S. which grow freely in sandy loam and peat, and young cuttings root in sand under bell-glasses, care being taken to wipe the glasses frequently to prevent their damping off.

Asparagus, hexan. monog. and asphodeleæ, S. G. and F. tr. Eur. and C. B. S. climbers, which grow freely in light loam, or loam and peat, and are increased by dividing at the root or by cuttings under a hand-glass without bottom heat.

——— officinalis, the garden asparagus, 1343; to force asparagus, 1280; plants, planting, time of beginning to force, temperature, air, water, gathering, successional supplies, 1280; to force in pits, 1281; forming, planting, produce, successional supply, forcing the roots as they stand in the open ground, 1281.

Asperugo, German madwort, pentan. monog. and boragineæ, a H. an. Brit. of common culture, 1662.

Asperula, woodruff, tetran. monog. and rubiaceæ, H. peren. and a H. an. Eur. of easy culture, 1656 and 1662.

Asphodelus, asphodel, hexan. monog. and asphodeleæ, H. peren. Eur. of common culture, 1656.

Aspidium, shield-fern, cryptog. filices, and filiceæ, G. and H. peren. Eur. and N. A. ferns of the usual culture, 1678 and 1755.

Asplenium, spleen-wort, cryptog. filices, and filiceæ, S. G. and H. peren. Eur. and S. Amer. ferns which may be cultivated as aspidium.

Aster, star-wort, syngen. poly. super. and corymbifereæ, G. tr. and bien. Eur. C. B. S. and N. Amer. of easy culture in loam and peat, and cuttings root readily, in the same kind of soil, under a hand-glass, without bottom heat. H. peren. and an. of easy culture in any soil.

Astragalus, milk-vetch, diadel. decan. and leguminoseæ, G. and H. peren. and H. an. Eur. As. Af. all of which thrive well in common soil, and are increased by seeds.

Astrantia, master-wort, pentan. dig. and umbelliferеæ, H. peren. Eur. of the easiest culture.

Astroloma, pentan. monog. and epacrideæ, a G. tr. N. S. W. which thrives best in loam and peat, and young cuttings root readily under a bell-glass in sand.

Asparaginous plants, 1301. 1343.

Ashes. 869, proportion in which they are afforded by the combustion of different species of tree, 1787.

Asarabacca, — see Asarum.

Ash-tree, — see Fraxinus.

Aspen, populus tremula.

Asphodel, — see Asphodelus.

Ashberg, a seat in Denmark, 66.

Astankina, a seat near Moscow, 88.

Ashby, Sir Anthony, said to have first introduced heading cabbages to this country from Holland, — see Brassica.

Association of ideas, its influence on the mind as to the expression of scenery, 1956 to 1959.

Ashted-park, Surrey, 2141.

Ashburnham-abbey, Sussex, 2143.

Ashridge-park, Buckinghamshire, 112; described 2155.

Aston-park, Shropshire, 2172.

Ashton-hall, Lancashire, 2192.

Ashcombe, a seat in Wiltshire, 2199.

Ashbrooke, a seat in Kilkenny, 2254.

Astley, Francis Duckenfield, Esq. a British author on gardening, 2283. A. D. 1797.

Athamanta, spignel, pentan. dig. and umbelliferеæ, H. peren. and an an. Eur. of easy culture, and propagated by seeds.

Athanasia, syngen. polyg. æqual. and corymbifereæ, G. tr. C. B. S. soil, a light loam, and cuttings root readily under a hand-glass: the H. an. species requires the usual culture.

Atractylis, syngen. polyg. æqual. and cynarocephaleæ, a H. peren. Spain, of common culture, 1656.

Atragene, polyan. polyg. and ranunculaceæ, a S. tr. G. tr. and H. tr. Eur. Afr. and Amer. climbers of easy culture, and propagated by cuttings, layers, or seeds.

Atraphaxis, hexan. dig. polygoneæ, a G. tr. and peren. Eur. and C. B. S. which grow in loam and peat, and cuttings root rapidly under a hand-glass.

Atriplex, orache, polyg. monœc. and chenopodeæ, Eur. of easy culture, and increased by cuttings; and H. an. to be treated as such, 1662.

——— hortensis, the garden orache, 1332.

Atropa, pentan. monog. and solaneæ, a G. tr. Eur. which grows in light loam, and is readily increased by cuttings; and a H. peren. of easy culture increased by seeds.

Atropa mandragora, the mandrake, 11, — see Mandragora.

Aubletia, polyan. monog. and tiliaceæ; S. tr. S. Amer. which grow freely in light loam, and well ripened cuttings strike under a bell-glass, if not allowed to damp off; it flowers best when the stem is ringed.

Aucuba, monœc. tetran. and rhamneæ, a H. tr. Japan, which grows in common soil, and is readily increased by cuttings.

Aulax, diœc. tetran. and proteaceæ, G. tr. C. B. S. which thrive best in sandy loam with a great many sherds at the bottom of the pot. Cuttings taken off at a joint will root in sand under a hand-glass, care being taken to avoid damps.

Auricula, see Primula.

Augarten, a public promenade at Vienna, 62.

Audley-end, a seat in Essex, 2151.

Aubrey-hall, Warwickshire, 2174.

Austen, Francis, a British author on gardening, 2283. A. D. 1653.

Aviary, 742; for singing birds, 743; parrots, 744.

Avena, oat-grass, trian. dig. and gramineæ, H. peren. and an. Eur. and Amer. of the easiest culture.

Averrhoa, decan. pentag. terebintaceæ, S. tr. E. Ind. which thrive well in light sandy loam; and ripe cuttings root freely in sand under a hand-glass.

Avens, geum, avens.

Avocennia, didyn. angios. and myoperineæ, India, a S. tr. soil, loam and peat, and cuttings root in sand under a glass, in moist heat.

Avington, a seat in Hampshire, 2197.

Awlwort, see Subularia.

Axyris, monœc. tetran. and chenopodeæ,

H. an. Siberia, of common culture, 1662.

Ayenia, pentan. monog. and malvaceæ, Jamaica, a S. tr. and S. bien. which grow in rich loam, and cuttings root freely in sand in a moist heat.

Ayres, Mr. Richard, a British writer on gardening, 2283. A.D. 1820.

Azalea, pentan. monog. and rhodoraceæ, N. Amer. and India, the G. tr. thrive best in sand and peat, and young cuttings taken off close to the ripened wood, and planted in pots of sand, will root readily in moist heat under a bell-glass; the H. tr. Eur. and Amer. require peat or sandy loam, and vegetable earth, and are increased from layers or seeds, 1689.

Azar, Gerib, an encourager of gardening, 152.

Azarole, mespilus azarolus.

B.

Barnes, Thomas, as an author on British gardening, 2283. A. D. 1759.

Bastard, William, Esq. a British writer on gardening, 2283. A.D. 1777.

Banks, Sir Joseph, a British author on gardening, 2283. A.D. 1805.

Barnet, Mr. Peter, a British author on gardening. A.D. 1811.

Barton, Mr. Thomas, a British author on gardening, 2283. A.D. 1814.

Baxter, Mr. William, a British gardening author, 2283. A.D. 1819.

Badmington-house, Gloucestershire, 2168.

Barnsley-park, Gloucestershire, 2168.

Barrington-hall, Gloucestershire, 2168.

Bassingbourne-hall, Durham, 2187.

Bathorne-house, Durham, 2187.

Babworth, a seat in Northumberland, 2189.

Bavis-morant, a seat in Hampshire, 2197.

Baron-hill, a seat in Anglesea, 2206.

Barnbarrow-house, Wigtonshire, 2226.

Ballochmoyle, a seat in Ayrshire, 2227.

Barganny-park, Ayrshire, 2227.

Barnbougle-park, Linlithgowshire, 2232.

Balgonie-castle, a seat in Fifeshire, 2235.

Banfshire, gardens of, 2240.

Balnagowan, a seat in Rosshire, 2247.

Ballyraget-house, in Kilkenny, 2254.

Ballyroam, a seat in Queen's County, 2257.

Ballinlough, a seat in Westmeath, 2260.

Barmeath, a seat in Lowth, 2262.

Ballinamoan, a seat in Waterford, 2263.

Ballygriffin, a seat in Tipperary, 2265.

Ballymont, a seat in Limerick, 2265.

Bally-donellan, a seat in Galway, 2270.

Barons-court, a seat in Tyrone, 2270.

Ballymoney, a seat in Down, 2231.

Bacon, Francis, Lord Verulam, his writings on gardening, 2283. A.D. 1620.

Baynes, John, Esq a British writer on gardening, 2283. A D. 1757.

Barometer, 611 and 623.

Baccharis, plowman's spikenard, syngen. polyg. superfl. and corymbifereæ, N. Amer. G. tr. which grow in loam and peat, and cuttings root readily in sand under a hand-glass.

Bactris, monœc. hexand. and palmeæ, S. tr. S. Amer. palms, which thrive in sandy loam, and like other palms, are only to be propagated by seed.

Bæckia, octan. monog. and myrtiaceæ, G. tr. N.S.W. which grow in loam and peat, are very hardy, and cuttings of the young wood root readily in sand under a bell-glass.

Balbisia, syngen. polyg. super. corymbiferеæ, a H. an. Mexico, of common culture, 1662.

Ballota, stinking-horehound, didyn. gymnos. and labiateæ, H. peren. Eur. of the easiest culture, 1656.

Babiana, trian. monog. and irideæ, G. peren. C. B. S. bulbs which grow in sandy loam and peat, and are propagated by offsets or seeds.

Banks and margins of pieces of water, how to improve, 1983.

Ball's-pond Nursery, 2132.

Bayham-abbey, a seat in Sussex, 2143.

Barking-irons, 617, — see Implements.

Barrow, different sorts of, 621.

Barrow, watering-engine, 621.

Baxin, Giles Augustin, his works on gardening, 2284. A.D. 1741.

Bastien, Jean Francois, his works on gardening, 2284. A.D. 1805.

Bauman, F. G., his works on gardening, 2284. A.D. 1788.

Barruel-Beauvert, his works on gardening, 2284. A.D. 1782.

Bark, tanners, how to manage for horticultural purposes.

Bacoii, A ——, his works on gardening, 2286. A.D. 1596.

Barelli, Giuseppe, his work on fungi, 2286. A.D. 1808.

Balsamita, syngen. polyg. super. and corymbiferеæ, H. peren. Ital. of the easiest culture.

Balsamita vulgaris, the costmary, 1389.

Baltimora, syngen. polyg. necess. and corymbiferеæ, a H. an. Vera Cruz, of common culture, 1662.

Bambusa, bamboo-cane, hexan. dig. and gramineæ, S. tr. India reeds, which thrive well in a loamy soil, and are readily increased by suckers.

Banisteria, decan. trig. and malpighiaceæ, S. tr. Amer. and W. Ind. which grow well in sandy loam, and cuttings of ripe wood root freely under a hand-glass in sand.

Banksia, tetran. monog. and proteaceæ, G. tr. New Holl. soil one-third peat, one-third loam, and one-third sand, with the pots well drained, and the plants never let flag for want of water as they will seldom recover. Cuttings must be well ripened before they are taken off, cut at a joint, and planted in pots of sand without shortening the leaves; cover with hand-glasses, but do not plunge in heat.

Baptisia, decan. monog. and leguminoseæ, H. peren. N. Amer. which grow well in good garden soil, and are propagated by seeds, or (though slowly) by dividing the roots.

Barbarea, winter-cress, tetrad. siliq. and cruciferæ, H. peren. Brit. which will grow in any soil, and may be propagated by seeds, or dividing the plant.

——— vulgaris, the common winter-cress, 1361.

Barleria, didyn. angios. S. tr. bien. and G. peren. India and Amer. all which grow in loam and peat, with a little rotten dung, and cuttings root freely under a hand-glass.

Barosma, pentan. monog. and diosmeæ. G. tr. C.B.S. which grow well in sandy peat, and cuttings of ripened wood root readily in sand under a bell-glass.

Barringtonia, monad. polyand. and myrtaceæ, a S. tr. E. Ind. a very fine plant, scarce, and supposed difficult to manage; soil two-thirds loam, and one-third peat kept moist, and cuttings of ripe wood taken off at a joint, and put in a pot of sand under a hand-glass, without shortening the leaves, will root readily. *Sweet.*

Bartholina, gynan. monan. and orchideæ, a G. peren. C.B.S. which thrives best in sandy loam and peat, with a little water when not in a growing state; it is propagated by dividing the root.

Bartonia, icos. monog. and rosaceæ, G. bien. Missouri, of easy culture, and propagated by seeds, 1664.

Bartsia, tetrad. siliq. and scrophularineæ, H. peren. N. Amer. which are rather difficult to preserve, and require a shady border of peat earth; or to be planted in pots of the same soil, and kept moist: and H. an. Brit. which grow freely in a sandy soil.

Basella, pentan. trig. and chenopodeæ, S. bien. and an. of common culture, 1749.

Bassia, dodec. monog. and sapoteæ, S. tr. E. Indies, which grow freely in light loam, or loam and peat; and ripened cuttings strike under a hand-glass in sand.

Batschia, pentan. monog. and boragineæ, H. peren. N. Amer. which grow well in common soil, and are increased by seeds, or dividing the roots.

Bauera, polyan. dig. and cistineæ, G. tr. N.S.W. which grow in loam and peat, and cuttings root readily in the same soil under a bell-glass.

Bauhinia, mountain ebony, decan. monog. and leguminoseæ, S. tr. E. and W. Ind. mostly climbers which thrive well in light loam, and cuttings between old and young, do well under a bell-glass in sand, in a moist heat.

Barclay, John, the celebrated author of the romance of Argenis, 44.

Basket, a utensil woven of the spray, twigs, bark, or woody fibre of trees, 620; the common form is roundish; but there are a great many forms used by the market gardeners near London, and other large towns, as hamper, barge, boat, &c. for the larger kinds, formed of willow twigs unbarked; flat, shallow, &c. for medium sizes, formed of peeled willow; and sieve, punnet, pottle, thumb, &c. for the smaller sorts, formed of split willows or thin shavings of woody fibre of any sort. Some are formed of bullrushes, or the leaves of sparganum, juncus, or typha, which are called mat-baskets.

———, flower-borderings, 624.

Baldwin, (of Bald. *Sax.* bold, and Winnean, *Sax.* to overcome; a bold man, a conqueror,) Mr. Thomas, gardener, to the Marquis of Hertford, at Ragley, near Alcester, Worcestershire, 131. 1157; his writings on gardening, 2283. A.D. 1818.

Bark-stove, or moist-stone; a hot-house in which the mass of bark, earth, sand, or other materials in which the pots containing the plants are plunged, or the plants themselves planted, is heated from below; or by the fermentation of the bed of materials, as well as by the atmosphere of the house.

————, used in horticulture, its construction and management, — see Pine-stove.

————, used in floriculture, its construction for growing or flowering plants, 1594; for propagation, 1604: when fire heat is substituted for bark, 1605; when steam is applied for that purpose, 1605; heated air, 1605.

————, used in floriculture, its general management, 1619; choice of species and planting, 1620; arrangement of plants in pots, 1621; botanical arrangement, 1622.

————, used in floriculture for propagation, its culture, 1626.

Bark, for the use of tanners, trees from which it is usually or may be obtained, 1787.

Bacoche, 1449; the common name of the apricot in Tuscany, corrupted from the original Arabic word, Bercoch.

Bahama, red wood, ceanothus colubrinus, — see Ceanothus.

Balm, — see Melissa.

—— of Gilead, — see Dracocephalum and Amyris.

Balsam, — see Impatiens.

Balsam-apple, monordica Balsamina.

Balsam-herb, justicia comata.

——— of Capevi, copaifera officinalis.

Balsam tree, — see Amyris.

Bamboo-cane, — see Bambusa.

Banana, — see Musa.

Bane-berry, (bana, *Sax.* a murderer, and berry), actæa spicata.

Banyan-tree, (priest's tree, *Ind.*) ficus religiosus.

Barbadoes bastard cedar, bubroma guazuma.

Barbadoes cherry, — see Malpighia.

Barberry, (barb, a beard, and berry), — see berberis.

Barley, — see Hordeum.

Barrenwort, — see Epimedium.

Base-rocket, (base, low, vile,) reseda lutea.

Basil, (Basil, a town in Switzerland), — see Ocymum.

Bastard-balm, — see Melittis.

——— cabbage-tree, — see Geoffroya.

——— cedar, — see Cedrela.

——— hare's ear, phyllis nobla.

——— Indigo, — see Amorpha.

——— lupine, — see Lupinaster.

——— mangeneel, — see Cameraria.

——— orpine, — see Andrachne.

——— pimpernell, centunculus minimus.

——— toad flax, — see Thesium.

——— vervain, — see Stachytarpheta.

——— vetch, — see Phaca.

Bawd-money, meum athamanticum.

Bay, see Laurus.

Barth, a warm place, or pasture.

Barrow, a machine used in gardening for transporting materials from one point to another. There are the common, the separating, the new-ground work, the water, the hand-barrow, and the barrow watering-engine, 621.

Barton, (*Sax.*) a backside or backlying field.

Baven, faggots of branches and spray, with their ends untrimmed.

Barnton, a seat in Mid-Lothian, 113.

Bargany, a seat in Ayrshire, 114.

Bangor, banchor, (*Sax.*) chapital choir, 115.

Bass-mats, (from the Russian bast-bark,) used in gardening, 624.

Belon, a seat in Kildare, 2255.

Bellew, a seat in Galway, 2270.

Bellisle, a seat in Fermanagh, 2270.

Belvoir, a seat in Down, 2231.

Beale, John, a British author on gardening, 2283. A.D. 1657.

—— Dr. John, a British author on gardening, 2283. A.D. 1666.

Beattie, Mr. William, a British writer on gardening, 2283. A.D. 1811.

Belon, Peter, 35. 103. a French writer on gardening, 2284. A.D. 1553.

Besnier, ———, a French writer on gardening, 2284. A.D. 1705.

Berry-gatherer, 617, see Implements.

Bellows for fumigation, used in gardening, 622.

Bertrand, Francis, his works on gardening, 2284. A.D. 1757.

Bearde, de l'Abbage, his Essay on Agriculture, 2284. A.D. 1769.

Berger, Ch. Glo. his works on gardening, 2285. A.D. 1802.

Becker, William, Glo. his work on gardening, 2285. A.D. 1795.

Beckstedt, J. Kp. his works on gardening, 2285. A.D. 1795.

Benoist, Pere, a French astronomer, at Pekin, in the 18th century, 160.

Bernstein, J. Glo. his work on gardening, 2285. A.D. 1793.

Beckmann, John, 75. his writings relative to gardening, 2285. A.D. 1781.

Beaunier, ———, his work on gardening, 2184. A.D. 1820.

Bertholon, ———, his works on gardening, 2284. A.D. 1800.

Bertin, ———, his writings on gardening, 2284. A.D. 1800.

Bechstein, D. J. M. his works on gardening, 2286. A.D. 1818.

Bertuch, M. his work on gardening, 2286. A.D. 1821.

Benigni, Fortunato, his work on gardening, 2286. A.D. 1813.

Bengius, Peter Jonas, his work on gardening, 2288. A.D. 1780.

Belgrave, William, his works on gardening, 2291. A.D. 1755.

Berries, grown in horticulture, as edible fruits, 1460.

Berceau, (cradle, arch, *Fr.*) an arbour or bower, formed in horticulture and arboriculture as a place of repose, 1799.

Beckett, the seat of the Rev. Lord Barrington, near Farringdon, in Gloucestershire, 107.

Beaufort, Duchess of, 118.

Beati, Dr., the friend and cotemporary of Hartlib, to whom the latter addressed some of his works, 107.

Belvue, (pretty view, *Fr.*) a very common name of country seats in most parts of the world, 142.

Beroot, a seat of the Emir Facardine, near Jerusalem, in the 17th century, 150.

Bengalore, a royal residence with celebrated gardens in the East Indies, 153.

Beaumont, Sir Harry, a name assumed by Mr. Spence, and affixed to letters from China, translated and published by him, 160.

Bengal, its circumstances as to gardening, 165.

Beatson, Major-general Sir Alexander, formerly governor of St. Helena; a gentleman attached to agriculture, who has invented some new implements, and brought into notice the practice of burning clay, strenuously recommended by Switzer about a century ago. (See his Tract on the Cityaus of the ancients,) and more recently by Hitt, 548.

Beattie, Mr. William, C. M. H. S. gardener to the Earl of Mansfield, at Scone, Perthshire, 983.

Beaumont, Simon de, a distinguished citizen of Holland in the 17th century, a great encourager of botany and gardening, who had a fine garden at Beverning, 43.

Beverning, see Beaumont, Simon de.

Bénard, Mons. de, author of some papers on gardening, published in *Memoirs de la Société du Seine et Oise*, during the present century, 45, 46.

Belœil, a fine villa near Paris, which before the revolution, belonged to the celebrated Prince de Ligne.

Benningsen, General Von, a native of Germany, and general of cavalry in the Russian service; a warm patron of arts and sciences, who had a fine seat and botanic garden near Wilna, which was burnt to the ground and destroyed in the retreat of 1812. 90. 92.

Beck, (*Sax.*) a brook or rivulet.

Beetle, (*Sax.*) a wooden mallet for driving wedges to split roots, &c.

——— (*Sax*) an insect of the coleopterous order, see Blatta.

Bents, bulrushes, see Juncus.

Besca, (old *Latin*,) a spade or shovel.

Beet, (*Sax*) to boot or help, a term used by gardeners in Scotland for filling up blanks in plantations. To beat up, is with them synonimous with to plant up, or fill up with plants.

Bevel, or bevel-square, an instrument made use of by carpenters and masons, and also in gardening for the adjusting of angles.

Beauty, that property in objects by which they are recommended to the power or faculty of taste; the reverse of ugliness; the primary, or most general object of love or admiration. *Jeffrey*, in *Supp. Encyc. Brit.* That which gives pleasure to the mind in objects of sense. *M. A. Schimmelpenninck*, Chap. I.

Though, in the common colloquial acceptation of the term beauty, it is applied only to such objects as delight the senses of vision and hearing; yet, in the strict and literal sense of the word, a fine view, a harmonious concert, the perfume of a rose, or the taste of an anana, are each possessed of beauty.

The authors quoted, and also Alison, Stewart, and Knight, have discussed the subject of beauty in a clear and satisfactory manner, by which it appears that the great error of preceding writers on the subject, consisted in supposing that there was only one kind of beauty; whereas, as these authors have shown, there are many kinds, though some are much more general and universal than others. Nothing but mind can either please or disgust mind; and therefore the beauty that we see in objects depends, as D'Alembert has observed, on what is within ourselves. Man is possessed of the origin of every taste and refined enjoyment naturally; but every one of these, from the lowest sense to the highest, requires cultivation before it become capable of conferring much enjoyment on the mind. Though in the nature of things, therefore, there may be an absolute or universal beauty; yet, practically, all beauty may be said to be relative to the state of man in different countries and ages, and in different degrees of civilization and refinement. Fashion, therefore, or the prevailing modes of the day, will by the the greater number of persons, always be esteemed the true criterion of beauty.

Beauty of kitchen garden scenery, 1067; of the flower-garden, 1618; of landscape scenery, 1950 and 1960.

Beaufortia, polyadelph. icosan. and myrteaceæ, G. tr. N. Hol. soil, two-thirds peat and one-third sandy loam, and cuttings from nearly ripened wood, strike root freely in sand under a bell-glass.

Beckmannia, trian. dig. and gramineæ, a H. an. Eur. a grass of the easiest culture.

Bee-house, — see Apiary.

Bee, —, see Apis.

Bedfordshire, gardens and residences of, 2156.

Begonia, monœc. polyan. and hydrocharideæ, S. tr. peren. and bien. S. Amer. succulent plants which grow readily in sandy loam and cuttings root freely in the same soil.

Bejaria, dodec. monog. and rhodoraceæ, a G. tr. Florida, which thrives best in sandy peat, and may be increased by layers and cuttings; the latter planted in sand under a bell-glass in a little peat.

Bellis, daisy, syngen. polyg. super. and corymbifereæ, H. tr. and an. Eur. of the easiest culture.

Bellium, syngen. polyg. super. and corymbifereæ, H. peren. and an. Italy, rock work plants of common culture, 1656 and 1662.

Berardia, syngen. polyg. æqual. and cynarocephaleæ, H. peren. Italy, of common culture, 1656.

Berberis, barberry, hexan. monog. and berberideæ, H. tr. Eur. and Amer. of robust growth and easy culture, propagated by suckers and seeds.

Berberis vulgaris, the common barberry, 1464.

Berckheya, syng. polyg. frust. G. tr. and bien. C. B. S. which grow freely in loam and peat, and root readily in common earth under a hand glass.

Besleria, didyn. angios. and scrophularineæ, S. tr. W. Ind. handsome plants, of easy culture in rich, light soil. Cuttings strike freely in rotten tan, without any protection.

Beta, beet, pent. dig. and chenopodeæ,

a G. bien. Mad. H. peren. Hung. and H. bien. S. Eur. and Brit. of easy culture in sandy loam, and propagated by seeds.

Beta vulgaris, the common red beet, 1325.

—— cicla, the white beet, a spinaceous plant, 1331. It is from the roots of this last species that the French and Germans obtained sugar with so much success during the late war. The following was the ordinary process: — Reduce the roots to a pulp, by pressing them between two rough cylinders; put the pulp in bags and press out the liquor it contains; boil this liquor; precipitate the saccharine matter by quick lime; pour off the liquor; add to the residuum a solution of sulphuric acid, and boil again; the lime uniting with the acid, is got rid of by straining; and the liquor may then be gently evaporated, or left to granulate slowly, after which it is ready for undergoing the common process of refining raw sugars.

—— maritina, a native plant which may be used as an esculent, 1401.

Betonica, betony, didyn. gymnos. and labiateæ, H. peren. Eur. of common culture, 1656.

———— officinalis, a tea plant, 1414.

Betula, birch, monœc. polyan. and amentaceæ, H. tr. of easy culture; the American sorts prefer bog-earth and moisture, and are propagated by seeds or layers, and some curious sorts by grafting or budding.

——— alba, and other species cultivated as timber-trees, 1926. 1927.

Bean, — see Vicia.

Bean-tree, — see Zygophyllum.

Bean trefoil, menyanthes trifoliata, — see Menyanthes.

Bearbind, — see Convolvulus.

Bearberry, arbutus uva-ursi.

Bear's-breach, — see Acanthus.

Bear's-ear, sanicle, — see Sanicula.

Bed straw, — see Galium.

Beech, — see Fagus.

Beet, — see Beta.

Bell-flower, — see Campanula.

Benjamin-tree, laurus benzoin.

Bent-grass, — see Agrostis.

Berry-bearing alder, rhamnus frangula.

Betony, — see Betonica.

Besl. eyst. Besleri hortus eystettensis.

Bell-glass, a curvilinear utensil, of glass, in one piece; called a receiver among chemists. It is used for covering cuttings of plants, and differs from a hand-glass in the latter, being larger and composed of several pieces glazed in a frame, — see 620.

Berkshire, gardens and residences of, 2164.

Bentley-priory, Middlesex, 2135.

Beddington, a seat in Surrey, 107; described, 2141.

Belvidere, a seat in Kent, 2147.

Beechwood-park, Hertfordshire, 2152.

Beaumont-lodge, Berkshire, 2164.

Benham-house, Berkshire, 2164.

Belmont, a seat in Herefordshire, 2171.

Berrington, a seat in Herefordshire, 2171.

Beaudesart, a seat in Staffordshire, 2173.

Belmont, a seat in Staffordshire, 2173.

Beaumanor, a seat in Leicestershire, 2176.

Belvoir-castle, Lincolnshire, 2181.

Belchamp-hill, a seat in the county of Durham, 2187.

Belle-vue, a seat in Hampshire, 2197.

Berwickshire, gardens of, 2220.

Bellview, a seat in Wicklow, 2252.

Besom, different kinds of, used in gardening, 616.

Birdsal, a seat in Yorkshire, 2184.

Bilham-house, Yorkshire, 2185.

Bicton, a seat in Devonshire, 2203.

Bishop's-court, a seat in Kildare, 2255.

Bickham, George, a British writer on gardening, 2283. A. D. 1750.

Biggs, Mr. Arthur, C. M. H. S. a British author on gardening, 2283. A. D. 1807.

Bishop, Mr. Thomas, a British author on gardening, 2283. A. D. 1814.

Bidet, M——, his writings on gardening, 2284. A. D. 1759.

Bidens, syngen. polyg. æqual. and corymbifereæ, a S. an. H. peren. and H. an. E. Ind. and S. Amer. the annual species may be treated as tender, and half-hardy annuals; they prefer a moist situation and light soil. The perennials may be kept in pots in similar soil, and propagated by dividing the plant.

Bignonia, trumpet-flower, didyn. angios. and bignoniaceæ, S. and G. tr. S. Amer. and China, some are climbers, and all grow well in loam and peat, and young shoots root readily, either in mould or sand, under a hand-glass in heat. The H. tr. are climbers, and grow well in common soil, and are increased by cuttings from the young wood or roots.

Billardiera, apple-berry, pentan. monog. and pittosporeæ, G. tr. Austral. climbers, which thrive well in loam and peat, and cuttings root readily in sand under a bell-glass.

Biscutella, buckler mustard, tetrad. siliq. and cruciferæ, a F. tr. and H. peren. and an. Eur. of common culture, 1656. 1662 and 1705.

Biserrula, hatchet vetch, diadel. decan. and leguminoseæ, H. an. S. Eur. of common culture, 1662.

Bixa, anotta, polyan. monog. and tiliaceæ, a S. tr. W. Ind. which grows to a large plant before it flowers, and therefore cuttings should be taken from flowering plants, in order that they may flower soon: they root freely under a hand-glass in sand, and the plants grow well in loam and peat.

Biennial plants, such as are of two years duration in their natural circumstances; but by culture, and especially by pinching off the flowers as they appear, many of these may be rendered triennial or of still longer duration. Many exotics, which are annuals, and biennials, in their native countries, are perennials in our stoves. Hardy biennials, 1659; Frame b. 1709.

Bilston-house, the seat of Addison, in Warwickshire, 103; described, 2174.

Bib. Bank. bibliotheca, banksiana.

Bill, an edge tool, at the end of a stale or handle; if short, it is called a hand-bill, and when long, a hedging or hedgebill, — see Hedgebill.

Bind-weed, — see Convolvulus.

Birch, — see Betula.

Bird-pepper, — see Capsicum.

Birds-eye, primula farinosa

Birds-foot, — see Ornithopus.

Birds-foot, trefoil, — see Lotus.

Birthwort, — see Aristolochia.

Bishops-weed, — see Ammi.

Bitter-sweet, solanum dulcamara.

Bitter vetch, — see Orobus.

Billet, (*billet*, Fr.) a tree or log of wood, cut up for fuel; billet-wood.

Binnarium, (*Lat.*) a pond or stew for the keeping and feeding of fish.

Birds, enemies of gardens, how to destroy, 1030.

Blendon-hall, Kent, 2147.

Blickling-hall, Norfolk, 2160.

Blenheim, a seat in Oxfordshire, 2163.

Blaize-castle, Gloucestershire, 2167.

Blackmore-park, Worcestershire, 2169.

Blithfield-park, Staffordshire, 2173.

Blair Adam, a seat in Kinrosshire, 2234.

Blith or *Blythe*, Walter, 142. a British writer on gardening, 2283. A. D. 1649.

Blake, Stephen, a British writer on gardening, 2283. A. D. 1644.

Blake, Mr. Thomas, a British writer on gardening, 2283. A. D. 1821.

Blanching, (whitening) a process for depriving plants of part of their bitter qualities, 981.

Blanching-pots, 620.

Blatta, the black beetle, or cock roach, an insect of South America, but naturalized in Europe, in kitchens, ovens, and hot-houses; it comes abroad only at night, and is killed by red wafers.

Blæria, tetran. monog. and ericeæ, G. tr. C. B. S. which thrive only in sandy peat, and young cuttings will root in sand under a bell-glass, or in a close frame in a shady situation.

Blakea, dodec. monog. and melastomeæ, a S. tr. Jamaica, which thrives well in peat and loam, and requires a good deal of water; cuttings require to be quite ripe, otherwise they rot; planted in sand in moist heat under a hand-glass, they root freely.

Blandfordia, hexan. monog. and hemerocallideæ, G. peren. N. S. W. which grow in sandy loam and peat, and are propagated by suckers or seeds.

Blenchum, cryptog. filices, and filiceæ, G. and H. peren. C. B. S. Eur. and N. Amer. ferns, which grow in loam and peat, and are increased by dividing at the root or seeds.

Blechum, didyn. angios. and acanthaceæ, a S. peren. W. Ind. which grows well in a rich, light soil; and cuttings root freely under a hand-glass in heat.

Bletia, gynan. monan. and orchideæ, S. peren. China and W. Ind. which grow well in sandy loam and peat, and are readily propagated by dividing at the root.

Blighia, akee tree, octan. monog. and sapindeæ, a S. tr. — see 1520.

Blitum, strawberry blite, monan. dig and chenopodeæ, H. an. S. Eur. of the easiest culture.

Blast, plants and especially the cereal grasses are said to be blasted when the seeds or ears are lank and thin, — see Vegetable Pathology.

Blight, a common term for injuries received by the vegetable kingdom when in a state of growth, which cannot be referred to any obvious or certain cause, and coming suddenly is said to give them the appearance of being blighted or blasted, — see Vegetable Pathology.

Black bryony, — see Tamus.

—— saltwort, glaux maritima.

—— snake-root, cimicifuga serpentaria.

Bladder-nut, — see Staphylea.

Bladder senna, — see Colutea.

Blackberry; in England, the berries of the bramble are so named; and in Scotland, those of the black currant.

Blade, (*blad*, *Sax.*) a leaf.

Blit, an ancient synonym for the beet, beta.

Boletus, the spunk, a fungus which grows on the bark of trees, and is used in many places as tinder, — see Pinus.

Blair-house, or Blair Athol, a seat of the Duke of Athol, in Perthshire, 114. 1809, described 2236.

Blair Drummond, the seat of Lord Kaimes, and now of Mr. Home Drummond, in Stirlingshire, 113. described 2236.

Blessington gardens, situated in the county of Dublin, formerly of some note, 115. 135.

Blakie, Thomas, Esq. of Beechwood, near Edinburgh, C. M. H. S., a gentleman settled in France since 1775. He first travelled there as a collector, and sent home most of the plants mentioned in the Hortus Kewensis, as introduced by Drs. Fothergill and Pitcairn. He afterwards remodelled the Duke of Orlean's gardens at Mousseau, near Paris, and from that time has followed the profession of landscape gardener in France. At the commencement of the revolution he furnished the potatoes with which the Thuilleries were planted, and for which he was never paid, but was offered the title

or office of Inspector of gardens for the department of the Seine and Ouse, which he declined. He now resides at St. Germans, and has lately given some extensive designs for the Prince of Salm Dyck, in the Netherlands, 52.
Blackwell, Elizabeth, widow of Dr. Blackwell, who died in Sweden; author of a Curious Herbal, containing 500 cuts of the useful plants.
Botley, a seat in Staffordshire, 2173.
Bolesworth-castle, Cheshire, 2193.
Booth's-hall, Cheshire, 2193.
Bonchurch-cottage, Isle of Wight, 2197.
Boward, a seat in Wiltshire, 2200.
Borrington, a seat in Devonshire, 2203.
Bodorgan, a seat in Anglesea, 2206.
Boultibrooke, a seat in Radnorshire, 2213.
Bodfach, a seat in Montgomeryshire, 2214.
Bothwell-house, Lanarkshire, 2229.
Bonfeil, John, a British author on gardening, 2283. A. D. 1622.
Bobart, Jacob, a British author on gardening, 2283. A. D. 1684.
Boutcher, William, a British author on gardening, 2283. A. D. 1772.
Booth, Mr. David, a British author on gardening. 2283. A. D. 1814.
Boothby, Sir Brooke, a British author on gardening, 2283. A. D. 1816.
Bornefond, ——, a French writer on gardening, 2283. A. D. 1653.
Boullay, ——, a French writer on gardening, 2284. A. D. 1712.
Borning piece, 618, — see Instruments.
Bonnelle, Charles, his work on gardening, 2284. A. D. 1763.
Bouché, P——, his works on gardening, 2284. A. D. 1809.
Bonnet, Charles, Henry, his works on gardening, 2284. A. D. 1800.
Bousmard, ——, his writings on gardening, 2284. A. D. 1788.
Books on gardening, 2283.
Books of accounts and others required to be kept by gardeners, 1057.
Borch, Michael Jean, Comte de, his works on gardening, 2286. A. D. 1780.
Boronia, octan. monog. and ...., G. tr. N. S. W. which thrive well in loam and peat, and young cuttings strike readily under a bell-glass in sand.
Borya, diœc. dian. and euphorbiaceæ, H. tr. N. Amer. which thrive in any common soil, and are increased by layers. Ripened cuttings planted in autumn will also take root.
Bosea, golden rod, pentan. dig. and chenopodeæ, a G. tr. Canar. which grows freely in loam and peat, and cuttings root in sand, under a hand-glass, without heat.
Bocconia, tree celandine, dodec. monog. and papaveraceæ, a S. tr. Ind. which grows well in sandy loam, and ripens seeds plentifully; and a H. peren. China, which grows in rich soil, and is propagated by dividing the roots.
Bœhmeria, monœc. tetrand. and urticeæ, a G. tr. Canar. which thrives well in loam and peat, and cuttings root freely in the same kind of soil under a hand-glass. The H. peren. Virginia, grows in peat soil, and is propagated by dividing the root.
Boerhaavia, hog-weed, dian. monog. and nyctagineæ, S. tr. and peren. Indies, which thrive well in rich loam, and cuttings root readily.
Boltonia, syngen. polyg. super. and corymbifereæ, H. peren. N. Amer. of common culture, 1656.
Bombax, silk cotton tree, monad. polyan. and malvaceæ, S. tr. E. Ind. and S. Amer. which grow freely in loamy soil, and cuttings, not too ripe, taken off at a joint, will root freely under a hand-glass in heat.
Bontia, didyn. angios. and myoporineæ, a S. tr. W. Ind. which thrives in peat and loam, and cuttings root readily in heat, under a hand glass.
Borago, borage, pentan. monog. and boragineæ, H. peren. bien. and an. Eur. of the easiest culture.
Borago officinalis, the common borage, 1378.
Borassus, diœc. hexan. and palmeæ, a S. tr. E. Ind. which thrives well in sandy loam, and is propagated by seed.
Borbonia, diadel. decan. and leguminoseæ, G. tr. C. B. S. which grow in loam and peat, and young cuttings strike readily under a bell-glass in sand.
Bossiæa, diadel. decan. and leguminoseæ, G. tr. Austral. which grow in loam and peat, with a little sand, the pots being well drained; and cuttings, not too ripe, will root in sand, under a bell-glass, guarding against damp.
Botrychium, moonwort, cryptog. stachyopterides, and filiceæ, H. peren. N. Amer. and Brit. ferns, which grow in peat earth in shady situations, and are propagated by dividing the root or by seeds.
Bourreria, pentan. monog. and boragineæ, S. tr. E. and W. Ind. of easy culture in loam and peat, and cuttings root freely under a hand-glass.
Bouvardia, tetran. monog. and rubiaceæ, G. tr. N. and S. Amer. which grow in loam and peat, and are increased by cuttings of the roots, or young cuttings under a hand-glass in heat.
Bole or boale, the trunk or main stem of a tree.
Bouds, weevills, or popes, insects of the curculio genus, which breed in malt, corn, nuts, and various seeds.
Borage, — see Borago.
Bog-rush, — see Schœnus.
Bourbon-palm, latania rubra.

Box-tree, — see Buxus.

Boxthorn, — see Lycium.

Boscage, (boscagium, Lat. or bocage, Fr.) a grove or thicket of trees.

Boscus, (old Lat.) all manner of wood.

Bower, (bur, or bure, Sax. a parlour,) an arbour formed with trees, — see Arbour.

Border (bordure, Fr.) the edge, fringe or margin of any thing, especially when distinguished by a line of demarcation, by ornament, or otherwise from the main piece or plat.

Borders in gardening are of general use in horticulture and floriculture, as accompaniments to walks, and walls or other fences. The former are chiefly as ornamental compartments; and the latter partly ornamental, but chiefly for the culture of fruit-trees, and the more delicate herbaceous esculents. The width of borders that accompany walks, is generally guided by that of the walk; but they are esteemed handsomer when broader rather than narrower; wall or fence borders should, according to the most approved ideas, never be less than the height of the wall or fence; since the roots of a tree require as much room to extend themselves as the shoots. For the formation of borders in kitchen gardens, see Horticulture, (1094.) and in flower gardens and shrubberies, see Floriculture, (1569. 1580.)

Borders for fruit-trees, (1096.) See Kitchen Garden.

Border flowers, herbaceous plants of hardy constitution and easy culture, well adapted for ornamenting borders. In floriculture they are classed under distinct heads, viz. as perennials, 1655; bulbs, 1657; biennials, 1659; hardy annuals, 1661; half-hardy annuals, 1663; for particular purposes, 1664; for concealing upright deformities, 1665; horizontal deformities, 1666; which will grow under the shade and drip of trees, 1667; for ornamenting pieces of water, 1668; for ornamenting margins of water, 1670; rocks, 1671; with evergreen leaves for winter display, 1672; for edgings to beds or borders, 1673; highly odoriferous, 1674; dial plants, 1677; ferns and mosses, 1678; alpines, 1679; common shewy sorts for a small garden, 1680.

Boboli gardens, at Florence, 28. 30.

Borghese, villa of, at Rome, 31.

Botanic garden, a garden for the culture of plants with a view to botanical science.

Botanic gardens, public, their formation, 2042 to 2046; management, 2125.

Bowden, a seat in Wiltshire.

Botanic curator, 2068; his duties, 2080.

Botanic gardener, 2080.

Botanic gardens of Chelsea, 2131; Kew, 2142; Oxford, 2152; Cambridge, 2158; Hull, 2184; Liverpool, 2191; Bury, 2159; Edinburgh, 2218; Glasgow, 2229; Dublin, 2251; Cork, 2264.

Botanic gardens for the sale of plants, at Monkwood, 2227; at Forfar, 2237.

Bosc, Monsieur Louis Auguste Guillaume, F. L. S. H. S. inspector of the government garden of the Luxembourg, Paris, 44; his works on gardening, 2283. A. D. 1819.

Boursault, Monsieur, possessor of a fine garden in Paris, 57. 1214.

Boissiere, a beautiful villa near Geneva, 67.

Bose, Gaspard, proprietor of a fine garden near Leipsic, at the end of the 17th century, 69.

Boc. mus. Museo di Piante rare. Di Don Paulo Boccone.

Bot. Mag. Curtis's Botanical Magazine.

Bot. Reg. Kerr's Botanical Register.

Bot. Rep. the Botanist's Repository for new and rare Plants, by H. Andrews.

Bot. Cult. Sweet's Botanical Cultivator, 8vo. 1820.

Bœttinger, C. A. 10. 108; his works, 2286. A. D. 181.

Boerhaave, a celebrated chemist and physician of Leyden, 43.

Borecole (boreal cole, northern cole or cale,) see Brassica.

Boulevard, promenade, 2038.

Boston-house, Middlesex, 2135.

Botley, a seat in Surrey, 2140.

Bockmann, A ——, his work on gardening, 2286. A. D. 1815.

B. P. Brown's Prodromus Floræ Novæ Hollandiæ, &c.

Bruchus, pisi, 1314.

Brown, Launcelot, Esq. a celebrated landscape gardener, born at Cambol, or Camphill, a few houses near the village of Hartburn, in Northumberland. He died in 1782, without issue, holding at the time the situation of head-gardener at Hampton-court, and possessed of considerable wealth, which he left to a nephew, 111.

Bridgeman, a landscape gardener of eminence in the early part of the 18th century, 107.

Br. *Brown*, Robert, Esq. F R S. librarian to the Linnean Society, and possessor of the Banksian Library, one of the first botanists of Europe, distinguished for his knowledge, and improvement of the Jussieuean system.

Brechin-castle, Forfarshire, 123. 133.

Bro. Jam. the Civil and Natural History of Jamaica, by Patr. Browne.

Brompton-park nursery, 2132, Middlesex.

Brentford-nursery, Middlesex, 2132.

Brompton agricultural nursery, Middlesex, 2132.

Broughton-hall, Staffordshire, 2173.

Brecknockshire, gardens of, 2216.

Brousse, M —— de la, his works on gardening, 2284. A. D. 1772.

Broughton, or Adelphi-nursery, Edinburgh, 2218.
Braid-house, Mid-Lothian, 2218.
Broughton-house, Kirkcudbrightshire, 2225.
Brodie house, in Kincardineshire, 2238.
Braham-castle, in Ross-shire, 2247.
Brockley-park, in Queen's County, 2257.
Bryansford, a seat in Down, 2231.
Brown, Sir Thomas, M.D. 117. a British author on gardening, 2283. A.D. 1658.
Bradley, Richard, F. R. S. 117. 139; as a British author on gardening, 2283. A.D. 1716.
Bryant, Charles, a British author on gardening, 2283. A.D. 1783.
Brocq, Phillip, le, M.A. a British writer on gardening, 2283. A.D. 1786.
Brown, Robert, a British writer on gardening, 2283. A.D. 1786.
Brulles, ——, a British writer on gardening, 2283. A.D. 1790.
Braddick, John, Esq. 132; as a British author on gardening, 2283. A.D. 1817.
Brown, Mr. James, a British gardening author, 2283. A.D. 1817.
Brookshaw, Mr. George, a British gardening author, 2283. A.D. 1817.
Brookes, Mr. Samuel, a British writer on gardening, 2283. A.D. 1321.
Brossard, Davy, or David, a French writer on gardening, 2284. A.D. 1552.
Breitenbach, Ph. Fr. his works on gardening, 2284. A.D. 1805.
Breitschneider, K. B. his work on gardening, 2284. A.D. 1798.
Bridel, his works on gardening, 2284. A.D. 1793.
Bretonniere, M——, de la, his works on gardening, A.D. 2284. A.D. 1783.
British authors on gardening, 2283.
Bramieri, Don Giulio, his works on gardening, 2286. A.D. 167.
Brochieri, Francesco, his work on gardening, 2286. A.D. 1777.
Bruley, C——, his works on gardening, 2286. A.D. 1804.
Brabejum, African almond, polyg. monœc. and proteaceæ, a G. tr. C. B. S. which grows in sand and peat, and ripened cuttings root in sand under a hand-glass.
Brachysema, decan. monog. and leguminoseæ, a G. tr. N. Holl. a climber which thrives well in sandy loam and peat, and is increased by layers or cuttings under a bell-glass in sand.
Brassavola, gynan. monan. and orchideæ, a S. peren. W. Ind. a parasite, or air-plant, which may be hung up in baskets of moss or tan, or tied in a belt of moss to the trunk of a palm or other tree.
Brassia, gynan. monan. and orchideæ, a S. peren. Jam. an air-plant, requiring the same treatment as the brassavola.
Brassica, tetrad. siliq. and cruciferæ, H. peren. bien. and an. Eur. of the easiest culture.
Brassica oleracea var. α capitata, the white cabbage, 1302.
———— β rubra, the red cabbage, 1304.
———— γ sabauda, the Savoy cabbage, 1305.
———— var, the Brussels sprouts, 1306.
———— δ sabellica, the borecole, 1307.
———— ε botrytis, the cauliflower, 1308.
———— ζ —— var, the broccoli, 1309.
———— η napobrassica, turnip-rooted cabbage, 1307.
——— napa, rape used as a salad plant in gardens, and grown in agriculture for food for sheep, and for the seed to be pressed for its oil, 1357.
——— rapa, turnip, 1322.
——— eruca, a salad plant, 1364.
Briza, quaking-grass, trian. dig. and gramineæ, a H. peren and an. Brit. grasses of the easiest culture.
Brodiæa, hexan. monog. and hemerocallideæ, G. peren. Georgia, which grow well in sand and peat, kept moist, and are propagated by dividing the root like agapanthus.
Bromelia, hexan. monog. and bromeliaceæ, S. tr. natives of South America and the West Indies, all of which grow well in two-thirds good fresh loam, one-third leaf mould or rotten dung, and as much sand as will prevent the mixture from getting hard and compact, with watering. A warm, and rather moist atmosphere is required to grow the fruiting sorts to any size; but they are otherwise very hardy. All the species bear that peculiar production called a crown on the summit of their fruit, by which, or by suckers, they are usually propagated.
Bromelia ananas, the common pine-apple, 1481; its general culture, 1666; preferable varieties, 1167; soil, 1169; artificial heat, 1170; propagation, 1172; nursing department, 1173; succession department, 1179; fruiting department, 1189; general directions common to the three departments, 1201; insects, 1210; compendium of a course of culture, 1211; recent improvements, 1212; by T. A. Knight, 1212; by P. Marsland, 1214.
Bromus, brome-grass, trian. dig. and gramineæ, H. peren. tr. and an. Eur. of the easiest culture.
Brosimum, bread-nut, polygam. diœc. and ...., S. tr. Jam. soil, a light loam; propagation by large old cuttings not divested of their leaves, in a pot of sand under a hand-glass in a moist heat.
Brossea, pentan. monog. and ericeæ, a S. tr. S. Amer. which grows in peat and sand, and young cuttings will root in

the same mixture under a bell-glass on gentle heat.

Brotera, syngen. poly. segr. and cynarocephaleæ, a H. peren. S. Amer. which will grow in common loam, and is propagated by dividing the root.

Broughtonia, gynan. monan. and orchideæ, a S. peren. Jam. an air-plant, requiring the same treatment as brassavola.

Broussonetia, paper mulberry, diœc. tetran. and urticeæ, a H. tr. Japan, which grows in common garden soil, and is readily increased by layers.

Browallia, didyn. angios. and scrophularineæ, G. an. S. Amer. of the usual treatment, 1664.

Brownea, monad. decan. and leguminoseæ, a S. tr. W. Ind. which grows best in loamy soil, and cuttings of ripened wood will root in sand under a hand-glass in moist heat.

Brucea, diœc. tetran. and terebintaceæ, a S. tr. Abyssinia, which thrives in loamy soil, and cuttings root in sand under a hand-glass in heat.

Brugmansia, pentan. monog. and solaneæ, a S. tr. Peru, which thrives in rich loam, and strikes from cuttings in moist heat.

Brunia, pentan. monog. and rhamneæ, G. tr. C. B. S. with heath-like leaves, which grow in sandy peat with a moderate supply of water; and young cuttings in sand under a bell-glass will strike root freely.

Brake, the fern Pteris.

Bramble, — see Rubus.

Bread-fruit, — see Artocarpus.

Brooklime, veronica beccabunga.

Broom, — see Spartium.

Bryony, — see Bryonia.

Brasiletto, — see Cæsalpinia.

Bread-nut, — see Brosimum.

Brome-grass, — see Bromus.

Brook-weed, — see Samolus.

Broom-rape, — see Orobanche.

Brecket-hall, Hertfordshire, 2152.

Brickenden Bury, a seat in Hertfordshire, 2152.

Broxburn Bury, a seat in Hertfordshire, 2152.

Bretley park, a seat in Derbyshire, 2177.

Bradford, a town in Yorkshire, gardens of, 2184.

Bramham park, Yorkshire, 2184.

Brockelesby-hall, Yorkshire, 2184.

Bradwell-lodge, Durham, 2187.

Broxted-lodge, Durham, 2187.

Browsholme, a seat in Lancashire, 2191.

Bromhall, a seat in Cheshire, 2193.

Bramborough-house, Cheshire, 2193.

Bradwell-lodge, Hampshire, 2197.

Bramshill, a seat in Hampshire, 2197.

Broadlands, a seat in Hampshire, 2197.

Broxmore, a seat in Wiltshire, 2199.

Bridges, different kinds of, used in gardening, 751 to 756.

Bubon, pentan. dig. and umbelliferæ, G. tr. and G. bien. Eur. and C. B. S. which grow freely in loam and peat, and ripened cuttings taken off at a joint, and planted under a hand-glass in sand, will root readily; the H. bien. species is of easy culture, 1660.

Bubroma, bastard cedar, polyadel. dodec. and malvaceæ, a S. tr. Jamaica, which thrives well in loam and peat, and cuttings root freely in sand under a hand-glass.

Buchnera, didyn. angios. and scrophularineæ, a H. peren. N. Amer. which grows best in pots in loam and peat, and is increased chiefly by seeds.

Bucida, olive bark tree, decan. monog. and santalaceæ, a S. tr. Jamaica, which grows best in loam and peat, and well-ripened cuttings root in sand under a hand-glass plunged in heat.

Buddlea, tetran. monog. and scrophularineæ, G. tr. and a H. tr. Chili, and C B. S. which thrive in any loamy soil, and cuttings root freely under a common hand-glass.

Buffonia, tetran. dig. and caryophylleæ, a H. an. of common culture, 1662.

Bulbocodium, hexan. monog. and melanthaceæ, a H. peren. Spain, a bulb of common culture, 1658.

Bumalda, pentan. dig. and rhamneæ, a G. tr. Japan, which thrives well in an equal portion of loam, and peat; and ripened cuttings root readily under a hand-glass in sand.

Bumelia, pentan. monog. and sapoteæ, S. tr. N. Amer. preferring loamy soil, and propagated by well-ripened cuttings in sand under a hand-glass; and H. tr. which grow in common soil, and root in sand under a hand-glass.

Bunias, tetrad. silic. and cruciferæ, a H. peren. Eur. of common culture. 1656 and 1662.

Bunium, earth-nut, pentan. dig. and umbelliferæ, H. peren. Brit. of common culture, 1656.

Bunium bulbocastanum, common earth-nut, 1611.

Buonapartea, hexan. monog. and bromeleæ, a S. tr. which thrives best in loam and decayed leaves.

Buphthalmum, syngen. poly. super. and corymbiferæ, G. tr. and F. peren. Eur. and Amer. which grow freely in loam and peat, and cuttings root in the same soil under a hand-glass: and H. peren. and an. of common culture, 1656 and 1662.

Buckinghamshire, gardens and residences of, 2154.

Busch, Peter, 85; a British author on gardening, 2283. A.D. 1797.

——, Joseph, a British author on gardening. A.D. 1821.

Bucknal, Thomas Skip Dyot, Esq. a British author on gardening, 2283. A.D. 1797.

Bull, Mr. William, a British author on gardening, 2283. A.D. 1820.

Burchardt, Th. H. O., his work on gardening, 2204. A.D. 1805.

Butret, ——, his works on gardening, 2248. A.D. 1795.

Budding, different modes of, 909—921.

Bussars, Marco, his work on gardening, 2286. A.D. 1794.

Burtin, Francis Xavier, his works on gardening, 2287. A.D. 1784.

Bupleurum, hare's-ear, pentan. dig. and umbelliferеæ, G. tr. and peren. Eur. and C.B.S. which grow freely in loam and peat, and cuttings root readily in the same soil, under a hand-glass; and H. peren. and an. of common culture, 1656. 1662.

Bursaria, pentan. monog. and pittosporeæ, a G. tr. Ind. and Amer. a shewy plant which grows best in sandy loam and peat, and cuttings root readily in sand under a bell-glass.

Bursera, polyg. diœc. and terebintaceæ, a S. tr. W. Ind. which grows in loamy soil, and large cuttings root in sand under a hand-glass in moist heat.

Bartonia, decan. monog. and leguminoseæ, a G. tr. N. Holl. requiring attentive treatment; it grows in sandy loam and peat, with the pots well drained, and young cuttings will root in sand under a bell-glass.

Butea, diadel. decan. and leguminoseæ, S. tr. E. Ind. splendid plants which grow in loam and peat, and cuttings taken off at a joint, and planted in sand, and not deprived of their leaves, will root in moist heat, covered with a hand-glass.

Butomus, flowering-rush, ennean. hexag. and hydrocharideæ, a H. peren. Brit. an aquatic, 1669.

Buttneria, pentan. monog. and malvaceæ, S. tr. Amer. which grow in loam and peat or rich loam, and ripened cuttings root under a hand-glass in sand.

Buxus, monœc. tetran. and euphorbiaceæ, H. tr. of easy culture, and propagated by cuttings or layers.

——— sempervirens, the common box tree, the best of all edging shrubs, 1673; as a timber tree, 1933.

Butler, Mr., gardener to the Earl of Derby, at Knowlesley, and afterwards a nurseryman at Prescot, 131. 629.

Bury, St. Edmunds, botanic garden at, 121. 2154.

Bushey-park, in Hertfordshire, 107.

Bushnell's Wells, Oxfordshire, 107.

Bull-herb, Herbier de la France, par Mr Bulliard.

Buildings, how to operate with, in gardening scenery, 1991.

————, of the Greeks, 1993; Indians, 1994; Chinese, 1995.

Burwood-park, Surrey, 2140.

Buckhurst-park, Sussex, 2143.

Bulstrode, a seat in Buckinghamshire, 1224.

Buenos-Ayres, a seat in Gloucestershire, 2167.

Burwell-park, a seat in Lincolnshire, 2180.

Burleigh, a seat in Lincolnshire, 2180.

Burley-on the-hill, a seat in Rutlandshire, 2182.

Burton Constable, a seat in Yorkshire, 2185.

Burnhall, a seat in Durham, 2187.

Buteshire, gardens of, 2250.

Buffon, George Louis le Clerc, Count de, his works on gardening, 2284.

Buchoz, Pierre Joseph, his works on gardening, 2284. A.D. 1760.

Bulbs, what, 285; to propagate by, 876; to cultivate hardy bulbous flowers, 1657; exotic bulbs, — see Frame, Green house, &c.

Bulbs, their management as articles of trade in the nursery business, 2121.

Buch. ic. Buch's icones plantarum.

Burdock, — see Arctium.

Burnet, — see Poterium.

Butcher's-broom, — see Ruscus.

Butterwort, — see Sanicula.

Buckbean, menyanthes trifoliata.

Buckler mustard, — see Biscutella.

Buckthorn, — see Rhamnus.

Buckwheat, polygonum fagopyrum.

Buckwheat tree, mylocarpum ligustrinum.

Bugle, — see Ajuga.

Bugloss, — see Anchusa.

Bugwort, — see Cimicifuga.

Burnet saxifrage, — see Pimpinella.

Bur parsley, see Caucalis.

Bur reed, — see Sparganium.

Butter bur, tussilago petasites.

Button tree, — see Conocarpus.

Button flower, — see Gomphia.

Button weed, see Spermacoce.

Button wood, cephalanthus occidentalis.

Bystropogon, didyn. gymnos. and labiateæ, G. tr. Canaries, which thrive in loam and peat, and cuttings root readily in the same soil under a hand-glass.

Byzantium, gardens of, 103.

Bysshe court, a seat in Surrey, 2140.

C.

Cacalia, syngen. polyg. æqual. and corymbifereæ, a S. tr. and S. an. C.B.S. and Amer. succulents, which grow in sandy loam and brick rubbish, and are propagated by cuttings; the H. peren. are of the easiest culture.

Cachyris, pentan. dig. and umbelliferеæ, H. peren. Eur. of common culture, and propagated by seeds, 1656.

Cactus, icosan. monog. and cacteæ, S. D.S. Indies and Amer. and G. tr. succulents of easy culture, 1783.

Cactus opuntia, the Indian fig, 1519.
Cabbage moth, noctua brassicæ, 1310.
Cacucia, decan. monog. and onagrareæ, a S. tr. Guiana, which grows well in loam and peat, and cuttings root freely in sand under a hand-glass.
Cadia, decan. monog. and leguminoseæ, a S. tr. Arabia, which prefers a light soil, and cuttings root in sand under a hand-glass and plunged in heat.
Cæsalpina, decan. monog. and leguminoseæ, S. tr. E. and W. Ind. prickly branched, which thrive well in loam and peat, and cuttings sometimes succeed, taken off in a growing state, but not too young, and plunged in a pot of sand under a hand-glass in moist heat.
Cæsia, hexan. monog. and asphodeleæ, a G. peren. N. S. W. which grows in loam and peat, and is increased by dividing at the root or by seeds.
Cæsulia, syngen. polyg. æqual. and corymbifereæ, a S. peren. E. Ind. requiring a rich, loamy soil, and cuttings root freely.
Cakile, tetrad. silic. and cruciferceæ, a H. peren. and an. Eur. the first best grown in pots, and the other of common culture, and both increased by seeds.
Caladenia, gynan. monan and orchideæ, a G. peren. N. S. W. which may be grown in loam and peat, and increased by division at the root.
Calodium, monœc. polyan. and aroideæ, S. tr. and peren. Ind. and Amer. most of which grow freely in water, or in rich soil in a moist heat; they are propagated by tubers of the root.
Calamagrostis, trian. dig. and gramineæ, H. peren. Eur. grasses of the easiest culture.
Calamintha, calamint, didyn. gymnos. and labiateæ, F. tr. and H. peren. Eur. and Amer. of common culture, and increased by seeds or dividing at the roots.
Calamus, hexan. monog. and palmeæ, S. tr. E. Ind. palms, which thrive best in sandy loam, and a warm, moist atmosphere, and are propagated by seed.
Calceolaria, slipper-wort, dian. monog. and scrophularineæ, G. peren. and an. Peru and Falkland islands, of easy culture, and propagated by seeds.
Caernarvonshire, gardens and residences of, 2207.
Cardiganshire, gardens and residences of, 2210.
Canons, a seat in Middlesex, 107; described, 2124.
Caenwood, a seat in Middlesex, 2135.
Carlton Palace gardens, London, 109; described 2137.
Canon-house, Sussex, 2143.
Cashiobury, a seat in Hertfordshire, 107; described, 2153.
Cambridge botanic garden, 2158.
Caversham, a seat near Reading, 107; described, 2164.
Castle Ashby, Northamptonshire, 1169; described, 2183.
Carr Castle, Yorkshire, 2185.
Castle Howard, Yorkshire, 107; described, 2186.
Castle Eden, Durham, 2187.
Carden, a seat in Cheshire, 2193.
Cadland, a seat in Hampshire, 2197.
Castle Malwood Cottage, Hampshire, 2197.
Carns-hill, a seat in Hampshire, 2197.
Castle-hill, a seat in Devonshire, 2203.
Carclere, a seat in Corwall, 2204.
Calonne, ———, his works on gardening, 2284, A. D. 1779.
Cabanis, de Salignac, his works on gardening, 2284, A. D. 1786.
Caylus, N—— de, his works on gardening, 2284, A. D. 1806.
Cadet-de-Vaux, Antoine Alexis, his works on gardening, 2284, A. D. 1807.
Cavanilles, Antonio Joseph, his works on gardening, 2290, A. D. 178 .
Cause, D— H—, his works on gardening, 2287, A. D. 1676.
Carradori, his works on gardening, 2286, A. D. 1807.
Cattaneo, Giacomo, his works on gardening, 2286, A. D. 1767.
Caronelli, Conte Pietro de, his works on gardening, 2286, A. D. 167 .
Caldasia, pentan. monog. and scrophularineæ, a S. an. New Spain, of common culture, 1749.
Calea, syngen. polyg. æqual. and corymbifereæ, S. tr. and a S. bien. W. Ind. which grow in rich soil, and cuttings strike readily either in sand or mould.
Calanchoe, octan. tetrag. and sempervíveæ, D. S. tr. As. and Afr. succulents which thrive well in sandy loam, but require bottom heat to make them flower. "The leaves placed on a pot of mould, or on the tan, will shoot out young plants from the notches of the margin." *Sweet.*
Calendula, marygold, syngen. polyg. necess. corymbifereæ, G. tr. and a G. peren. Eur. and C.B.S. which thrive in loam and peat, and cuttings root freely in the same soil under a hand-glass; and H. an. of the easiest culture.
Calendula officinalis, the common pot-marygold, 1377.
Caleya, gynan. monan. and orchideæ, a G. peren. N. S. W. which thrives in sandy loam and peat, and is increased by dividing at the root or by seeds.
Callistachys, decan. monog. and leguminoseæ, G. tr. N. Holl. which grow fast and flower freely in loam and peat, and cuttings planted in sand under a bell-glass root readily.
Calla, heptan. monog. and aroideæ, a G. and H. peren. Eur. and C. B. S. the first

an aquatic, and the other a marsh plant of easy culture. C. æthiopia will also grow well on the green-house stage.

Callicarpa, tetran. monog. and verbenaceæ, S. and G. tr. Ind. and Amer. which grow best in loam and peat, and ripened cuttings strike root in sand under a hand-glass in heat.

Callicoma, dodec. dig. and cunoniaceæ, a G. tr. N. S. W. which thrives in loam and peat, and cuttings of ripe wood root readily in sand under a hand-glass.

Calligonum, dodec. tetrag. and polygoneæ, a H. tr. Caspian Sea, which may be grown in loam and peat, and propagated by layers.

Callisia, trian. monog. and commelineæ, a S. peren. W. Ind. a creeper of easy culture, 1748.

Callitriche, water star-wort, monan. dig. and naiadeæ, a H. an. Brit. which grows on the surface of shallow water, and sends down delicate fibres to the soil below.

Calluna, octan. monog. and ericeæ, a H. tr. Brit. (formerly erica,) the common heath; it requires to be grown in peat soil, and may be increased by seeds, layers, or cuttings of the young shoots planted in sand under a hand-glass.

Calodendrum, pentan. monog. and pittosporeæ, a G. tr. C. B. S. which, as the name imports, is of great beauty. It grows in loam and peat, and cuttings of ripe wood root readily in sand under a hand-glass.

Calophyllum, polyan. monog. and guttiferæ, S. tr. Ind. which grow well in light loam, and cuttings of ripened wood strike freely in sand, under a hand-glass in moist heat.

Calopogon, gynan. monan. and orchideæ, a F. peren. N. Amer. which grows in peat, and is increased by dividing at the root.

Calothamnus, polyadelph. icosan. and myrtaceæ, G. tr. N. Holl. which thrive in loam and peat, and cuttings root in sand under a bell-glass.

Calotropis, pentan. dig. and asclepiadeæ, S. tr. N. Amer. which grow in light loam, young cuttings root freely under a hand-glass in a pot of sand, care being taken that they do not get mouldy.

Caltha, polyan. polyg. and ranunculaceæ, H. peren. Brit. marsh plants of the easiest culture.

Calycanthus, icosan. polyg. and rosaceæ, H. tr. N. Amer. which thrive in loam and peat, and root by layers in the same soil.

Calypso, gynan. monan. and orchideæ, a H. peren. N. Amer. a bulb, which grows best in peat or in sandy loam and peat, and is increased by offsets from the bulbs, or by seeds.

Calyptranthes, icosan. monog. and myrtaceæ, S. peren. W. and E. Ind. which thrive in sandy loam and peat; and, though cuttings do not strike freely, ripened ones sometimes root under a hand-glass. Layers answer best.

Calystegia, bearbind, pentan. monog. and convolulaceæ, H. peren. Eur. and Amer. of common culture, 1656.

Camelina, tetrad. silic. and cruciferæ, H. an. Eur. of common culture, 1662.

Camellia, monadel. polyan. and auranteæ, G. tr. China, of great beauty, — see 1716, 1717.

Cameraria, bastard mangeneel, pentan. monog. and apocyneæ, Ind. which grows well in loam and peat, and cuttings root in a pot of sand under a hand-glass.

Campanula, bell-flower, pentan. monog. and campanuleæ, G. tr. peren. bien. and an. and H. peren. and an. Eur. As. Afr. and Am. of common culture, and increased by seeds, dividing at the root, or by cuttings.

Campanula rapunculus, the rampion, 1347.

Camphorosma, tetran. monog. and chenopodeæ, a G. tr. S. Eur. of easy culture in light soil, not over watered.

Canarina, hexan. monog. and campanulaceæ, a G. peren. Canaries, requires a light soil, no water where the leaves have died down, and to be put in the stove to flower well. It is propagated from cuttings of the roots or shoots.

Canella, dodec. monog. and meleaceæ, a S. tr. W. Ind. soil loamy; and cuttings of large old wood, with all the leaves taken off at a joint, in sand, in a moist heat, strike, though with difficulty.

Canna, Indian shot, monan. monog. and canneæ, S. peren. Ind. and S. Amer. reedy or marsh plants of easy culture, and propagated by seeds or dividing the root.

Cannabis, hemp, diœc. pentan. and urticeæ, a H. an. India, of easy culture, 1662.

Capparis, caper-tree, polyan. monog. and cappardeæ, S. and G. tr. Eur. and W. Ind. chiefly climbers and trailers, which grow freely in light loam, and strike readily by cuttings.

Capparis spinosa, the caper-bush, 1407.

Capsicum, pentan. monog. and solaneæ, S. tr. G. tr. and H. an. Indies, of easy culture, and propagated by cuttings or seeds.

Capsicum annuum, cerasiforme and grossum, 1406.

Caralluma, pentan. dig. and asclepiadeæ, D. S. tr. E. Ind. succulents which grow in brick rubbish and loam, and increase by cuttings left till their wounds dry up before planting.

Cardamine, lady's smock, tetrad. siliq. and cruciferæ, a G. peren. and H. peren. bien. and an. Eur. of the easiest culture.

Cardamine pratensis, ladies' smock, 1413.

Cardiospermum, heart-seed, octan. trig. and sapindeæ, S. an. India and Brasil, of common culture, 1749.
Carduus, thistle, syngen. poly. æqual. and cynarocephaleæ, H. peren. bien. and an. Eur. of common culture, 1656 and 1662.
Carduus marianus, 1351.
Carex, monœc. trian. and cyperaceæ, a G. peren. and H. peren. Eur. and Amer. grasses of common culture.
Careya, monad. polyan. and ...., a S. peren. E. Ind. which grows in light soil.
Carica, papaw tree, diœc. decand. and cucurbitaceæ, S. tr. India, which grow vigorously in a loamy soil, and large cuttings, not deprived of their leaves, root in sand under a hand-glass in heat.
Carissa, pentan. monog. and apocyneæ, S. tr. E. Ind. which grow in loam and peat, well drained and without being much watered; cuttings root in sand under a bell-glass in heat.
Carlina, carline thistle, syngen. polyg. æqual. and cynarocephaleæ, H. peren. bien. and an. Eur. of common culture, and raised from seeds.
Carolinea, monad. polyan. and malvaceæ, S. tr. W. Ind. splendid plants which thrive well in loamy soil, and cuttings taken off at a joint, and not deprived of their leaves, root in sand under a hand-glass in heat.
Carpesium, syngen. polyg. super. and corymbifereæ, H. peren. Eur. and China, which grow in light soil, and are increased by seeds.
Carpinus, hornbeam, monœc. polyan. and amentaceæ, H. tr. Eur. and Amer. of common culture.
Carpinus betulus, the common hornbeam, 1918.
Carpopogon, diadelp. decan. and leguminoseæ, S. tr. E. Ind. climbers which grow in loam and peat, and cuttings root freely under a bell-glass in sand.
Carthamus, syngen. polyg. æqual. and cynarocephaleæ, G. tr. Eur. and Afr. which grow well in a loamy soil, and cuttings root freely in sand under a hand-glass. The H. peren. and an. are of common culture, 1656 and 1662.
Carum, caraway, pentan. dig. and umbellifereæ, H. bien. Eur. of common culture.
Carum carvi, the common caraway, 1395.
Caryophyllus, clove-tree, icos. monog. and myrteaceæ, a H. tr. Moluccas, which grows in loam and peat, and cuttings, not deprived of their leaves, root in sand under a hand-glass in a moist heat.
Caryota, monœc. polyan. and palmeæ, a S. tr. E. Ind. a palm which grows in sandy loam, and is propagated by seeds.
Cassia, decan. monog. and leguminoseæ, S. and G. tr. bien. and an. E. and W. Ind. which thrive in loam and peat, and cuttings will root in sand under a hand-glass in moist heat: many kinds ripen seeds.
Cassine, pentan. trig. and rhamneæ, a S. tr. and G. tr. C. B. S. which grow freely in loam and peat, and cuttings root readily in sand under a hand-glass.
Cassinia, syngen. polyg. segr. and corymbifereæ, G. peren. N. Holl. of common culture, 1769.
Castanea, chestnut, monœc. polyan. and amentaceæ, H. tr. Eng. and Amer. of common culture.
Castanea vesca, the sweet chestnut, 1478 and 1919.
Castilleja, didy. angios. and scrophularineæ, a H. peren. Louisiana, of common culture, 1656.
Casuarina, monœc. monan. and conifereæ, G. tr. Austral. which grow freely in loam and peat, and cuttings root in sand under a hand-glass.
Catalpa, dian. monog. and bignoniaceæ, a S. tr. W. Ind. which grows well in light loam, and cuttings root in sand under a hand-glass in heat; the H. species thrives in common soil, and is increased from seeds or cuttings of the roots.
Catananche, syngen. polyg. æqual. and cichoraceæ, a H. peren. and an. Eur. and Afr. of common culture, 1656 and 1662.
Catesbæa, lily thorn, tetran. monog. and rubiaceæ, S. tr. W. Ind. which grow in loam and peat, and cuttings root in sand plunged in heat, and covered with a bell-glass.
Cathartocarpus, decan. monog. and leguminoseæ, S. tr. E. Ind. which may be treated as cassia.
Caucalis, bur parsley, pentan. dig. and umbelliferaæ, H. bien. and an. Eur. of common culture, 1660. 1662.
Caulophyllum, hexan. monog. and berberideæ, H. peren. N. Amer. of common culture, 1656.
Cauliflower, — see Brassica.
Carrot, — see Daucus.
Cabinets in woods, 1799.
Caled. mem. Memoirs of the Caledonian Horticultural Society. Some account of its formation, 123.; of the memoirs of the society, 2283. A. D. 1810.
Cantaleup melon, — see Cucumis.
Camb. Brit. Cambden's Britannia, an antiquarian work.
Calton-hill, Edinburgh, 143.
Cape of Good Hope, gardening of, 168.
Cayenne, gardening of, 168.
Calcutta, gardening of, 170.
Carre, a country word for a wood in a boggy place.
Caves and caverns, as garden decorations, 768.

Caimo, P., his tours in Spain, &c. 99.
Caled. Depic. Chalmer's Caledonia Depicta, an antiquarian work, 113.
Cassino, (Ital.) a little house, a villa, or cottage ornée, 23.
Caserta, a royal Neapolitan palace and gardens, 33.
Cavallerizza, (Ital.) a manége or place for practising horsemanship, 49.
Cascades, 776, — see Waterfalls.
Cabbage, — see Brassica.
Canterbury bell, — see Campanula.
Cape jasmine, — see Gardenia.
Caper bush, — see Capparis.
Caraway, — see Carum.
Cardinal flower, — see Lobelia.
Carnation, — see Dianthus.
Carlsruhe, (Charles's peace or retreat,) public gardens of, 69. 2037.
Canton, fatee-gardens at, 2040.
Calder-house, Midlothian, 165. described, 2218.
Castle-wig, a seat in Wigtonshire, 2226.
Callander, a seat in Stirlingshire, 139. described, 2231.
Castle-Gray, in Perthshire, 2236.
Castle-glammis, in Angusshire, 2237.
Caithness, gardens of, 2244.
Cantray, a seat in Invernesshire, 2248.
Castle Grant, in Invernesshire, 2248.
Camden-park, in Wexford, 2253.
Castletown, a seat in Kildare, 2255.
Carton, a seat in Kildare, 2255.
Carlow, the county of, as to gardening, 2258.
Castletown, Delvin, a seat in Westmeath, 2260.
Castle-Martyn, a seat in the county of Cork, 2264.
Cashel-palace, in Tipperary, 2265.
Cashier, a seat in Tipperary, 2265.
Castletown, a seat in Tipperary, 2265.
Castlebar-house, a seat in the county of Mayo, 2271.
Cavan, county of, as to gardening, 2274.
Castle-blaney, a seat in Monaghan, 2276.
Caledon-hill, a seat in Tyrone, 2277.
Castle-gosford, in Armagh, 2280.
Castle-dillon, in Armagh, 2280.
Castle-upton, a seat in Antrim, 2282.
Castel, Robert, a British writer on gardening, 2283. A. D. 1728.
Carlisle, Anthony, Esq. F. R. S. as a British writer on gardening, 2283. A. D. 1813.
Carr, John, Esq. a British author on gardening, 2283. A. D. 1817.
Cattley, William, Esq. a British author on gardening, 2283. A. D. 1820.
Call, Mr. Martin Miller, 87. 91. as a British writer on gardening, 2283. A. D. 1821.
Cadet, Charles Louis, his works on gardening, 2284. A. D. 1801.
Calvel, Etienne, his works on gardening, 2284. A. D. 1802.
Castel, René Richard, his works on gardening, A. D. 1802.
Calvert, ———, his works on gardening, 2284. A. D. 1821.
Caus, Solomon, his works on gardening, 2285. A. D. 1620.
Cabinets de verdure, 1570.
Cabbage-tree, — see Areca.
Calabash-tree, — see Crescentia.
Calamint, — see Calamintha.
Calathian violet, gentiana pneumonanthe.
Caltrops, — see Tribulus.
Camphire tree, laurus camphora.
Campion, cucubalus baccifer.
Canada rice, Zizania aquatica.
Canary-grass, — see Phalaris.
Candleberry myrtle, myrica gale.
Candy-carrot, athamanta cretensis.
Candy-tuft, — see Iberis.
Canterbury bell, campanula medium.
Cape jasmine, gardenia florida.
Cardamom, elettari cardamomum.
Cardinal-flower, lobelia cardinalis.
Cardoon, cynara cardunculus.
Carline-thistle, — see Carlina.
Carob-tree, ceratonia siliqua.
Cashew-nut, anacardium orientale.
Cassava, jatropha manihot.
Castor-oil plant, ricinus palma christi.
Catchfly, lychnis vescaria.
Cat-mint, — see Nepeta.
Cat's-ear, — see Hypochæris.
Cat's-tail, — see Typha.
———— grass, — see Phleum.
Cat-thyme, teucrium marum.
Cav. ic. Ant. Jos. Cavanilles, Icones et Descriptiones Plantarum quæ aut sponte in Hispania crescunt, aut in Hortis hospitantur.
Caterpillar, the second or *larva* stage in the progress of insects generated from eggs, after which they become *puppæ*, and lastly, *imagæ* or perfect insects. Mode of destroying caterpillars on the cabbage tribe, 1308; gooseberries, 1466; roses and other flowers, 1614 and 1688.
Ceanothus, pentan. monog. and rhamneæ, S. tr. and G. tr. Amer. and W. Ind. which grow in loam and peat, and cuttings root freely in sand under a hand-glass. The H. tr. grow in common soil, and are readily raised from seeds or layers.
Cecropia, snake-wood, diœc. dian. and urticeæ, a S. tr. Jam. which prefers a loamy soil, and large cuttings planted in sand under a hand-glass will strike root.
Cedrela, pentan. monog. and meliaceæ, a S. tr. W. Ind. which grows well in loam and peat, and cuttings root under a hand-glass in sand.
Celastrus, staff-tree, pentan. monog. and rhamneæ, G. and H. tr. C. B. S. and Amer. requiring similar treatment to ceanothus.
Celosia, cock's comb, pentan. monog. and

amaranthaceæ, a S. bien. and an. E. Ind. and China; of common culture.

Celosia cristata, the common coxcomb, 1653.

Celsia, didyn. angios. and solaneæ, S. an. F. bien. and H. an. Eur. and E. Ind. of common culture, 1749. 1662.

Celtis, nettle-tree, polyg. monœc. and amentaceæ, S. tr. and H. tr. Eur. and Amer. which require only common soil and culture, and are increased by seeds or layers, or by cuttings.

Cenchrus, trian. monog. and gramineæ, a S. tr. and H. an. India; grasses of the easiest culture.

Cenia, syngen. polyg. super. and corymbiferæ, H. an. C. B. S. of common culture, 1662.

Centaurea, centaury, syngen. polyg. frustra. and cynarocephaleæ, G. F. and H. peren. bien. and an. Eur. of common culture.

Centaurea benedicta, the blessed thistle, 1402.

Centunculus, bastard pimpernel, tetran. monog. and primulaceæ, a H. an. Brit. of common culture.

Cephaelis, pentan. monog. and rubiaceæ, S. tr. Jam. and Afr. which thrive in loam and peat, and cuttings root freely under a hand-glass in sand.

Cephalanthus, button-wood, tetran. monog. and rubiaceæ, a H. tr. N. Amer. which grows best in loam and peat, and is propagated by layers or ripened cuttings.

Cephalophora, syngen. polyg. æqual. and corymbiferæ, a F. peren. Chili, which grows in sand and peat, and young cuttings root readily under a hand-glass.

Cerastium, mouse-ear, chick-weed, decan. pentag. and caryophylleæ, H. peren. and an. Eur. of the easiest culture.

Ceratocarpus, monœc. monan. and chenopodeæ, a H. an. Tartary, of common culture.

Ceratonia, carob-tree, polyg. diœc. and leguminoseæ, a G. tr. Levant, which thrives well in loam and peat, and ripened cuttings root in sand under a hand-glass.

Ceratophyllum, hornwort, monœc. polyan. and naiadeæ, H. peren. Brit. aquatics, of easy culture, and increased by seeds.

Cerbera, pentan. monog. and apocyneæ, S. tr. S. Amer. and India, which grow in loam and peat, and cuttings root readily in sand under a hand-glass in moist heat.

Cercis, Judas-tree, decan. monog. and leguminoseæ, H. tr. Eur. and Amer. which grow in common soil, and are raised from seeds or layers.

Cerinthe, honeywort, pentan. monog. and boragineæ, a H. tr. and an. Eur. of common culture.

Cestrum, pentan. monog. and solaneæ, S. and G. tr. E. and W. Ind. which grow well in loam and peat, and cuttings root in sand under a hand-glass.

Cels, Mr., Francois, C. M. H. S. an eminent nurseryman at Mont-Rouge, Paris, 59.

Ceylon, gardening of, 171.

Cedar of Lebanon, — see Pinus.

Celery, — see Apium.

Cedar of Goa, cupressus lusitanica.

Celandine, — see Chelidonium.

Centaury, — see Centaurea.

Ceruti, Joseph Ant. Joach. his works on gardening, 2284. A. D. 1792.

Cederhelm, Baron Karl Wilhelm, his works on gardening, 2284. A. D. 1740.

Chærophyllum, chervil, pentan. dig. and umbelliferæ, H. peren. bien. and an. Eur. and N. Amer. of the easiest culture.

Chamædorea, diœc. hexan. and palmeæ, a S. tr. Caracas, which grows in sandy loam and a strong moist heat, and is propagated by seeds.

Chamærops, polyg. diœc. and palmeæ, S. tr. S. Eur. and N. Amer. palms requiring the same treatment as chamædorea.

Chaptalia, syngen. polyg. necess. and corymbiferæ, a H. peren. N. Amer. best cultivated in loam and peat in pots.

Chara, monœc. monan. and naiadeæ, H. an. Brit. aquatics of easy culture.

Cheilanthes, cryptog. filices, and filiceæ, G. and H. peren. As. and Amer. ferns which grow in loam and peat, and require to be kept in a moist shaded situation.

Cheiranthus, wall-flower, tetrad. siliq. and cruciferæ, G. and H. tr. and peren. Eur. and As. under-shrubs and evergreen herbs, of easy culture in light soil, and propagated by seeds or cuttings.

Chelidonium, celandine, polyan. monog. and papaveraceæ, H. peren. Eur. of the easiest culture.

Chelone, didyn. angios. and bignoniaceæ, H. peren. N. Amer. elegant plants which grow in loam and peat, and are propagated by cuttings or dividing the root.

Chenolea, pentan. monog. and chenopodeæ, a G. tr. C. B. S. which grows in rich light soil, and cuttings root freely under a hand-glass.

Chenopodium, goose-foot, pentan. dig. and chenopodeæ, G. peren. and H. peren. and an. Eur. and Amer. of the easiest culture.

———— bonus-henricus, 1333.

———— urbicum, 1410.

Cherleria, decan. trig. and caryophylleæ, a H. peren. Scot. a rock-work plant which grows in loam and peat, and is increased by dividing at the root.

Chimaphila, decan. monog. and ericeæ, H. tr. N. Amer. rather difficult to preserve; they grow best in a bed of peat, and seldom transplanted.

Chiococca, snow-berry, pentan. monog.

and rubiaceæ, a S. tr. Jam. which thrives well in loam and peat, and cuttings root freely in sand under a hand-glass.

Chionanthus, fringe-tree, dian. monog. and oleineæ, H. tr. N. Amer. of great beauty, which grow in good loamy soil, and are increased by seeds or grafting on the common ash.

Chironia, pentan. monog. and gentianeæ, G. tr. C. B. S. which grow in peat with a little loam, and young cuttings root under hand-glasses in the same soil.

Chlora, yellow-wort, octan. monog. and gentianeæ, a H. an. of common culture.

Chloranthus, chulan, tetran. monog. and Loranthaceæ a G. tr. China; which may be treated as chenolea.

Chlorophytum, hexan. monog. and asphodeleæ, a S. and G. peren. Afr. which grow in loam and peat, and are increased by dividing at the root or by seeds.

Chomelia, tetran. monog. and rubiaceæ, a S. tr. W. Ind. which grows in loam and peat, and cuttings root readily in sand under a hand-glass in heat.

Chondrilla, syngen. polyg. æqual. and cichoraceæ, a H. peren. France, which grows best in peat soil, and is increased by seeds or dividing at the root.

Chorispermum, tetrad. siliq. and cruciferæ, a H. an. of common culture. 1662.

Chorizema, decan. monog. and leguminoseæ, G. tr. N. Hol. which grows in sandy loam and peat, and produces seed in abundance.

Chrysanthemum, syngen. polyg. super. and corymbifereæ, a G. tr. and H. an. and peren. which grow in common garden soil, and are increased by dividing the root, or by cuttings, or seeds.

———————— leucanthemum, 1413.

———————— indicum,—see Anthemis.

Chrysanthellum, syngen. polyg. frustran. and corymbifereæ, a S. an. W. Ind. of common culture, 1749.

Chrysobalanus, cocoa-plum, icos. monog. and rosaceæ, a S. and G. tr. W. Ind. and Georgia, which grow in sandy loam, and large cuttings taken off at a joint, with their leaves uninjured, and planted thinly in a pot of sand, under a hand-glass, will strike root.

Chrysocoma, goldy-locks, syngen. polyg. æqual. and corymbifereæ, G. tr. C. B. S. and Eur. which thrive in loam and peat, and cuttings root readily under a hand-glass.

Chrysophyllum, star-apple, pentan. monog. and sapoteæ, S. tr. W. Ind. which thrive in sandy loam, and cuttings of ripened shoots root in sand under a hand-glass, with a strong moist heat.

Chrysoplenium, golden saxifrage, decan. dig. and saxifrageæ, H. peren. Eur. and Amer. which grow in shady moist places, and may be treated as marsh plants, 1670.

Chrysurus, trian. dig. and gramineæ, a H. an. of common culture, 1662.

Cherry,—see Prunus.

Charring wood, method of, 1870.

Charcoal, proportion in which it is afforded by different trees, 1787.

Chartreuse, nursery, at Paris, 57. 1482.

Chardin, Sir John, a Persian traveller, his notices on gardening, 11. 152.

Chron. Scot., Chronicles of Scotland, by Pittscottie, 113.

Chatelberault, a palace of the Duke of Hamilton, in France, and the name of an ornamental building in Hamilton-park, near Glasgow, 113.

Charleville-forest, a seat in the King's County, 115; described, 2256.

————, a seat in Wicklow, 2252.

Chapel Allerton, formerly the seat of R. A. Salisbury, Esq. situated near Leeds, 122. 2184.

Chartularies, deeds of tenure of the ancient religious houses, 133.

Chenar tree, platanus orientalis, 159,—see Platanus.

Chinampas, gardens of, 167.

Champs Elysées, a public garden at Paris, 50.

Chemin creux, (hollow way,) a suburban villa at Paris, 50.

Chapelle d'Isle, a retreat near Paris, 50.

Chambers, Sir William, 51. 111. 114. 150; as an author on gardening, 2283. A. D. 1757.

Charlottenburg, a royal residence near Berlin, 65.

Chaptal, the Count of, a distinguished French chemist and philosopher, 190. 365.; as a gardening author, 2284. A. D. 181..——

Chabanes, Marquis de, patentee of some improvements in stoves, and the application of heat to domestic purposes, 684.

Chapman, Mr. Robert, a British author on gardening, 2283. A. D. 1820.

Christie, Mr. William, a British writer on gardening, 2283. A. D. 1820.

Champier, Symphorien, a French writer on gardening, 2284. A. D. 1533.

Chesnée Monstereuil, Charles de la, a French author on gardening, 2284. A. D. 1654.

Chataigneraye, le Sieur de, a French writer on gardening, 2284. A. D. 1692.

Chomel, Noel, a French author on gardening, 2284. A. D. 1700.

Chambray, Louis, Marquis de, his works on gardening, 2284. A. D. 1765.

Chartreuse, le Reverend Peres de, their work on gardening, 2284. A. D. 1767.

Chassel, ———, his works on gardening, 2284. A. D. 1790.

Cherrier, J—— B——, his works on gardening, 2284. A. D. 1808.

Chesnil, Marquis de, his works on gardening, 2284. A. D. 1820.

Cherry-house, 1162, — see Prunus.
Chamomile, — see Anthemis.
Cherry-pepper, — see Capsicum.
Chervil, — see Chærophyllum,
Chestnut, — see Castanea.
Chickweed, — see Stellaria.
Christmas-rose, — see Heleborus.
Chaste-tree, — see Vitex.
Chawstick, gouania domingensis.
Cheese-rennet, galium verum.
Chick-pea, cicer arietinum.
Chocolate-nut, — see Theobroma.
Christ's thorn, zizyphus paliurus.
Chulan, — see Chloranthus.
Chermes, a genus of plant-louse, nearly allied to aphis, and generally confounded with the aphidæ, 1447.
Cheshire, gardens and residences of, 2193.
Chiswick-house, Middlesex, 745. 1162. described, 2135.
Charlton-house, Kent, 2147.
Chevening, a seat in Kent, 2148.
Chalfont-house, Buckinghamshire, 2154.
Chefden, Buckinghamshire, 2154.
Chippenham-park, Cambridgeshire, 2158.
Chalsey-farm, Berkshire, 2164.
Cheltenham, Gloucestershire, 2167.
Chaddesdon, a seat in Derbyshire, 107; described, 2177.
Chattesworth, a seat in Derbyshire, 2178.
Chipchase-castle, Northumberland, 2189.
Chillingham-castle, Northumberland, 2190.
Cholmondeley-hall, Cheshire, 2194.
Charlton-park, Wiltshire, 2200.
Charpentier, de Caussigny, his works on gardening, 2284. A.D. 18....
Christ, I —— L ——, his works on gardening, 2285. A.D. 1809.
Cicer, chick-pea, diadel. decan. and leguminoseæ, a H. an. of the easiest culture, 1664.
Cichorium, succory, syngen. polyg. æqual. and cichoraceæ, a F. bien. H. peren. and H. an. Eur. Afr. and India, of the easiest culture. C. endivia, the garden endive, 1353. C. Intybus, succory, 1354.
Cicuta, cow-bane, pentan. dig. and umbelliferæ, H. peren. Eur. and Amer. which grow best in marshy places, and are increased by seeds.
Cimicifuga, bugwort, polyan. pentag. and ranunculaceæ, H. peren. Eur. and N. Amer. of common culture, 1656.
Cinchona, pentan. monog. and rubiaceæ, S. tr. which grow in loam and peat, but not very freely, and ripe cuttings in sand under a hand-glass, in moist heat, will strike root.
Cineraria, syngen. polyg. super. and corymbiferæ, S. G. and H. tr. and peren. Eur. and C. B. S. plants of easy culture, and propagated by cuttings, division, or seeds.
Circæa, enchanter's nightshade, dian. monog. and onagrariæ, H. peren. Brit. creepers, which prefer moist shady situations, and grow in any soil.
Cissampelos, diœc. monad. and menispermeæ, a G. tr. and S. peren. S. Amer. climbers which grow freely in loam and peat, and cuttings root under a hand-glass.
Cissus, tetran. monog. and vitiaceæ, S. G. and H. tr. Amer. and Ind. of easy culture in peat and loam, or in garden earth, and readily propagated by cuttings; the S. and G. sorts in a moist heat, and the others in the shade under a hand-glass.
Cistus, rock-rose, polyan. monog. and cistineæ, G. F. and H. tr. Eur. and Amer. under-shrubs, which grow in common soil, or loam and peat, and may be increased by layers, or young cuttings taken off at a joint, and planted under a hand-glass; seeds are frequently produced, 1689.
Citharexylum, fiddle-wood, didyn. angios. and verbenaceæ, S. tr. W. Ind. which grow freely in loam and peat, and cuttings root in sand under a hand-glass.
Citrus, orange-tree, polyad. polyan. and auranteæ, G. tr. India and China, — see 1501.
—— aurantium, the orange, 1502.
—— medica, the lemon and citron, 1503.
—— acida, the lime, 1505.
—— decumana, the shaddock, 1506.
—— tribe, their propagation and culture, 1507 to 1510.
Cicely, — see Scandix.
Cion, — see Cyon.
Citizens' villas, 2026; management of, 2102.
Cladium, trian. monog. and cyperaceæ, a H. peren. Engl. a grass of the easiest culture.
Claytonia, pentan. monog. and portulaceæ, H. peren. and an. N. Amer. and Silesia, of the easiest culture.
Clematis, virgin's bower, polyan. polyg. and ranunculaceæ, S. and G. tr. climbers, which grow in light, rich soil, and young cuttings strike readily under a hand-glass in heat. The H. species grow in any soil, and are increased by layers, dividing at the root or seeds.
Cleome, tetrad. siliq. and capparideæ, S. tr. bien. and an. Ind. and Amer. which grow in rich, light soil, and are readily increased by cuttings or seeds.
Clerodendrum, didyn. angios. and verbenaceæ, S. and G. tr. Ind. and China, soil half loam, a quarter rotten-dung, and a quarter peat; they require a large pot to flower freely, and young cuttings root readily under a hand-glass.
Clethra, decan. monog. and ericeæ, a G. tr. and H. tr. N. Amer. the first thrives well in peat, with a little loam, and is propagated by cuttings or seeds; the hardy sorts grow in peat and sandy loam, and are generally increased by layers.
Cliffortia, diœc. polyan. and rosaceæ, G.

tr. C. B. S. which thrive well in loam and peat, and young cuttings root freely in sand under a bell-glass.

Clinopodium, wild basil, didyn. gymnos. and labiateæ, H. peren. Brit. and Egypt, which grow in any soil, and are increased by seeds or by dividing the roots.

Clitoria, diadel. decan. and leguminoseæ, S. tr. and an. Ind. and Amer. which thrive well in loam and peat, and ripened cuttings will root under a bell-glass in heat.

Clusia, balsam-tree, polyg. monœc. and guttiferæ, S. tr. which require a light sandy loam, and cuttings root freely in sand under a glass; in their natural state they grow on decaying or rotten barked trees.

Cluytia, diœc. gynan. and euphorbiaceæ, a S. tr. and G. tr. C. B. S. which grow in loam and peat, and young cuttings root readily in sand under a bell-glass.

Clypeola, treacle-mustard, tetrad. silic. and cruciferæ, a H. an. S. Eur. of the easiest culture, 1662.

Climate, as it affects gardening, 183, — see Gardening.

Climate of Great Britain, 606; study of, 610; artificial data, 611; thermometer, barometer, hygrometer, 612; rain-guage, 613.

Clouds, their terminology, &c. 605.

Clarke, Edward Daniel, L.D. D. author of Travels in Russia, 79. 103.

Claremont, a seat in Surrey, 109; described, 2141.

Clandon-place, a seat in Surrey, 2141.

Clayberry-hall, Essex, 2151.

Clarewell, a seat in Gloucestershire, 2168.

Clifton-hall, Nottinghamshire, 2179.

Clumber-park, Nottinghamshire, 2179.

Clowance, a seat in Cornwall, 2204.

Clydesdale-orchards, Lanarkshire, 2229.

Clackmannanshire, gardens of, 2233.

Clare-hall, a seat in the county of Dublin, 2251.

Clermont, a seat in Lowth, 2262.

Clare, county of, as to gardening, 2267.

Clover-hill, a seat in Roscommon, 2269.

Clonbrook, a seat in Galway, 2270.

Clusius, Carolus, his works on gardening, 2285. A.D. 1630.

Clemento y Rubio, Don Simon de Roxas, his work on gardening, 2290. A.D. 1807.

Clarici, Paulo Bartolomeo, 40; his work on gardening, 2286. A.D. 1726.

Clair's voyèes, (Fr.) open railings or barriers, 107.

Cluyt, Outger Augerius, (or Dirck, Dut.) 43, his works on gardening, 2287. A.D. 1631.

Clugny, a seat near Paris, 50.

Clary, — see Salvia.

Cloathing, the stems of trees, 1145.

Clearing-nut, strychnos potatorum.

Cleavers, galium aparine.

Cloud-berry, rubus chamæmorus.

Clover, — see Trifolium.

Clove-tree, caryophyllus aromaticus.

Clown's all-heal, stachys palustris.

Club-moss, — see Lycopodium.

Club-rush, — see Scirpus.

Climbers, vegetables which attach themselves to trees or other upright objects by their tendrils, or hooks, as the creepers do by their roots, and twiners by the convolving of their stems. Climbing herbaceous plants, 1665, — see Shrubs, Frame-plants, Greenhouse-plants, Dry-stove-plants, Stove-plants, &c.

Clipping, 815, — see Operations.

Cneorum, widow-wail, trian. monog. and terebintaceæ, a G. tr. S. Eur. which grows in light soil, and may be increased by cuttings or seeds.

Cnicus, horse-thistle, syngen. polyg. æqual. and cynarocephaleæ, H. peren. bien. and an. Eur. of common culture.

Cobœa, pentan. monog. and bignoniaceæ, a G. tr. Mex. a climber of easy culture, and propagated by seeds, or struck from cuttings under a hand-glass in a little moist heat.

Coccosypsilum, tetran. monog. and rubiaceæ, a S. peren. W. Ind. a creeper which grows freely in loam and peat, and cuttings root in sand under a hand-glass.

Coccoloba, seaside grape, octan. trig. and polygoneæ, S. tr. Ind. which grow freely in light, loamy soil, and cuttings taken off at a joint will root in sand under a hand-glass; the leaves must not be shortened.

Cocculus, diœc. dodec. and menispermeæ, S. tr. E. Ind. climbers which require plenty of room to flower, and grow in loam and peat; cuttings root easily under a hand-glass.

Cochlearia, scurvy-grass, tetrad. silic. and cruciferæ, H. peren. tr. and an. Eur. of common culture.

———— officinalis, the common scurvy-grass, 1365. armoracia, the horse-radish, 1375.

Cocos, cocoa-nut tree, monœc. hexan. and palmeæ, S. tr. E. and W. Ind. palms of the usual culture, — see Chamærops.

—— nucciferæ, the cocoa-nut, 1534.

Codarium, dian. monog. and scrophularineæ, a S. tr. Guinea, which grows in loam and peat, and ripened cuttings will root in sand under a hand-glass in heat.

Codon, decan. monog. and solaneæ, a G. bien. C. B. S. of easy culture, 1664.

Coffea, coffee-tree, pentan. monog. and rubiaceæ, a S. tr. Arabia and W. Ind. which thrives well in loam and peat, and ripened cuttings root easily in sand under a hand-glass in heat.

Coix, job's tears, monœc. triand. and gramineæ, S. peren. E. Ind. grasses which grow readily in light, rich soil, and seed plentifully.

Colbertia, polyan. pentag. and dilleniaceæ, a S. tr. E. Ind. which thrives in loam and peat, and ripened cuttings, not deprived of their leaves, root freely in sand under a hand-glass.

Colchicum, meadow saffron, hexan. trig. and melanthaceæ, H. peren. Eur. bulbs flowering in autumn, — see 1658.

Coldenia, tetran. tetrag. and boragineæ, a S. and E. Ind. of common culture.

Collinsonia, dian. monog. and labiateæ, a G. peren. an H. peren. N. Amer. of common culture; they prefer rather a moist situation.

Columnea, didyn. angios. and scrophularineæ, S. tr. W. Ind. of easy culture, and easily lost; it grows well in loam and peat, and strikes readily from cuttings, but will soon rot or damp off if it have too much water, or stand in a damp part of the house.

Colutea, bladder senna, diadel. decan. and leguminoseæ, H. tr. Eur. of easy culture, increased by seeds.

Comarum, icos. polyg. and rosaceæ, H. peren. Brit. marsh plants, 1670.

Commelina, trian. monog. and commelineæ, S. and G. peren. and an. and H. peren and an. Amer. all of which grow freely in sandy loam and peat, and are increased by dividing the root or by seed.

Commersonia, pentan. pentag. and meliaceæ, a S. and G. tr. N. Hol. which grow well in loam and peat, and cuttings root readily under a hand-glass in sand.

Comocladia, maiden-plum, trian. monog. and terebintaceæ, S. tr. W. Ind. which grow in loam and peat, and ripened cuttings in sand under a bell-glass in moist heat will strike root.

Comptonia, monœc. trian. and amentaceæ, a H. tr. N. Amer. which thrives best in peat soil, and is increased by layers.

Conium, hemlock, pentan. dig. and umbelliferæ, a G. tr. and H. bien. and an. Eur. C.B.S. and Barbary, which grow in any soil, and are increased by seeds.

Conocarpus, button-tree, pentan. monog. and combretaceæ, S. tr. W. Ind. which thrive well in loam and peat, and cuttings root in sand under a hand-glass in heat.

Convallaria, lily of the valley, hexan. monog. and smilaceæ, a H. peren. Brit. of easy culture.

Convolvulus, bind-weed, pentan. monog. and convolvulaceæ, tr. peren. and an. Eur. and Amer. of all the departments of culture, mostly twiners, which grow readily in any soil, and are increased by he root or seeds, and some by cuttings in sand.

Convolvulus batatas, the sweet or Spanish potatoe, 1539.

——— soldanella, 1413.

Conyza, fleabane, syngen. polyg. super. and corymbifereæ, tr. peren. and an. Eur. As. Amer. of all the departments which grow freely in loam and peat, and are increased by cuttings or seeds.

Cookia, wampee-tree, decan. monog. and aurantiæ, a S. tr. China, which thrives well in sandy loam, and ripened cuttings not deprived of any of their leaves, root in sand under a hand-glass in moist heat.

Copaifera, balsam of capevi, decan. monog. and leguminoseæ, a S. tr. S. Amer. which prefers a sandy loam, and ripened cuttings root in sand under a hand-glass.

Coptis, polyan. polyg. and ranunculaceæ, a H. peren. N. Amer. which grows best in pots and in peat soil, and is increased by dividing at the root.

Corallorhiza, gynan. monan. and orchdieæ, a H. peren. Scot. which grow best in peat soil, and is increased by seeds.

Corchorus, polyan. monog. and tiliaceæ, S. tr. and an. Ind. Amer. which thrive in rich soil, and root readily from young cuttings; and a H. tr. of easy culture, and which roots from cuttings as readily as the common willow.

Cordia, pentan. monog. and boragineæ, S. tr. and a peren. E. and W. Ind. which grows in loam and peat, and cuttings root freely in sand under a hand-glass in heat.

Coreopsis, syngen. polyg. frustr. and corymbifereæ, S. peren. bien. and an. W. Ind. and Amer. which grow freely in rich, light earth, and cuttings root under a hand-glass; and F. and H. peren. of easy culture.

Coriandrum, coriander, pentan. dig. and umbelliferæ, H. an. Eur. of easy culture.

——— sativum, the common coriander, 1394.

Coriaria, diœc. decan. and ...., a H. tr. S. Eur. of easy culture, increased by layers or suckers.

Coris, pentan. monog. and primulaceæ, a G. bien. S. Eur. of common culture, 1564.

Corispermum, tickseed, monan. dig. and chenopodeæ, H. an. of common culture, 1662.

Cornucopiæ, trian. monog. and gramineæ, a H. an. Levant, a grass of easy culture.

Cornus, dog-wood, tetran. monog. and caprifoleæ, H. tr. and peren. Eur. and N. Amer. of easy culture, excepting the two perennial species, which grow best in pots, or in a bed of peat.

Cornutia, didyn. angios. and verbenaceæ, a S. tr. W. Ind. which thrives in loam and peat, and cuttings root in sand under a hand-glass.

Coronilla, diadel. decan. and leguminoseæ, G. tr. Eur. which thrive well in loam and peat, and increase by cuttings or seeds; and H. tr. and peren. of common culture.

Coronopus, wart-cress, tetrad. silic. and cruciferæ, H. an. Brit. of easy culture.

Corræa, octan. monog. and diosmaceæ, G. tr. which thrive well in sandy loam and peat; and ripened cuttings root freely in sand under a bell or hand-glass.

Corrigiola, strapwort, pentan. trig. and portulaceæ, a H. an. Eng. of common culture, 1662.

Cortusa, bear's ear, sanicle, pentan. monog. and primulaceæ, a H. peren. Austria, which grows best in pots in loam and peat, and is increased by seeds or dividing at the root.

Corydalis, diadel. hexan. and papaveraceæ, H. peren. Eur. and Amer. which thrive in light rich soil, and are increased by dividing the roots, or by seeds.

Corylus, nut-tree, monœc. polyan. and amentaceæ, H. tr. Eur. and N. Amer. the common nut-tree, and garden-filberd, 1478. 1932.

Corypha, fan-palm, hexan. monog. and palmeæ, a S. tr. which grows in light soil and strong moist heat.

Cotta, —— his works on gardening, 2285. A.D. 1817.

Corthum, I. E. his works on gardening, 2285. A.D. 1814.

Comparetti, Andrea, his works on gardening, 2286. A.D. 1798.

Coombe-abbey, Warwickshire, 2175.

Colwick-hall, Nottinghamshire, 2179.

Coleby-hall, Lincolnshire, 2180.

Copgrove, a seat in Yorkshire, 2185.

Colgarth, a seat in Westmoreland, 2195.

Corby-castle, Cumberland, 2196.

Cowesfield-house, Wiltshire, 2199.

Collipriest-house, Devonshire, 2203.

Cotchell-house, Cornwall, 2204.

Comely-bank nursery, Midlothian, 2218.

Collington-house, Midlothian, 2218.

Colon, a seat in Lowth, 2262.

Cork botanic-garden, 2264.

Cowley, Abraham, the poet, as a British author on gardening, 2283. A.D. 1662.

Cotton, Charles, Esq., a British writer on gardening, 2283. A.D. 1675.

Collins, Samuel, Esq. a British writer on gardening, 2283. A.D. 1717.

Cowel, John, a British author on gardening, 2283. A.D. 1729.

Coventry, Francis, his works on English gardening, 2283. A.D. 1753.

Cobbett, William, as a writer on gardening, 2283. A.D. 1821.

Correa de Serra, Joseph, as a British author on gardening, 2283. A.D. 1821.

Cognatus, a name assumed by Gilbert Cousin, a French author on gardening, 2284. A.D. 1546.

Cornus, George, a French author on gardening, 2284. A.D. 1560.

Cointerreaux, Francois, his works on gardening, 2284. A.D. 1800.

Commelin, his works on gardening, 2287. A.D. 1676.

Colla, Luigi, his works on gardening, 2286. A.D. 1813.

Cosmea, syngen. polyg. frustran. and corymbiferæ, a G. peren. and an. Mexico, of common culture.

Costus, monan. monog. and scitamineæ, S. peren. India and S. Amer. reedy or marsh plants, increased by dividing at the root.

Cotula, syngen. polyg. super. and corymbiferæ, S. G. and H. an. C. B. S. of easy culture.

Cotyledon, navel-wort, decan. pentag. and sempervivеæ, G. tr. and a peren. C. B. S. succulents of easy culture; and H. peren. rock-work plants, propagated by seeds or dividing the root.

Coccus, hesperidum, to destroy, 1481.

Conservatory, a habitation for ornamental plants of moderate temperature, in which the greater part are planted in a bed of soil, and allowed to attain a considerable size; examples of, 1562. 1598; situation as to the mansion, 2008.

Cold-houses, for plants, 1606.

Constantinople, gardens of, 103.

Cook, Moses, 107; a gardening author, 2283. A.D. 1676.

Cours, Comp. d'Ag. Nouveau Cours Complet d'Agricultur, &c.

Coxe, William, Esq. 163; his work on fruit-trees, 2291. A.D. 1817.

Cole, coleworts, cale, kale, (keale, *Sax.* or caulis, a stem, *Lat.*) cabbage-plants of the brassica tribe, whose leaves are used before they form a head, — see Brassica.

Contracting gardeners, or new-ground workmen, 2071.

Collectors for gardens, 2076.

Counsellors, or garden artists, 2082.

Connoisseurs of gardening, 2090; their garden arrangements, 2101.

Country residences of England, 2128; of Wales, 2205; of Scotland, 2218; of Ireland, 2251.

Covent, or Convent-garden market, its gardening productions with their average prices, 2130.

Cornwall, gardens and residences of, 2204.

Cobham-place, a seat in Surrey, 2141.

Cobham-hall, Kent, 2148.

Coopersale, a seat in Essex, 2150.

Colne-park, Essex, 2151.

Copford-hall, Essex, 2151.

Copped-hall, Essex, 2151.

Cockenhatch, a seat in Hertfordshire, 2152.

Colney-house, Hertfordshire, 2152.

Coombe-lodge, a seat in Oxfordshire, 2162.
Coleshill-house, Berkshire, 2162.
Coccinella, lady-cow, or lady-bird, an insect of the coleopterous order, 1688.
Convenience, as expressive of design in gardening, 1955; as to mansions, 2007.
Cotton-thistle, — see Onopordum.
Couch-grass, triticum repens.
Cow-bane, — see Cicuta.
Cow-itch, — see Stizolobium.
Cow-parsnep, — see Heracleum.
Cowslip, — see Primula.
Cow-wheat, — see Melampyrum.
Coppice-wood, or copse-wood (from couper, to cut, Fr.); woods which may be cut periodically, — see 1800. 1848. 1860.
Copse, — see Coppice.
Compost, composed soil, or composed dung; a mixture of earths, or of earths and manures, or of manures alone; and hence the terms compost soil, and compost manure, 862.
——— ground, a place for laying and preparing composts, — see Kitchen-garden.
Corsfield-house, Wiltshire, 2200.
Coniferous trees, their culture and management, 1880.
Contortion, in plants, 497.
Consumption in plants, 498.
Cochlearium, or snailery, 748.
Columbarium, or pigeonry, 748.
Cottage-gardens, their managemement, 2095.
Cottage, different kinds of, 749.
——— ornée, 2024.
——— en verger, 2025; cottage and garden, of labourers, 3036; of artificers, 2096.
Composts, to collect and form, 870—873.
Cocoa-nut, — see Coccos.
Coffee-tree, — see Coffea.
Coriander, — see Coriandrum.
Costmary, — see Balsamita.
Cowslip, — see Primula.
Com. Got. Commentarii societatis regiæ scientiarum Gottingensis.
Cockscomb, — see Celosia.
Cocksfoot-grass, — see Dactylis.
Cocoa-plum, — see Chrysobalanus.
Cogwood-tree, Laurus chloroxylon.
Colewort, — see Crambe.
Colpoon-tree, cassine colpoon.
Coltsfoot, — see Tussilago.
Columbine, — see Aquilegia.
Common acacia, — see Robinia.
Comfrey, — see Symphytum.
Common dragon, arum dracunculus.
Contrajerva root, dorstenia contrajerva.
Coral-tree, — see Erythrina.
Cork-tree, quercus suber.
Cornelian-cherry, cornus mascula.
Corn flag, — see Gladiolus.
Cotton-tree, — see Gossypium.
Cotton-grass, — see Eriophorum.
Cotton-rose, filago pygmæa.
Crambe, colewort, tetrad. silic. and cruciferæ, G. tr. and peren. and an. Eur. and Amer. which thrive in rich light soil, and are increased by seed or dividing the root.
——— maritima, the sea cale, 1344.
Crassula, pentan. pentag. and semperviveæ, G. tr. peren. and an. and H. an. C. B. S. succulents of easy culture.
Cratæva, garlick-pear, dodec. monog. and capparideæ, S. tr. W. Ind. and Afr. which grow in loam, peat, and rotten dung, and are increased by cuttings in sand under a hand-glass.
Crepis, syngen. polyg. æqual. and cichoraceæ, H. tr. peren. bien. and an. Eur. of easy culture.
Crescentia, calabash tree, didyn. angios. and solaneæ, S. tr. W. Ind. which grow in loam and peat, and well-ripened cuttings root in sand under a hand-glass in moist heat.
Crinum, hexan. monog. and amaryllideæ, S. G. peren. Amer. and Ind. which grow in rich loam with dung, in large pots, and are increased by suckers, or by seeds.
Cristaria, monad. polyan. and malvaceæ, a H. peren. Missouri, which grows only in peat in a shaded border, and increases slowly by seeds, or dividing at the root.
Crithmum, samphire, pentan. dig. and umbelliferæ, a G. bien. and H. peren. which grow in light sandy soil, and are increased by seeds or dividing at the roots.
——— maritimum, the common samphire, 1408.
Crocus, trian. monog. and irideæ, H. peren. Asia and Eur. bulbs of the easiest culture, 1631. — see nine species described, with their culture.
Crossandra, didyn. angios. and acanthaceæ, a S. tr. E. Ind. which thrives well in rich light soil, and cuttings root in sand, under a hand-glass.
Crotalaria, diadel. decan. and leguminoseæ, S. and G. tr. bien. and an. E. Ind. and Afr. which grow in loam and peat, and are increased by young cuttings in sand under a bell-glass; some species ripen seeds.
Croton, monœc. monad. and euphorbiaceæ, S. tr. and an. Ind. Amer. and Eur. which grow in loam and peat, and cuttings with their leaves on, root in sand under a hand-glass.
Crowea, decan. monog. a G. tr. N. S. W. which grows in sandy loam and peat, in an airy situation, and not over-watered, and cuttings root freely in sand under a bell-glass.
Crucianella, crosswort, tetran. monog. and rubiaceæ, G. and H. tr. and an. Eur. of common culture.
Crypsis, trian. dig. and gramineæ, a H. an. Eur. a grass of easy culture.

Cryptarrhena, gynan. monan. and orchideæ, a S. peren. a parasite, which may be treated as aërides.

Cryptospermum, tetran. monog. and nyctagineæ, a G. peren. N. S. W. which grows in loam and peat, and cuttings root freely under a hand-glass in sand.

Cryptostemma, syngen. polyg. frustran. and corymbifereæ, H. an. C. B. S. of common culture, 1662.

Cranberry, — see Oxycoccus.

Cress, — see Lepidium.

Cracow, gardens of, 90. 92.

Craigie-hall, a seat near Edinburgh, 113.

Crichton, formerly a distinguished seat near Edinburgh, 123.

Cranesbill, — see Geranium.

Cress rocket, — see Vella.

Crosswort, — see Crucianella.

Crowberry, — see Empetrum.

Crowfoot, — see Ranunculus.

Crauford-lodge, Middlesex, 2134.

Croome-court, Worcestershire, 2169.

Crauford-bridge, Northamptonshire, 2183.

Croxdale-hall, Durham, 2187.

Crewe-hall, Cheshire, 2194.

Cranbury-house, Hampshire, 2197.

Crux Easton, a seat in Hampshire, 2127.

Crailing-house, Roxburgshire, 2221.

Cree-house, Kircudbrightshire, 2225.

Cromartyshire, in respect to gardening, 2243.

Craggan, a seat in Westmeath, 2260.

Crawford, Mr. William, a British author on gardening, 2283. A.D. 1814.

Crichton, Mr. Daniel, a British author on gardening, 2283. A.D. 1814.

Cramer, John Andrew, his works on gardening, 2285. A.D. 1766.

Crome, G., his work on gardening, 2285, A.D. 1811.

Cucubalus, campion, decan. trig. and caryophylleæ, a H. peren. Eng. of common culture.

Cucumis, cucumber, monœc. monad. and cucurbitaceæ, F. and H. an. India and C. B. S. of common culture in rich soil.

Cucumis sativus, the common cucumber, 1500; culture of in hot-beds, 1251; treatment till removed to the fruiting-bed, 1251; forming the fruiting-bed, 1253; air, 1255; water, 1256; training, 1257; growing under hand-glasses, 1259; culture in a flued pit, 1260; in M'Phail's pit, 1261; in a common pit, 1262; in stoves, 1262; in Weeks's patent frame, 1262.

Cucumis melo, the melon, 1499; culture of, 1263; soil and sorts, 1264; time of beginning to force, 1265; forming the seed-bed, choice of seed, sowing, 1265; treatment till removed to the fruiting-bed, 1266; forming the fruiting-bed, moulding, planting, 1266; temperature, 1267; air, 1268; water, 1269; earthing, 1269; training, 1270; setting, 1271; cutting the fruit, and saving seed, 1271; second crop from the same plants, 1272; late crops on old hot-beds, 1273; insects and diseases, 1273; culture of melons in a dung-pit, 1274; in a flued pit, 1274; in M'Phail's pit, 1275; under hand-glasses, 1276.

Cucurbita, gourd, monœc. monad. and cucurbitaceæ, F. and H. an. Ind. and S. Eur. of common culture in rich soil.

Cucurbita pepo, the pompion; C. citrullus, the water melon; C. melo pepo, the squash gourd; C. verrucosa, the warted-gourd; C. lagenaria, the bottle-gourd, C. aurantia, the orange-fruited gourd; and C. succado, the vegetable-marrow gourd, 1391.

Cullumia, syngen. polyg. frustr. and corymbifereæ, G. tr. C. B. S. which thrive in loam and peat, and cuttings root in the same soil under a hand-glass.

Cuminum, cumin, pentan. dig. and umbelliferæ, a H. an. of common culture, 1662.

Cunila, dian. monog. and labiateæ, H. peren. N. Amer. and Eur. of common culture, 1656.

Cabieres, ——, Ainé, his works on gardening, 2284, A. D. 1803.

Culland's Grove, Middlesex, 2134.

Cusworth-hall, Yorkshire, 2185.

Culzean Castle, in Ayrshire, 2227.

Cullen-house, in Banfshire, 2240.

Cushing, ——, a British writer on gardening, 2283, A. D. 1812.

Cumming, Robert, M. D., a British writer on gardening, 2283, A. D. 1813.

Cullum, The Rev. Thomas Gery, a British writer on gardening, 2283, A. D. 1820.

Curtains for shelter, — see Structures.

Curten, ——, his writings on gardening, 2284, A. D. 1798.

Cunonia, decan. dig. and cunoniaceæ, a G. tr. C. B. S. which grows in loam and peat, ripened cuttings will root in sand under a hand-glass.

Cuphea, dodec. monog. and salicareæ, a S. tr. and bien. and G. bien. and an. Amer. of common culture.

Cupressus, cypress, monœc. monad. and coniferæ, G. tr. Amer. and C. B. S. which grow well in loam and peat, and cuttings root in sand under a bell-glass; and H. tr. which grown in common soil, and are raised from seeds.

Curatella, polyan. dig. and magnoliæ, a S. tr. S. Amer. which thrives in sandy loam, and cuttings root in a pot of sand under a hand-glass.

Curculigo, hexan. monog. and asphodeleæ, S. and G. peren. E. Ind. bulbs of the usual culture.

Curcuma, turmeric, dian. monog. and scitamineæ, S. peren. E. Ind. reedy marsh plants, increased by division at the root.

Curtisia, hassagay-tree, tetran. monog. and ……………………, a G. tr. C. B. S. which thrives in loam and peat, and ripened cuttings, root under a hand-glass in sand.

Cuscuta, dodder, pentan. dig. and convolvulaceæ, a G. an. and H. peren. and an. Eng. and China; parasites which may be sown at the root of any branchy plant, and they will spring up, and attach themselves to it, — see 1678.

Cussonia, pentan. dig. and araliæ, G. tr. C. B. S. which thrive in sandy loam, and cuttings root in sand under a hand-glass.

Curculio, the weevil, a coleopterous insect which inhabits grain, nuts, and other seeds, — see Corylus.

Curculio nucum, the filbert weevil, 1479.

Cuttings to propagate by, 918.

Curraghmore, a seat in Waterford, 115; described, 2263.

Curtis, William, F. L. S. 122; a British author on gardening, 2283, A.D. 1783.

Cucumber, — see Cucumis.

Currant, — see Ribes.

Cuckooflower, lychnis floscuculi.

Cumin, cuminum cyminum.

Custard-apple, — see Annona.

Culex, the gnat, a dipterous insect.

Cumberland, gardens and residences of, 2197.

Cuffhels, Hampshire, 2197.

Cutting, 814; see Operations.

Curtius, Benedictus, his works on gardening, 2287, A. D. 1580.

Cyanella, hexan. monog. and asphodeleæ, G. peren. C. B. S. bulbs of common culture.

Cyathea, cryptog. filices, and filiceæ, a S. peren. W. Ind. a fern of the usual culture, 1755.

Cycas, diœc. polyan. and palmeæ, S. tr. E. Ind. which grow in light soil and moist heat, and are increased by seeds.

Cyclamen, pentan. monog. and primulaceæ, a G. peren. and H. peren. Eur. which grow in loam and peat, and are increased by seeds; when not in a growing state, the tubers should have no water.

Cyclopia, decan. monog. and leguminoseæ, a G. tr. C. B. S. which grows in sandy loam and peat, and very young cuttings will root readily in sand under a bell-glass, care being taken to wipe the glass frequently to prevent their damping off.

Cydonia, quince, icos. di-pentag. and rosaceæ, F. and H. tr. Eur. and Amer. of easy culture, and increased by cuttings, layers, or grafting on thorn stocks.

Cydonia vulgaris, the common quince, pyrus cydonia, L. 1439.

Cylista, diadel. decan. and leguminoseæ, S. tr. Ind. climbers which succeed well in loam and peat, and cuttings will root in sand under a hand-glass.

Cymbaria, didyn. angios. and scrophularineæ, a H. peren. Dauria, a rock-work plant, which prefers light sandy soil, and may be increased by seeds.

Cymbidium, gynan. dian. and orchideæ S. peren. E. Ind. which thrive in sandy loam mixed with potsherds and bits of wood, and well drained; the species are increased by dividing at the root.

Cynanchum, pentan. dig. and asclepiadeæ, S. and G. tr. Eur. and C. B. S. climbers which thrive in loam and peat, and cuttings root freely in sand under a hand-glass; the H. peren. thrive in light soil, and increase freely by seeds or the root.

Cynara, artichoke, syngen. polyg. æqual. cynarocephaleæ, G. and H. peren. Eur. and C. B. S. of common culture.

Cynara scolymus, the garden artichoke, 1345.

——— cardunculus, the cardoon, 1346.

Cynodon, trian. dig. and gramineæ, a S. peren. and H. peren. Eng. and E. Ind. grasses of the easiest culture.

Cynoglossum, hound's-tongue, pentan. monog. and boragineæ, a G. bien. and H. peren. and an. Eur. and Amer. of easy culture.

Cynometra, decan. monog. and leguminoseæ, a S. tr. E. Ind. which grows in sandy loam, and large cuttings root in sand under a hand-glass in heat.

Cynosurus, dog's-tail grass, trian. dig. and gramineæ, a H. peren. and an. Eur. grasses of easy culture.

Cyperus, trian. monog. and cyperaceæ, S. G. and H. peren. and an. Eur. Ind. Amer. grasses of easy culture.

Cyperus esculentus, the rush-nut, 1548.

Cyphia, pentan. monog. and campanulaceæ, G. peren. C. B. S. which thrive in loam and peat, and cuttings root readily under a bell-glass in sand.

Cypripedium, lady's slipper, gynan. dian. and orchideæ, H. peren. Eng. and N. Amer. which will thrive only in peat soil and in the shade, and are the better of protection during winter; they are difficult to increase, but sometimes they perfect seeds.

Cyrilla, pentan. monog. and ericeæ, a G. tr. Carolina, which grows in sandy loam, and young cuttings root in sand under a bell-glass, but not freely.

Cyrtanthus, hexan. monog. and amaryllideæ, G. peren. C. B. S. bulbs which grow in sandy loam and peat, require plenty of water when in a growing state, but scarcely any when dormant.

Cyrtopodium, gynan. monan. and orchideæ, S. peren. Amer. requiring the same treatment as cymbidium.

Cysticapnos, diadel. hexan. and papaveraceæ, a H. an. C. B. S. of common culture.

Cytisus, diadel. decan. and leguminoseæ, G. F. and H. tr. Eur. As. and Amer. chiefly shrubs which prefer a light soil, and are propagated readily by seeds or layers.

Cytisus alpinus, the tree or Scotch laburnum, 1930.

——— laburnum, the shrubby laburnum, 1893.

Cyprinus auratus, the gold fish, 1566.

Cyrenaica, gardens of, 4.

Cynips, the gall-fly, a hymenopterous insect, 445. 1498. — see Quercus.

Cypress, — see Cupressus.

Cyon (cion, sion, or scion, a twig of a tree), in grafting, that part which is attached to the stock in order to become the future tree; the shoot engrafted on a stock, — see Grafting.

Cynips quercus folii, the gall-gnat, 1912.

Cyfartha, a seat in Brecknockshire, 2212.

Czartoryska, Princess Isabella, 90. 92; her work on gardening, 3289, A. D. 1808.

D.

Dactylis, cock's-foot grass, trian. dig. and gramineæ, H. peren. Eur. of the easiest culture.

Dæmia, pentan. dig. and asclepiadeæ, a S. tr. E. Ind. which grows in loam and peat, and cuttings root in sand under a hand-glass.

Dahlia, syngen. polyg. super. and corymbifereæ, H. peren. Mexico, 1640. A recent novelty in the culture of this plant consists in grafting young shoots on tubers, the invention of Mr. Blake, of Kensington Gore, — see Hort. Trans. vol. iv.

Dais, decan. monog. and thymeleæ, a G. tr. C. B. S. which grows freely in loam and peat, and may be increased by cuttings of the roots placed in a warm situation.

Dalbergia, diadel. decan. and leguminoseæ, S. tr. E. Ind. which do well in sandy loam, and ripened cuttings root under a hand-glass in sand.

Dalea, diadel. decan. and leguminoseæ, S. and G. an. and H. peren. Ind. and Amer. of common culture.

Dalechampia, monœc. monad. and euphorbiaceæ, a S. tr. W. Ind. a climber, which grows in sandy loam, and roots freely in sand under a hand-glass.

Dalibarda, icos. polyg. and rosaceæ, a H. peren. N. Amer. a creeper, which prefers peat soil and a shaded situation.

Damasonium, hexan. polyg. and hydrocharideæ, a S. peren. E. Ind. an equatic.

Dampiera, pentan. monog. and goodenoviæ, a G. peren. N. S. W. which grows well in loam and peat, and young cuttings root freely under a hand-glass.

Daphne, octan. dig. and thymeleæ, a S. tr. which thrives in loam and peat, and roots by cuttings under a hand-glass; and H. tr. under-shrubs, which prefer peat soil, and are increased by seeds or grafting on the d. laureola — see 1689.

Datisca, diœc. dodec. and resediaceæ, a H. peren. Candia, of common culture, 1656.

Datura, thorn-apple, pentan. monog. and solaneæ, H. an. Asia, Afr. of the easiest culture.

Daucus, carrot, pentan. dig. and umbelliferæ, H. bien. and an. Eur. of the easiest culture.

——— carota, the garden-carrot, 1323.

Davallia, cryptog. filices, and filiceæ, a G. tr. and peren. N. S. W. and Canaries, ferns, of common culture as such.

Daviesia, decan. monog. and leguminoseæ, G. tr. N. S. W. which grow in sandy loam and peat, and cuttings, not too ripe, will root readily in pots of sand under a hand-glass, without bottom heat.

Dalmeny-house, kitchen-garden at, 1079. 1084.; hot-houses there, 1160.

Darwin, Erasmus, M. D. 194; as a British writer on gardening, 2283. A.D. 1781.

Dalry, formerly a nursery near Edinburgh, 114.

Dalbeth, a seat near Glasgow, 125.

Damascena, the damson, or damascus plum, 20.

Daffodil, — see Narcissus.

Daisy, — see Bellis.

Dandelion — see Leontodon.

Date-palm, — see Phœnix.

—— plum, — see Diospyros.

Day-lily, — see Hemerocallis.

Darnel, — see Lolium.

Danson-hill, Kent, 2147.

Dailsford, a seat in Worcestershire, 2169.

Darton-park, Yorkshire, 2185.

Dan-y-park, a seat in Brecknockshire, 2216.

Dalmahoy, a seat in Midlothian, 2218.

Dalkeith-park, Midlothian, 113, 114. 123; described, 2218.

Dalhousie-castle, Midlothian, 2218.

Dawson's court hall, a seat in Queen's County, 2257.

Dancer's court, a seat in Tipperary, 2265.

Dalystown, a seat in Galway, 2270.

Davies, Mr. Henry, a British author on gardening, 2283. A.D. 1819.

Davy, Pere, a French author on gardening, 2284. A.D. 1560.

Dahuron, René, a French author on gardening, 3284. A.D. 1696.

D'Argenville, Dezallier Ant. Joseph, a French author on gardening, 2284. A.D. 1713.

Dallinger, Prosper, his works on gardening, 2285. A.D. 1798.

Dalmar, Basse N——, his works on gardening, 2284. A.D. 1800.

Dahlman, G —— T ——, his works on gardening, 2288. A.D. 1728.

Design, principles of, in landscape gardening, 1952.

Demesnes, gardens of, 2019; management, 2104.

Derbyshire, gardens and residences of, 2177.

Devonshire, gardens and residences of, 2203.

Denbighshire, gardens and residences of, 2208.

Delaford-park, Middlesex, 2134.

Deepden, a seat in Surrey, 2140.

Deene Thorp park, Northamptonshire, 2183.

Den of Rubislaw, a seat in Aberdeenshire, 2239.

Derry, county of, as to gardening, 2279.

Decorative buildings used in gardening, 749 to 780, — see Edifices.

De Combles, his works on gardening, 2284. A.D. 1745.

Desbois, F. A. A. de la Chesnaye, his works on gardening, 2284. A.D. 1751.

Delille, Jacques, the poet, his works on gardening, 2284. A.D. 1765.

Deuso, John Daniel, his works on gardening, 2284. A D. 1735.

De Caumels, ——, his works on gardening, 2284. A.D. 1816.

Delaunay, Mordaunt, his works on gardening, 1284. A.D. 1811.

Desfontaines, René, his works on gardening, 2284. A.D. 1809.

Deleuze, J —— P —— F ——, his works on gardening, 2284. A.D. 180.

Decumaria, dodec. monog. and myrteaceæ, a H. tr. Carolina, which grows in common soil, and cuttings root freely in sand under a hand-glass.

Deeringia, pentan. monog. and amaranthaceæ, a S. bien. E. Ind. of common culture.

Delphinium, larkspur, polyan. trig. and ranunculaceæ, H. peren. bien. and an. Europe and Amer. of common culture.

Dendrobium, gynan. monan. and orchideæ, S. peren. N. S. W. parasites, which may be treated as aërides; and G. peren. which thrive in sandy loam and peat, and are increased by dividing at the root.

Dentella, pentan. monog. and rubiaceæ, a H. an. N. Holl. of common culture, 1662.

Desmanthus, polyg. monœc. and leguminoseæ, S. tr. bien. and an. E. and Ind. which grow in loam and peat, and some of them, as d. natans, may be treated as aquatics; they are increased by seeds or young cuttings planted in sand under a bell-glass.

Deciduous trees, with showy flowers, 1681.

De Distrib. plant. Humbold, de distributione plantarum.

Decandolle, L. A. one of the most eminent French botanists, distinguished, like Mr. Brown of this country, by his knowledge and improvement of the Jussieuean system of classification.

Delville, a seat near Dublin, 115.

Delhi, gardens of, 153.

Decorum, in garden operations, 1079.

Decorative edifices, used in gardening, 749.

Decortication, 486,

Dew, theory of, 605.

Deadly carrot, atropa belladonna.

Deadly nightshade, — see Thapsia.

Devil's bit, scabiosa succisa.

Delve, (*Sax.*) to dig, — see Dig.

Dermestes, leather-beetle, or chaffer, a coleopterous insect.

Dianella, hexan. monog. and asphodeleæ, a S. peren. and G. peren. which grow in sandy loam and peat, and are increased by division at the root.

Dianthus, pink, decan. dig. and caroyphylleæ, a G. tr. and peren. and H. peren. bien. and an. Eur. and As. which thrive in light rich soil, and strike by cuttings or pipings and layers, in sandy loam under a hand-glass.

——— caryophyllus, the carnation, 1646.

——— hortensis, the pink, 1647.

Diapensia, pentan. monog. and ericeæ, a H. peren. Lapland, an alpine, which must be grown in small pots in peat soil, and protected during winter.

Dichondra, pentan. dig. and convolvulaceæ, a S. peren. and G. peren. N. S. W. and Jam. which thrive well in loam and peat, and cuttings root freely.

Dicksonia, cryptog. filices, and filiceæ, a S. tr. and peren. G. peren. and H. peren. ferns of common culture as such.

Dictamnus, fraxinella, decan. monog. and rutaceæ, a H. peren. Germ. of easy culture, and may be propagated by seeds, cuttings, or division at the root.

Didelta, syngen. poly. frustran. and corymbifereæ, G. tr. C. B. S. which thrive well in any rich light soil, and cuttings root freely under a hand-glass.

Diervilla, pentan. monog. and caprifoliæ, a H. tr. N. Amer. a low shrub of easy culture, and increased by suckers.

Digitalis, foxglove, didyn. angios. and scrophularineæ, G. tr. and H. peren. and an. Eur. of easy culture.

Digitaria, finger-grass, trian. dig. and gramineæ, H. an. of common culture, 1662.

Dilatris, trian. monog. and hemodoraceæ, G. peren. grasses of common culture.

Dillenia, polyan. polyg. and dilleniaceæ, S. tr. E. Ind. which grow in light loam, and ripened cuttings, not deprived of their leaves, root freely in sand under a hand-glass in heat.

Dillwynia, decan. monog. and leguminoseæ, G. tr. N. S. W. which grow in sandy loam and peat, with pots well drained, and young cuttings root freely in sand under a bell-glass.

Dimocarpus, octan. monog. and sapindeæ, S. tr. the litchi and longan. of the Chinese, China, which grow in rich loam, and have been cultivated for their fruit, 1527.

Dionæa, venus' flytrap, decan. monog. and droseraceæ, a G. peren. Carolina, which thrives best when planted in a pot of sphagnum, or common moss, with a little peat mould at the bottom of the pot, and the pot placed in a pan of water.

Dioscorea, diœc. hexan. and dioscoreæ, S. peren. E. and W. Ind. climbers of easy culture.

——— sativa and alata, the yam, 1538.

Diotis, monœc. tetran. and chenopodeæ, a H. tr. Siberia, which grows in any light soil, and is readily propagated by layers, and cuttings may be rooted under a hand-glass.

Diphylleia, hexan. monog. and berberideæ, a H. peren. N. Amer. which grows freely in a light, rich soil, and is increased by dividing at the root.

Diplazium, cryptog. filices, and filiceæ, a S. peren. Jamaica, a fern which grows in loam and peat in the shade, and is increased by seed or dividing at the root.

Dipsacus, teasel, tetran. monog. and dipsaceæ, H. bien. Eur. of common culture.

Dipterix, tonquin-bean, diadel. decan. and leguminoseæ, a S. tr. Guiana, which grows in light loam, and ripened cuttings root in sand under a hand-glass in a moist heat.

Dirca, leather-wood, octan. dig. and thymeleæ, a H. tr. Virginia, which grows best in peat earth, and is increased by layers: snails are particularly fond of this plant.

Disa, gynan. monan. and orchideæ, G. peren. C. B. S. which thrive in sand and peat, and require very little water when not in a growing state.

Disandra, heptan. monog. and pediculareæ, a G. peren. Madeira, a trailing plant of common culture.

Disperis, gynan. monan. and orchideæ, a G. peren. C. B. S. which may be treated as disa.

Diuris, gynan. monan. and orchideæ, a G. peren. N. S. W. requiring the same culture as disa.

Diosma, pentan. monog. and diosmeæ, G. tr. C. B. S. which thrive best in peat soil, and young cuttings root freely in sand under a bell-glass.

Diospyros, date plum, polyg. diœc. and ebenaceæ, S. an. G. tr. Italy, Amer. and India, which thrive well in light, loamy soil, and ripened cuttings succeed best in sand under a hand-glass in heat. D. kaki, the Japan date plum is increased by inarching or budding on the common kinds.

———, lotus, the Eur. date plum, 1532.

Diss. orient. gard. Chambers's Dissertation on Oriental Gardening.

Ditchley, a seat in Oxfordshire, 107. described, 2163.

Donnington-grove, Berkshire, 2164.

Diel, Aug. Fred. Adrian, M. D., 75. his works on gardening, 2385. A. D. 1799.

Dill, — see Anethum.

Dittany, origanum dictamnus.

Dill. elt. Joh. Jac. Dillenii Hortus Elthamensis.

Dig, (dician, *Sax.* to make a trench about,) to break or open up the ground with a spade; in gardening, to raise, reverse, and pulverize the surface-soil for eight or ten inches deep, — see Digging.

Digging, 797.

Dung-fork, — see Implements.

Dickson, James, and Co. British authors on gardening, 2283. A. D. 1749.

Dicks, John, of Knightsbridge, a British author on gardening, 2283. A. D. 1769.

Dickson, Mr. James, F. L. S., &c. a British author on gardening, 2283. A. D. 1805.

Dickson, Mr. Thomas, a British author on gardening, 2283. A. D. 1810.

Dick, Mr. John, a British gardening author, 2283. A. D. 1813.

Dietrich, Fr—— Gli——, his works on gardening, 2285. A. D. 1802.

Dorsetshire, gardens and residences of, 2201.

Donnington-park, Leicestershire, 2176.

Dogmersfield-park, Hampshire, 2197.

Downing, a seat in Flintshire, 2209.

Dol-y-Myllynllyn, a seat in Merionethshire, 2215.

Donegal, county of, as to gardening, 2278.

Down, county of, its gardens and residences, 2231.

Dodsley, Robert, as a British author on gardening, 2283. A. D. 1764.

Dove, John, a British writer on gardening, 2283. A. D. 1770.

Dow, the Rev. Anthony, a British writer on gardening, 2283. A. D. 1814.

Douette-Richardot, his works on gardening, 2284. A. D. 1808.

Dodartia, didyn. angios. and scrophularineæ, a H. peren. Levant, which thrives in rich, light soil, and is increased by seeds, or dividing at the root.

Dodecatheon, the African cowslip, pentan. monog. and primulaceæ, a H. peren. Virginia, which thrives in light loam, and is increased by dividing at the root.

Dodonæa, octan. monog. and terebintaceæ, S. and G. tr. Austral. Amer. and Africa, which thrive well in loam and peat, and are increased by cuttings under a bell-glass in sand.

Dolichos, diadel. decan. and leguminoseæ, S. and G. tr. bien. and an. which grow freely in light, rich soil, and are increased by cuttings under a hand-glass or by seeds, which many produce freely.

Dombeya, monad. dodec. and malvaceæ, a S. tr. Mauritius, which grows in sandy loam, and ripened cuttings root in a pot of sand in moist heat under a hand-glass.

Doodia, cryptog. filices, and filiceæ, a G. peren. N. S. W. a fern of the usual culture.

Doronicum, leopard's bane, syngen. polyg. super. and corymbiferesæ, H. peren. Eur. of common culture.

Dorstenia, tetran. monog. and urticeæ, Eur. and S. Amer. which grow freely in light, rich soil, and increase at the roots or by seed.

Doryanthes, hexan. monog. and amaryllideæ, a G. tr. N. S. W. which grows in loam and peat, and is increased by suckers.

Dorycnium, diadel. decan. and leguminoseæ, a G. tr. and peren. S. Eur. which thrive in loam and peat, and young cuttings planted under a bell-glass in sand root freely, or they may be raised from seeds.

Dornbach, a seat, and also a mountain near Vienna, 61.

Donn, James, F. L. S., curator of the Cambridge botanic garden, 119. his writings, 2283. A. D. 1796.

Don, George, of Forfar, 119.; as a British writer on gardening, 2283. A. D. 1810.

Don, David, librarian to A. B. Lambert, Esq. 2283. A. D. 1810.

Dog-wood, — see Cornus,

Doucin-stocks, 1426.

Dock, — see Rumex.

Dodder, — see Cuscuta.

Dog's-bane, — see Apocynum.

Dog's-cabbage, thelygonum cynocrambe.

Dog's-tail grass, — see Cynosurus.

Dog's-tooth violet, — see Erythronium.

Drill, (drillen, *Dut.* to bore holes with a drill,) a lengthened excavation formed in gardening by the hoe, for the purpose of inserting seeds. Sometimes drills are formed across beds by a large wide-toothed rake, and the same rake serves, when the plants are sprung up, to stir the soil between the rows.

Dreghorn-castle, Midlothian, 2218.

Dryburgh-orchard, in Berwickshire, 2220.

Drummond-castle, in Perthshire, 2236.

Drope, Francis, B. D. a British author on gardening, 2283. A. D. 1672.

Drummond, Mr. James, a British writer on gardening, 2283. A. D. 1818.

Dreyssig, ——, his works on gardening, 2285. A. D. 1809.

Draba, whitlow-grass, tetrad. silic. and cruciferesæ, H. peren. bien. and an. Eur. of easy culture.

Dracæna, dragon-tree, hexan. monog. and asphodeleæ, S. tr. E. Ind. which thrive well in light loam, and large cuttings stuck in the bark-bed when in a brisk heat root freely.

Dracocephalum, dragon's-head, didyn. gymnos. and labiateæ, a G. tr. and H. peren. and an. Eur. and Amer. of common culture.

Dracontium, dragon, heptan. monog. and aroideæ, S. peren. India, which grow in light, rich soil, and are increased by dividing at the roots.

Drimia, hexan. monog. and asphodeleæ, G. peren. C. B. S. bulbs which grow in sandy loam and decayed leaves.

Drosera, sundew, pentan. pentag. and droseraceæ, H. peren. Brit. which grow in watery bogs in peat-earth, but which will thrive and flower well when kept in small pots in the green-house. "The pots should be filled three parts full of peat-earth, and some moss placed on it, the droseræ then planted in the moss, and the pots placed in pans of water." *Sweet.*

Dryandra, tetran. monog. and proteaceæ, G. tr. N. Holl. which require the same treatment as banksia.

Dryas, icos. polyg. and rosaceæ, a H. peren. Brit. which thrives best in a border of peat, and may be increased by cuttings dividing at the roots or by seeds, which it produces in abundance.

Drypis, pentan. tetrag. and caryophylleæ, a H. bien. Italy, of common culture.

Dry-stove, its construction, 1599.

Dry-stove plants, 1730; woody sorts, 1731; climbing, 1732; succulent, 1733; bulbous, 1734; herbaceous, 1735.

Dry-rot, — see Merulius destruens.

Dronningaard, a seat in Denmark, 61.

Drottingholm, a royal garden near Stockholm, 68.

Dreghorn-castle, near Edinburgh, 114.

Dryander, Jonas, M. D. an eminent botanist and bibliographer, author of the Bibliotheca Banksiana, 119.

Dropsy, in plants, 492.

Draining, 850 to 852.

Dragon, — see Dracontium.

Dragon's-head, — see Dracolephalum.

Dragon-tree, — see Dracæna.

Dropwort, spirea filipendula.

Dumfriesshire, as to gardening, 2224.

Dumbartonshire, gardens of, 2230.

Duplin-castle, in Perthshire, 2236.

Dunkeld-house, in Perthshire, 2236.

Duff-house, Bamfshire, 2240.

Dunrobin-castle, Sutherlandshire, 2246.

Dunsay-castle, a seat in Eastmeath, 2259.

Dunsandle, a seat in Galway, 2270.

Duncombe, John, a British author on gardening, 2283. A. D. 1769.

Dunbar, Mr. John, a British writer on gardening, 2283. A. D. 1808.

Duchesne, Ant. Nicholas, his works on gardening, 2284. A. D. 1760.

Dupuy, ——, his tract on gardening, 2284. A. D. 1765.

Dubois, Louis, his works on gardening, 2284. A. D. 1804.

Duplessis, F —— S ——, his writings on gardening, 2284. A. D. 1802.

Dumont-Courset, his works on gardening, 2284. A. D. 1802.

Durand, ——, his works on gardening, 2284. A. D. 1784.

Durdos, ——, his writings on gardening, 2284. A. D. 1783.

Durival, Clement, his works on gardening, 2284. A. D. 1777.

Dutch books on gardening, 2287.

Du. Ham. Du. Hamel's Treatise on Fruit Trees.

Duhamel, — see Du. Hamel.

Duranta, didyn. angios. and verbenaceæ, S. tr. Amer. and W. Ind. which grow in loam and peat, and cuttings root freely in sand under a hand-glass.

Durio zibethinus, the durion, 1523.

Dunkeld, Perthshire, 1809.

Duddingston-house, in Midlothian, 114; described, 2218.

Duncan, Andrew, M. D. 133. 692; as a British writer on gardening, 2283. A. D. 1811.

Dublin, county of, its gardens and residences, 2251.

——— society, 142.

——— botanic garden, 143.

Du Halde, a missionary who wrote on China and its gardening, 150.

Duracina, hard skinned cherries, 19.

Dufresnoy, a French landscape gardener, 50.

Duck's-foot, — see Podophyllum.

Duck-weed, — see Lemna.

Dumb-cane, — see Arum.

Durham, gardens and residences of, 2187.

Durham-park, Middlesex, 2134.

Dunstbourne, Abbots, a seat in Gloucestershire, 2168.

Duncombe-park, Yorkshire, 2186.

Duckingfield-lodge, Lancashire, 2191.

Durham Massey, a seat in Cheshire, 2193.

Dunglass-house, East Lothian, 2219.

Dunse-castle, Berwickshire, 2220.

Du Petit Thouars, Le Chevalier Aubert, Aubert, de, his works on gardening, 2284. A. D. 1816.

Dwarf fan palm, chamerops humilis.

Dung, stable, how to manage for hot-beds, 864.

Dyrham, a seat in Gloucestershire, 2168.

E.

East Lothian, gardens of, 2219.

Eames, Mr., a landscape gardener, who died the beginning of the present century, 111.

Earth-nut, — see Bunium.

Earl's-court, Middlesex, 696.

Earl's-court villa, Middlesex, 2134.

Eastsheen, a seat at, in Surrey, 127.

East Indies, gardens of, 170.

East Hornden, a seat in Essex, 1226.

Earth-pea, lathyrus amphicarpos.

Ealing-grove, 2134.

Eastwick-house, Surrey, 2141.

Eastcliff-lodge, Kent, 2147.

Eastbury-house, Essex, 2150.

Easton-lodge, Essex, 2151.

Earl's stoke, Wiltshire, 2199.

Eastmeath, county of, its gardens and residences, 2259.

Ebn-Alwan, a Moorish prince, and patron of gardening, 98.

Ebourgeonnement or disbudding, — see Pruning, and Operations of Gardening.

Echinaria, trian. dig. and gramineæ, a H. an. S. Eur. of common culture.

Echinophora, sea parsnip, pentan. dig. and umbelliferæ, H. peren. Eur. which grow in light soil, and are increased by seeds.

Echinops, globe thistle, syngen. polyg. segreg. and corymbiferæ, H. peren. and an. Eur. of easy culture.

Echites, pentan. monog. and apocyneæ, S. and G. tr. W. Ind. which grow freely in loam and peat, and cuttings root readily under a hand-glass in sand.

Echium, viper's bugloss, pentan. monog. and borragineæ, G. tr. C. B. S. which grow in loam and peat, and may be raised from cuttings or seeds; and H. bien. and an. Eur. of common culture.

Eclipta, syngen. polyg. super. and corymbiferæ, a S. and H. an. of common culture, 1749 and 1660.

Edwardsia, decan. monog. and leguminoseæ, F. tr. N. Zeal. which grow in common soil, and are generally raised by seeds, but cuttings will root in sand under a bell glass.

Ed. Encyc. the Edinburgh Encyclopædia, conducted by Dr. Brewster.

Edible wild and other neglected plants, 1409; greens and pot herbs, 1410; roots, 1411; legumes, 1412; salads, 1413; teas, 1414; variously applicable, 1415.

——— fungi, 1417.

——— fuci, 1420.

Edger, a seat in Essex, 107.

Edwards, Mr. Sydenham, an eminent botanical painter, lately deceased, 122.

Edinburgh botanic garden, 123; described, 2218.

Eden farm, Kent, 2147.

Edwinsford, a seat in Caermarthenshire, 2217.

Edifices used in gardening, 706; economical buildings, 706; head-gardener's dwelling-house, 706; gardener's office, 707; and room, 708; fruit room, 709; root-cellar, 710; loft, 711; coal-house, 712; journeyman's lodge, 713; sheds, 714; entrance lodges and gates, 715; buildings for raising water, 716; wells, 716; pumps, 717; conduits, 718; reservoirs, 719; tanks, 720.

Anomalous buildings; ice-house, 721; bee-house, 723; Polish hives, 724; common hive, 725; glass hive, 726; storying hive, 727; hive of Palteau, 728; Huish's hive, 729; Howison's hive, 730; management of bees, 731; position of the apiary, 732; varieties of bees, 734; materials and size of hives, 734; situation for hives, 735; taking of bees, 736; covering the hives, 738; swarming, 738; taking the honey, 739; by total deprivation, 740; by suffocation, 741; aviaries, 742; for canary or song-birds, 743; parrots, 744; verdant aviary, 745; management, 746; menageries, 747; piscinaries, 748.

Edifices used in gardening; decorative buildings, useful class; cottages, 749; Gothic, Grecian, Chinese, Bengal, English, Scotch, Italian, Polish, Russian, Swedish, Danish, 749; primitive huts, 750; bridges, 751; fallen tree, foot plank, Swiss bridge, 751; bent plank, 752; of common carpentry, 753; of masonry, 754; of cast iron, 755; boat bridge, 756; sepulchral structures, 757; the gate, 758; maintenance of a gate's position, 759; gates as decorations, 761; schlagbaum, (falling beam,) 761; rails, 762.

Decorative buildings, convenient class, prospect tower, Kiosque, 763; temples, 764; porches and porticoes, 765; alcoves, 766; Italian arbor, 767; French arbor, 767; caves and caverns, 768; grottoes, 769; roofed seats, boat-houses, moss-houses, flint-houses, bark-huts, 770; elegant structures, 771; exposed seats, 772; swings, 773; constructions for displaying water, 774; waterfalls, 775; cascades, 776; jets and other hydraulic devices, 777; drooping fountains, 778; sun dials, 729; vanes, 780.

Decorative buildings, characteristic class, rocks, 781; ruins, 782; antiquities, 783; rarieties and curiosities, 784; monumental objects, 785; sculptures, 786; vegetable sculptures, 787; inscriptions, 788; eyetraps, 789, — see Structures used in Gardening.

Edifices of gardening, their farther improvement, 790.

Edwards'-square, London, mode in which it is laid out, 2041.

Education of gardeners, importance of, 2298; professional education, 2299; intellectual, 2303; moral, religious, and physical, 2305; economical, 2311.

Egg plant, — see Solanum.

Eglinton-castle, a seat in Ayrshire, 115. 123; described, 2227.

Egger-moth, — see Phalena.

Egham-park, Surrey, 2140.

Eggleston-house, Durham, 2187.

Ehreta, pentan. monog. and boragineæ, S. tr. E. and W. Ind. which grow in loam and peat, and cuttings root readily under a hand-glass.

Ehrhartia, hexan. monog. and gramineæ, a G. peren. C. B. S. a grass of common culture.

Ehrhart, Frederick, his works on gardening, 2285. A. D. 1782.

Eisenstadt, (Iron town,) a seat in Hungary, 63.

Ekebergia, decan. monog. and meleaceæ, a G. tr. C. B. S. which grows in loam and peat, and cuttings without their leaves shortened, root readily in sand under a hand-glass.

Ekeberg, Captain, 161; as an author, 2288. A. D. 1771.

Elvedon-hall, Suffolk, 2159.

Elvetham, a seat in Hampshire, 2197.

Elliot, Mr. Robert, a British writer on gardening, 2283. A. D. 1812.

——, John, Esq. F. R. S. a British author on gardening, A. D. 1819.

Elæagnus, oleaster, tetran. monog. and elæagneæ, S. and G. tr. Amer. and Ind. which grow in loam and peat, and ripened cuttings root freely in a pot of sand under a hand-glass.

Elæocarpus, polyan. monog. and guttiferеæ, a S. and G. tr. E. Ind and N. Hol. which may be treated like elæagnus.

Elæocharis, spike-rush, trian. monog. and cyperaceæ, H. bien. Eur. Afr. and Austral. marsh grasses is of easy culture.

Elæodendrum, olive-wood, pentan. monog. and rhamneæ, Afr. and Austral. which grow in loam and peat, and ripened cuttings root in sand under a hand-glass.

Elais, oily-palm, diœc. hexan. and palmeæ, a S. tr. a palm of the usual culture.

Elate, monœc. hexan. and palmeæ, a S. tr. E. Ind. a palm of easy culture.

Elatine, water-wort, octan. tetrag. and caryophylleæ, a H. an. of common culture.

Elegia, diœcia trian. and restiaceæ, G. peren. C. B. S. rush-like plants of easy culture.

Elephantopus, elephant's-foot, syngen. polyg. segr. and corymbiferæ, S. and G. peren. E. and W. Ind. which grow freely in loam and peat, and cuttings root in the same soil under a hand-glass.

Elettaria, monan. monog. and scitamineæ, S. peren. E. Ind. reedy marsh-plants of easy culture.

Eleusine, trian. dig. and gramineæ, a S. peren. and H. an. Ind. and Amer. of easy culture.

Elichrysum, syngen. polyg. super. and corymbifereæ, G. tr. and peren. which grow in sandy peat well drained, and cuttings root freely in sand in a frame on a hot-bed; but not covered with a bell-glass, otherwise they are apt to damp off.

Ellisia, pentan. monog. and boragineæ, a H. an. Virginia, of the usual culture. 1662.

Elsholtzia, didyn. gymnos. and labiateæ, a H. an. Siberia, of common culture. 1662.

Elymus, lime-grass, trian. dig. and gramineæ, H. peren. and an. Eur. and Amer. grasses of common culture.

Elytraria, dian. monog. and acanthaceæ, a H. peren. Carolina, of common culture, 1656.
Elder, — see Sambucus.
Elecampane, — see Inula.
Elm-tree, — see Ulmus.
Elephant apple, feronia elephantum.
Elephant's-foot, tamus elephantipes.
Ellis, William, a British author on gardening, 2283. A.D. 1738.
—— John, a British author on gardening, 2283. A.D. 1770.
—— Thomas, a British author on gardening, 2283. A.D. 1776.
—— Daniel, Esq., a British author on gardening, 2283. A.D. 1807.
Elsholtz, John Sigismond, his works on gardening, 2285. A.D. 1663.
Elcho-house, East Lothian, 125.
Elkinton, Mr., his system of draining, 573.
Electricity, 606.
Embryopteris, diœc. polyan. and ebenaceæ, a S. tr. E. Ind. which grows in sandy loam, and ripened cuttings root in sand under a hand-glass in moist heat.
Empetrum, crow-berry, diœc. trian. and ericeæ, a G. and H. tr. Eur. under-shrubs, which may be treated like erica.
Empleurum, monœc. tetran. and diosmaceæ, a G. tr. C. B. S. which grows freely in sandy peat, and cuttings strike root readily under a bell-glass in sand.
Emmerich, Lieut. Col. A., a British writer on gardening, 2283. A.D. 1789.
Emmerton, Mr. Isaac, 152; his works on gardening, 2283. A.D. 1816.
Embankments, 570.
Employers of gardeners, 2091.
Ember-court, Surrey, 2140.
Enkianthus, decan. monog. and ericeæ, a G. tr. China, which grows in sandy loam and peat, and ripened cuttings root readily in pots of sand under a hand-glass without bottom heat.
En-quenouille, (*Fr.*), a mode of training trees, 1104.
Entrance lodges and gates, 715.
Endive, — see cichorium.
Enchanter's nightshade, — see circæa.
E. B. and Eng. Bot. } English Botany, Sir *J. E. Smith*, the figures by *J. Sowerby*,
Enville, a seat in Staffordshire, 2173.
Encombe, a seat in Dorsetshire, 2201.
Enmore-castle, Somersetshire, 2202.
Entrance lodges and gates, — see Edifices.
Englebert, Jortin, his works on gardening, 2288. A.D. 1784.
Epacris, pentan. monog. and epacrideæ, G. tr. N. S. W. which thrive in sandy peat, rough and turfy, and they require frequent shifting. "Young cuttings planted in pots of sand, under bell-glasses in autumn or winter, or early in spring, will root freely; but not so in summer." *Sweet.*
Ephedra, diœc. monad. and coniferæ, H. tr. Eur. under-shrubs which grow in peat earth, and prefer a moist situation; they are readily propagated by division at the root.
Ephielis, octan. monog. and sapindeæ, a S. tr. Guiana, which grows in light loam, and large cuttings root best under a hand-glass in sand.
Epidendrum, gynan. monan. and orchideæ, S. peren. W. Ind. parasites which may be treated as aërides.
Epigæa, decan. monog. and rhodoraceæ, a H. tr. N. Amer. which thrives in peat soil, and is increased by layers; it requires to be protected during winter.
Epilobium, willow herb, octan. monog. and onagrareæ, G. and H. peren. and an. Eur. and Amer. of the easiest culture.
———— angustifolium, 1410.
Epimedium, barrenwort, tetran. monog. and berberideæ, a H. peren. Eng. which prefers peat and loam, and is readily increased by dividing the roots.
Epipactis, gynan. monan. and orchideæ, H. peren. Brit. which do best in pots in loam and peat, and increase by dividing the roots; they require little water when in a dormant state.
Epicurus, gardens of, 10. 107.
Equisetum, horse-tail, cryptog. gonopterides, and equisetaceæ, a H. tr. and H. peren. Brit. which may be treated like ephedra.
Equestrian promenades, 2037.
Eridge-castle, Sussex, 2143.
Erddig, a seat in Denbighshire, 2208.
Erbstein, K. F. W., his works on gardening, 2285. A. D. 1799.
Eranthemum, dian. monog. and acanthaceæ, tr. E. and W. Ind. which grow in rich light soil, and root readily under a hand-glass.
Eranthis, winter aconite, polyan. polyg. and ranunculaceæ, a H. peren. Italy, the winter aconite, of the easiest culture.
Erica, heath, octan. monog. and ericeæ, G. tr. C. B. S. mostly under-shrubs. Table of species and varieties, 1714. Propagation and culture, 1715. The H. species grow in peat soil, and are increased by layers, cuttings, or seeds, 1415 and 1689.
Erigeron, syngen. polyg. super. and corymbifereæ, H. peren. bien. and an. Eur. and Amer. of common culture.
Erinus, didyn. angios. and scrophularineæ, a G. tr. and T. peren. Eur. and C.B.S. which thrive best in peat, and increase by cuttings or dividing at the root.
Eriocaulon, pipewort, trian. trig. and restiaceæ, a H. peren. Scot. which grows in bogs, and is increased by seeds or suckers from the roots.
Eriocephalus, syngen. polyg. necess. and corymbifereæ, G. tr. C. B. S. which grow in light, rich soil, and cuttings root readily in the same soil under a hand-glass.
Eriogonum, ennean. monog and poly-

goneæ, H. peren. N. Amer. which thrive best in pots, and are increased by seeds.

Eriophorum, cotton grass, trian. monog. and cyperaceæ, H. peren. Eur. and Amer. bog grasses of easy culture.

Eriospermum, hexan. monog. and asphodeleæ, G. peren. C. B. S. with tuberous roots, of easy culture in sandy loam and peat.

Erithalis, pentan. monog. and rubiaceæ, a S. tr. Jamaica, which grows best in loam and peat, and cuttings root in sand under a hand-glass in moist heat.

Erodium, heron's-bill, monad. pentan. and geraneaceæ. G. peren. and H. an. Eur. and Asia, of easy culture, — see Geraniæ.

Ervum, tare, diadel. decan. and leguminoseæ, H. an. Brit. and Ind. of easy culture, — see 1412.

Erucaria, tetrad. siliq. and cruciferеæ, a H. an. of easy culture.

Eryngium, eryngo, pentan. dig. and umbelliferæ, a S. peren. and H. peren. Eur. and Amer. which grow in any soil, and are increased by seeds or dividing the root.

Erysimum, hedge-mustard, tetrad. siliq. and cruciferæ, H. peren. bien. and an. Eur. of the easiest culture, — see Barbarea.

Erythræa, pentan. monog. and gentianeæ, a G. peren. and H. an. Eur. of common culture.

Erythrina, coral-tree, diadel. decan. and leguminoseæ, S. and G. tr. which grow readily in sand and peat, and cuttings, not too ripe, root in sand under a hand-glass.

Erythronium, dog's tooth violet, hexan. monog. liliæ, H. peren. Eur. and Amer. with tuberous roots, of easy culture.

Erlau, in Hungary, famous for its wines. 63.

Ermenonville, one of the most distinguished country seats in France, about ten leagues from Paris, on the road to Flanders by Morfontaine, 51.

Eryngo, — see Eryngium.

Erissoma mali, — see Aphis lanigera.

Esculent roots, 1301. 1315.

Esterhaz, a seat in Hungary, belonging to Prince Esterhazy, 63. 81.

Escurial, palace of, in Spain, 99.

Esher place, formerly a seat in Surrey, 109.

Essex, gardens and residences of, 2149.

Escot house, Devonshire, 2203.

Espaliers, or espalier-rails, railings of timber or iron for the culture of fruit-trees, used as a substitute for walls, — see Structures.

Espalier trees, such as are suitable for or are planted against espalier rails, — see Kitchen-garden.

Ethulia, syngen. polyg. æqual. and corymbiferеæ, S. an. India, of common culture, 1749.

Etiolation of plants, 495.

Etienne, Charles, a French author on gardening, 2284. A. D. 1535.

Etler, J. Ch., his works on gardening, 2285. A. D. 1789.

Eucalyptus, icos. monog. and myrteaceæ, G. tr. Austral. which grow in loam or peat, and cuttings root in sand under a bell-glass, but not very freely.

Euchilus, decan. monog. and leguminoseæ, a G. tr. N. Hol. which thrives in sandy loam and peat, and cuttings root freely under a bell-glass in sand.

Euclea, diœc. dodec. and terebintaceæ, G. tr. C. B. S. which grow freely in loam and peat, and ripened cuttings root readily in sand under a bell-glass.

Euclidium, tetrad. silic. and cruciferеæ, a H. an. Levant, of common culture.

Eucomis, hexan. monog. and asphodeleæ, G. peren. C. B. S. bulbs which grow in light, rich soil, and may be propagated by offsets; or, if leaves be stripped off close to the bulb, and planted in pots of mould, they will produce bulbs at their base.

Eucrosia, hexan. monog. and amaryllideæ, a S. peren. Cape Horn, a bulb which may be treated as amaryllis.

Eugenia, icos. monog. and myrtiaceæ, S. and G. tr. Ind. and Amer. which thrive in two-thirds loam and one-third peat, and ripened cuttings root freely in sand under a hand-glass.

——— jambos, the malay apple, 1525.

Eupatorium, syngen. polyg. æqual. and corymbiferеæ, S. tr. and H. peren. Amer. of easy culture.

Euphorbia, spurge, dodec. trig. and euphorbiaceæ, S. D. S. and G. tr. and peren. Eur. As. Afr. and Amer. mostly succulents, which prefer loam and lime rubbish. *Sweet* says, "The way I have succeeded best in striking the cuttings, is to stick them in the tan amongst the pots in a good heat, and not cover them with any glass." Bot. Cult. 55.

Euphrasia, eye-bright, didyn. angios. and scrophularineæ, H. an. of easy culture.

Euryale, polyan. monog. and hydrocharideæ, a S. an. India, an aquatic which often produces seeds, — see 1757.

Eustace, the Rev. John Chetwode, a Roman Catholic clergyman, author of an eloquent classical tour in Italy, 2 vols. 4to. 1813. He died of a fever at Naples in 1815.

Euston-hall, Suffolk, 2159.

Eustoma, pentan. monog. and gentianeæ, a H. an. W. Ind. of easy culture, 1662.

Eustrephus, hexan. monog. and asphodeleæ, a G. peren. N. S. W. a climber which grows in sandy loam and peat, and is increased by dividing the root, or by cuttings under a hand-glass.

Eutaxia, decan. monog. and leguminoseæ, a G. tr. N. Hol. which thrives best in sandy loam and peat, and young cuttings root freely in sand under a bell-glass.

Euthales, pentan. monog. and goodenoviæ, a G. peren. N. Hol. which grows in sandy loam and peat, with little water, and may be increased, though slowly, by dividing the root or by seed.

Euonymus, spindle-tree, pentan. monog. and rhamneæ, a G. tr. and H. tr. Eur. and Amer. of easy culture in common soil, and propagated by layers, ripened cuttings planted in autumn, or seeds.

Evolvulus, pentan. dig. and convolvulaceæ, S. an. both Indies, of easy culture, 1749.

Evergreen-trees, suitable for floricultural purposes, 1682.

Evelyn, John, F.R.S. 27. 127; his writings on gardening, 2283. A.D. 1658.

———, Charles, Esq. a British author on gardening, 2283. A.D. 1717.

Everlasting, — see Gnaphalium.

——— pea, lathyrus latifolius.

Evening flower, — see Hesperantha.

Everingham, a seat in Yorkshire, 2185.

Ewood, Surrey, 2141.

Exacum, tetran. monog. and gentianeæ, a G. bien. and H. an. Eur. of common culture.

Excœcaria, diœc. monad. and Euphorbiaceæ, a G. tr. Chili, which will grow readily in light, rich soil, and cuttings root in sand under a hand-glass.

Exotic fruits, 148.

———, neglected as such, 1500; little known, but meriting cultivation, 1519.

——— esculents, not hitherto cultivated as such, 1537.

——— culture, leading operations of, 1014—1019.

Ex. Gard. Cushing's Exotic Gardener.

Excavation of ground, 799.

Exton-park, Rutlandshire, 107. 2182.

Expedients in the management of gardens, 2106—2109.

Exbury-house, Hampshire, 2197.

Eyebright, — see Euphrasia.

Eyetraps, in gardening, 789.

Eywood, Herefordshire, 2171.

F.

Fabricia, icos. monog. and myrtiaceæ, G. tr. Austral. which thrive well in loam and peat, and young cuttings root readily under a bell-glass in sand.

Fagara, tetran. monog. and terebintaceæ, S. tr. and a G. tr. W. Ind. and Japan, which grow in light loam, and cuttings root in sand under a hand-glass.

Fagonia, decan. monog. and rutaceæ, a G. bien. and an. Candia and America, of common culture.

Fagus, monœc. polyan. and amentaceæ, H. Brit. and Amer. of easy culture, and increased by seeds; and some curious varieties by grafting or budding on the others.

——— sylvatica, the beech-tree, 1917.

Falkia, hexan. dig. and convolvulaceæ, a G. peren. C.B.S. a creeper of common culture, and propagation in loam and peat soil.

Farsetia, tetrad. silicu. and cruciferæ, a G. tr. Eur. which grows in loam and peat, and young cuttings root in the same soil under a hand-glass; and H. peren. and an. rock-work plants which are increased by dividing the roots or by seeds.

Falkland-palace, in Fifeshire, 113.

Fairchild, Mr., Thomas, 119; his works on gardening, 2283. A.D. 1722.

Fairbairn, Mr., curator of the Chelsea botanic garden, 119. 2131.

Farmer's-gardens of Middlesex, 2131.

—————, their formation, 2085.

Fatee gardens, at Canton, 160.

Farm, the situation for the home-farm of a residence, 2016; management, 2097; see Ferme Ornée.

Fairy-hill, a seat in Hampshire, 2197.

Farringdon-house, Devonshire, 2203.

Fawley-court, Buckinghamshire, 2154.

Farnham-house, a seat in Cavan, 2274.

Farn-hill, a seat in Tyrone, 2277.

Facio, Nicholas, F.R.S. 150; a British author on gardening, 2283. A.D. 1699.

Falconer, William, M.D. his works relative to gardening, 2283. A.D. 1783.

Fairweather, Mr., John, a writer on gardening, 2283. A.D. 1819.

Fanon, ——, his works on gardening, 2283. A.D. 1804.

Falli, — his works on gardening, 2286. A.D. 1670.

Fedia, trian. monog. and dipsaceæ, a H. tr. and an. Eur. of easy culture, 1656 and 1662.

Feronia, elephant-apple, polyg. monœc. and ...., a S. tr. E. Ind. which grows in loam and peat, and cuttings root in sand under a hand-glass.

Ferraria, monadel. trian. and irideæ, G. peren. C.B.S. bulbs which may be treated as ixia.

Ferula, giant fennel, pentan. dig. and umbelliferæ, H. peren. and a bien. Eur. which grow in common garden soil, and are increased by seeds.

Festuca, fescue-grass, trian. dig. and gramineæ, H. tr. and an. Eur. of the easiest culture.

Fences, barriers for inclosure and defence; they are either *live fences*, formed by connected lines of woody plants, or *dead fences*, formed of earth, stone, iron, timber, or other mineral or dead vegetable matter.

Fences for plantations, 1804.

Fences, in landscape-gardening, 1976 and 2000.

Ferns, exotic, their culture, 1775.
Fëlcho-tarkan, a seat in Hungary, 63.
Ferney, the seat of Voltaire, near Geneva, 67.
Felling-trees, 483.
Fellenburgh, Mr., a celebrated Swiss agriculturist, 509.
Fennel, — see Anethum.
Fencewood, best trees for, 1787.
Feather-grass, stipa pennata.
Felwort, swertia perennis.
Fennel, anethum fœniculum.
——— flower, — see Nigella.
Fenugreek, — see Trigonella.
Fescue-grass, — see Festuca.
Feverfew, — see Pyrethrum.
Feverwort, — see Triosteum.
Feabes, a local name for gooseberries, — see Ribes.
Ferme ornée, 2022.
Fernhill, a seat in Hampshire, 1297.
Fea-berries, a local name for gooseberries, — see Ribes.
Felbrig, a seat in Norfolk, 2160.
Felix hall, Essex, 2151.
Farmanagh, gardens of, 2275.
Feuerison, K. G., his works on gardening, 2285. A.D. 1780.
Feige, K. Theodore L., his writings on gardening, 2285. A.D. 1790.
Fernaini, D—— Louis, his tract on the genus Pinus, 2286. A.D. 181. .
Figtree, — see Ficus.
Fir-tree, — see Pinus.
Ficaria, pilewort, polyan. polyg. and ranunculaceæ, a H. peren. Brit. of common culture, 1656.
Ficus, fig-tree, polyand. diœc. and urticeæ, S. and G. tr. Eur. E. Ind. C.B.S. and Austral. which grow well in light loam, and cuttings with their leaves uninjured, root in sand under a hand-glass in heat.
——— carica, the fig-tree, 1493; culture of in the fig-house, 1247; in the stove, 1250; in the open air, 1493.
Fig-house, construction of, 1162.
Filago, cotton-rose, syngen. polyg. super. and corymbifereæ, a H. an. S. Eur. of common culture.
Fischer, Frederick, Ernest Lewis, M.D. 91. 1205; his writings on gardening, 2283. A.D. 1819.
Fisherwick, formerly a seat in Warwickshire.
Fitzherbert, Sir Anthony, 127. 136; his works on gardening, 2283. A.D. 1532.
Fig marygold, — see Mesembryanthemum.
Figwort, — see Scrophularia.
Filmy leaf, hymenophyllum tunbridgense.
Finger-grass, — see Digitaria.
Fitness, a beauty in gardening, 1953.
Finningley-park cottage, Yorkshire, 2185.
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Franseria, monœc. pentan. and corymbiferæ, G. tr. S. Amer. which grow freely in loam and peat, and cuttings root readily in the same soil under a hand-glass.
Frasera, tetran. monog. and gentianeæ, a H. bien. Carolina, of common culture in loam and peat, 1660.
Fraxinus, ash-tree, polygam. diœc. and oleineæ, H. tr. Eur. and Amer. which grow in any soil not over wet, and are increased by seeds; the more curious sorts by budding or grafting.
———— excelsior, the common ash-tree, 1913; American ash, 1914.

Fritillaria, fritillary, hexan. monog. and liliaceæ, a G. peren. and H. peren. Eur. and Persia, bulbs of easy culture.
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Furcræa, hexan. monog. and bromeliæ, D. S. tr. and a peren. S. Amer. succulents which thrive in loamy soil, and require but little water; it is increased by offsets from the roots.
Fusanus, polygam. monœc. and santalaceæ, a G. tr. C. B. S. which will grow in loam and peat, and may be propagated by young cuttings in sand under a bell-glass.
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Galax, pentan. monog. and ...., a H. peren. N. Amer. which may be treated as galardia: it prefers a moist situation.
Galaxia, monad. triand. and irideæ, G. peren. C. B. S. bulbs which may be treated as ixiæ.
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Galenia, octan. dig. and chenopodeæ, a G. tr. C. B. S. which grows in rich, light soil, and cuttings will root readily under a hand-glass.
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Gastrolobium, decan. monog. and leguminoseæ, a G. tr. N. Holl. which grows in loam and peat, and ripened cuttings root in sand under a hand-glass.
Gaultheria, decan. monog. and ericeæ, H. tr. N. Amer. creepers which thrive best in peat soil, and are increased by layers or seeds.
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——— botanic, of England, 117; of Gerrarde, in Holborn, of Norwich, of Lady Clarendon, 117; of Dr. Turner, at Wells, of William Coyte of Stubbers, of Charles I. at Hampton-court, of Chelsea, Oxford, Dr. Uvedale at Enfield, 118; of Cambridge, 120; of Dr. John Hill, Dr. James Sherwood, Mr. Dubois, Bishop Compton, Duke of Argyle, 120; of Kew, 121; of Liverpool, Hull, Bury, Hibbert, . of Chalfont, Thornton, of Clapham, White Knights, Chapel Allerton, Millhill, Comte de Vandes, 122.

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——— commercial, of England; of London and Wise, Corbett, Lee, Loddiges', Knight, Malcolm, Thomson, Gray and Son, Jenkins, Grange, Gunter, Andrews, &c., 120 to 140.

——————— Scotland; Malcolm, Anderson and Leslie, Dickson, Brown, &c., 120 to 140.

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——— royal of Britain; Carlton-house, 109; Buckingham-house, Kensington, Kew, 2137; Windsor, 2165; Hampton-court, Brighton, 2145.

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——— experimental, of Britain; of the London Horticultural Society, 132; of the Edinburgh Horticultural Society, 133.

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——— botanic, — see Botanic Garden.

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Gardens, different kinds of, in Britain, relatively to the different classes of society, and the different species of gardeners, 2094; private gardens, 2095; cottage-gardens, 2095; artificers' gardens, 2096; of farmers, 2097; of street-houses, 2098; of tradesmen, 2099; of amateurs, 2100; of connoisseurs, 2101; of citizens, 2101; of villas, 2103; of villas and demesnes, 2104; of mansions, 2105; of royal palaces, 2110.

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——— of England, 2128; Wales, 2205; Scotland, 2218; Ireland, 2251.

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Gerarde, John, a British writer on gardening, 117. 192. 2283. A.D. 1597.

Gentil, —— a British author on gardening, 2283. A.D. 1706.

German authors on gardening, 2285.

Gerthing, Joseph, his writings on gardening, 2284. A.D. 1788.

Geiger, Fr. X. his works on gardening, 2285. A.D. 1796.

Genssler, Ch. Jac. his works on gardening, 2285. A.D. 1796.

Geist, J ——, M.D. his works on gardening, 2285. A.D. 1814.

Ger. herb. J. Gerard's herball.

Geissorhiza, tile-root, trian. monog. and irideæ, G. peren. C. B. S. which may be treated like ixiæ.

Gelonium, diœc. icos. and ...., a S. tr. E. Ind. which may be treated like gardenia.

Gelsemium, pentan. monog. and apocyneæ, a H. tr. N. Amer. of easy culture.

Genipa, genip-tree, pentan. monog. and rubiaceæ, S. tr. S. Amer. which may be treated like gardenia.

Genista, diadel. decan. and leguminoseæ, G. and H. tr. of easy culture, and increased chiefly by seeds.

Gentiana, gentian, pentan. dig. and gentianeæ, H. peren. Eur. and Amer. and annuals, which grow best in peat and loam, and the smaller sorts in pots; they are increased by cuttings, or dividing at the root.

Geodorum, gynan. monan. and orchideæ, S. peren. E. Ind. which grow best in sandy loam and peat, and the only mode of increasing them is by division at the root.

Geoffroya, bastard cabbage-tree, diadel. decan. and leguminoseæ, a S. tr. Jamaica, which grows in sandy loam, and cuttings root in the same soil under a hand-glass.

Geranium, crane's bill, monad. decan. and geraniæ, G. and H. peren and an. Eur. C. B. S. and Amer. of easy culture, — see Geraniæ.

Geraniæ, table of species and varieties, 1711; propagation, 1712; culture, 1713.

Gerardia, didyn. angios. and scrophularineæ, a S. peren. and H. peren. and an. E. Ind. and N. Amer. of easy culture.

Geropogon, old man's beard, syngen. polyg. æqual. and cichoraceæ, a H. peren. and an. Italy, of common culture.

Gesneria, didyn. angios. and bignoniaceæ, S. tr. Amer. which thrive well in light rich soil, and cuttings root either in sand or mould, under a hand-glass in heat.

Gethyllis, hexan. monog. and amaryllideæ, G. peren. C. B. S. bulbs which may be treated like ixiæ.

Getonia, decan. monog. and combretaceæ, a S. tr. E. Ind. which grows best in loam and peat, and cuttings root in sand under a hand-glass in heat.

Geum, avens, icos. polyg. and rosaceæ, H. peren. N. Amer. and Eur. of the easiest culture.

Gentian, — see Gentiana.

Ginger, — see Zingiber.

Gen. Rep. Scot. Sir John Sinclair's general report of Scotland.

Georgi, Dr., 84; his work on gardening, 2289. A.D. 1793.

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Gesner, John, his works on gardening, 2285. A.D. 1753.

Gillingham hall, Norfolk, 2160.

Gibside, a seat in Durham, 2188.

Giles, John, a British writer on gardening, 2283. A.D. 1767.

Gilpin, the Rev. William, his works relative to gardening, 2283. A.D. 1768.

Gibbs, Mr. William, 112; his writings on gardening, 2283. A.D. 1814.

Girardin, R. L. Vicomte d'Ermenonville, his works on gardening, 2284. A.D. 1777.

Ghinia, dian. monog. and verbenaceæ, a S. an. W. Ind. of common culture.

Gibbs, Messrs., nurserymen at Inverness, 2119.

Ginseng, panax quinquefolium.

Giant fennel,—see Ferula.

Gibson, John, M.D. 133; his writings on gardening, 2283. A.D. 1768.

Gibson, T. 107; his works on gardening, 1691.

Girdling-trees, 479.

Gisekia, pentan. pentag. and portulaceæ, a S. an. E. Ind. of common culture.

Gladiolus, corn-flag, trian. monog. and irideæ, G. and H. peren. C. B. S. bulbs of easy culture, 1637.

Glaucium, horn-poppy, polyan. monog. and papaveraceæ, a H. bien. and an. Eur. of common culture.

Glaux, black saltwort, pentan. monog. and salicareæ, a H. peren. Brit. which grows best in pots in sand and peat, andis increased by dividing at the roots.

Glechoma, ground-ivy,didyn. gymnos. and labiateæ, H. peren. Eur. of common culture, 1656.

Gleditschia, polyg. diœc. and leguminoseæ, a F. and H. tr. Amer. and China, of easy culture, and increased by layers or seeds.

Glinus, dodec. pentag. and ficoideæ, a G. an. S. Eur. of common culture.

Globba, dian. monog. and scitamineæ, S. peren. E. Ind. reedy plants of easy culture, and increased by dividing at the roots.

Globularia, tetran. monog. and globulariæ, G. tr. Eur. which grow well in loam and peat, and cuttings root freely in the same soil under a hand-glass.

Glossodia, gynan. monan. and orchideæ, a G. peren. N. S. W. which grows in sandy loam and peat, and requires but little water when not in a growing state; it is increased by offsets or seeds.

Gloriosa, hexan. monog. and liliæ, S. peren. E. Ind. with tuberous roots,—see 1748.

Gloxinia, didyn. angios. and bignoniaceæ, S. peren. S. Amer. which thrive in light rich soil, and leaves taken off close to the stem and planted, will root and make plants.

Glamorganshire, gardens and residences of, 2211.

Glyceria, trian. dig. and gramineæ, a H. peren. Brit. a grass of the easiest culture.

Glycine, diadel. decan. and leguminoseæ, Gr. tr. Ind. and Amer. mostly climbers, which thrive in loam and peat, and root readily from cuttings; and H. peren. of easy culture in similar soil.

Glycyrrhiza, liquorice, diadel. decan. and leguminoseæ, H. peren. of easy culture.

——— glabra, the common liquorice, 1400.

Glades in planting, 1799.

Glossology, 196.

Glasswort,—see Salicornia.

Globe amaranth,—see Gomphrena.

——— flower,—see Trollius.

——— thistle,—see Echinops.

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Glynde, a seat in Sussex, 2143.

Glasgow botanic garden, 2229.

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Glengary-house, in Invernesshire, 2248.

Glass case,—see Structures.

Gleditsch, John Gotlieb, (John Love-god,) his works on gardening, 2285. A. D. 1765.

Glaser, J. F. his works on gardening, 2285. A. D. 1774.

Gmelin, John Frederick, his works on gardening, 2285. A. D. 1787.

Gmelina, didyn. angios. and verbenaceæ, S. tr. E. Ind. which grow best in sandy loam and peat, and cuttings root in sand under a hand-glass in heat.

Gnaphalium, everlasting, syngen. polyg. super. and corymbifereæ, S. and G. tr. C. B. S. and Eur. which thrive in peat or in sandy loam, and cuttings taken off at a joint and planted in the same soil, the pots placed in a steady situation, but not under glasses, root freely. The H. species are of common culture.

Gnidia, octan. dig. and thymeleæ, G. tr. C. B. S. which thrive well in peat soil, with the pots well drained, and care being taken neither to over water them, nor let them droop for want of water, as they are easily killed. Very young cuttings root in sand under bell-glasses.

Gnol-castle, Glamorganshire, 2211.

Gomesa, gynan. monan. and orchideæ, a S. peren. Brasil; a parasite, which may be treated as aërides, epidendrum, &c.

Gomphia, button-flower, decan. monog. and guttifereæ, S. tr. Jamaica; which thrive in sandy loam, and cuttings root in sand under a hand-glass in a moist heat.

Gomphocarpus, pentan. dig. and asclepiadeæ, G. tr. C. B. S. which grow freely in loam and peat, and cuttings in sand under a hand-glass in a little bottom-heat, root freely.

Gompholobium, decan. monog. and leguminoseæ, G. tr. Austral. which thrive in sandy loam and peat, not over-watered

young cuttings root without difficulty under a bell-glass in sand.
Gomphrena, globe amaranth, pentan. monog. and amaranthaceæ, a S. tr. peren. bien. and an. Ind. and Amer. of easy culture.
Goniocarpus, tetran. monog. and onagrareæ, a G. an. China; of common culture.
Gonolobus, pentan. dig. and asclepiadeæ, S. tr. Amer. climbers, which grow freely in loam and peat, and cuttings root readily under a hand glass: the other species are of easy culture.
Goodenia, pentan. monog. and goodenoveæ, G. tr. N. Spain, which grow freely in loam and peat, and cuttings root under a hand-glass.
Goodia, diadel. decan. and leguminoseæ, G. tr. Austral. which thrive well in sandy loam and peat, and young cuttings root freely under a bell-glass in sand.
Goodyera, gynan. monan. and orchideæ, a S. peren. Eur. and Amer. which grows in loam and peat, and is increased by suckers from the root, and H. peren. which thrive in sandy peat, and may be increased like the others.
Gordonia, monad. polyan. and malvaceæ, a G. and F. tr. which grow in peat soil with a little loam, and are increased by layers or ripened cuttings under a hand-glass.
Gorteria, syngen. polyg. frustr. and corymbifereæ, a G. an. C. B. S. of easy culture.
Gossypium, cotton, monad. polyan. and malvaceæ, S. tr. bien. and an. Ind. and Amer. which thrive in rich, light soil, and generally ripen of seeds; or cuttings will root under a hand-glass in sand.
Goring, E. H. J—— Bm. Trommsdorf, and F. K. L. Sikler, their joint work on gardening, 2285. A. D. 1802.
Gouania, polyg. monœc. and rhamneæ, S. tr. W. and E. Ind. which grow freely in loam and peat, and ripened cuttings root in sand under a hand-glass in heat.
Gorinka, a seat near Moscow, 88. 91.
Gould, Mr., an Englishman, in the service of Prince Potemkin, considered in his day as the first gardener in Russia, 87. 96.
Gogar-house, Mid Lothian, 114.
Gordon, James, an eminent nurseryman, 133.
Gossford-house, East Lothian, commonly called Wemyss-house, 1805; described, 2219.
Goat's beard, — see Tragopogon.
—— rue, — see Galega.
—— thorn, astragalus tragacantha.
Golden rod, — see Solidago.
—— rod tree, bosea yervamora.
—— saxifrage, — see Chrysoplenium.
—— thistle, — see Scolymus.
Goldylocks, — see Chrysocoma.
Gooseberry, — see Ribes.
Goosefoot, — see Chenopodium.
Gourd, — see Cucurbita.
Goutweed, — see Ægepodium.
Goodwood, a seat in Sussex, 2144.
Godmersham-place, a seat in Kent, 2147.
Gosfield-hall, Essex, 2151.
Gorhambury-house, Hertfordshire, 2152.
Goathurst, a seat in Somersetshire, 2202.
Great Fulford, a seat in Devonshire, 2203.
Golden-grove, a seat in Caernarvonshire, 2217.
Gormanstown-house, in Eastmeath, 2259.
Gort-house, a seat in Galway, 2270.
Gorrie, Mr. Archibald, his writings on gardening, 2283. A. D. 1812.
Gouges, de Cessures, his work on gardening, 2284. A. D. 1758.
Gotz, J. F. his work on gardening, A. D. 1780.
Gotthardt, J. Ch. and R. Eyserbock, their works on gardening. A. D. 1806.
Gopsal-hall, Leicestershire, 2176.
Gosforth-house, Northumberland, 2189.
Grammitis, cryptog. filices, and filiceæ, a H. peren. Brit. a fern of the usual culture.
Grangea, syngen. polyg. super. and corymbifereæ, S. and H. an. E. Ind. of common culture.
Gratiola, hedge-hyssop, dian. monog. and scrophularineæ, a S. bien. and H. an. Eur. Ind. and Amer. of common culture.
Grevillea, tetran. monog. and proteaceæ, G. tr. N. S. W. which grow freely in sandy loam and peat, and ripened cuttings root under a hand-glass in sand.
Grewia, polyan. monog. and tiliaceæ, S. and G. tr. Ind. and C. B. S. which thrive in loam and peat, and cuttings do best in sand under a hand-glass in heat.
Grias cauliflora, the anchovy pear, polyan. monog. and guttifereæ, a S. tr. Jamaica; 1522.
Grielum, decan. pentag. and geraniaceæ, a G. peren. C. B. S. which thrives best in sandy gravel, with the pots well drained, and cuttings root in the same soil without glasses.
Grindelia, syngen. polyg. super. and corymbifereæ, G. tr. and a peren. Mexico; which thrive well in light, rich soil, and young cuttings root freely in the same soil under hand-glasses.
Grislea, octan. monog. and salicareæ, a S. tr. E. Ind. which thrives in loam and peat, and young cuttings root freely in sand under a bell-glass in heat.
Gronovia, pentan. monog. and cucurbitaceæ, a S. peren. Jamaica; a climber, which thrives well in rich soil, and cuttings root readily under a hand-glass in heat.
Greenhouse, its construction, 1595; general culture of, 1624.
———— plants, tables of, 1710; select sorts, 1710 and 1718; woody sorts, 1719;

culture, 1721; climbers, 1726; succulents, 1727; bulbs, 1728; herbaceous, 1729; selections for particular purposes, 1730; for a small green-house, 1730.

Grenada, gardens of, 99.

Greenwich-park, Kent, 107. 2146.

Gray, Mr. Christopher, 108; his works on gardening, 2283. A. D. 1740.

Grape-gatherer, 617, — see Implements.

Grove, a seat in Hertfordshire, 2152.

——, a seat in Middlesex, 2134.

Grove hill, Surrey, 2140.

Grove cottage, Oxfordshire, 2162.

Grimsthorpe-hall, Lincolnshire, 2180.

Grimstone Garth, Yorkshire, 1232.

Grange-hall, Durham, 2187.

Gruncroft, a seat in Durham, 2187.

Grange-park, Hampshire, 2197.

Griffin, Mr. William, 131; his writings on gardening, 2283. A. D. 1808.

Graham, Dr. Patrick, his writings on gardening, 2283. A. D. 1814.

Grottoes, as decorations in gardening, 769.

Ground measurer, 618, — see Implements.

—— compasses, 618, — see Instruments.

Grindstone, used in gardening, 621.

Grotjan, John August, his works on gardening, 2285. A. D. 1750.

Gravel, 188.

Græffer, Mr. John, 33; his works on gardening, 2283. A. D. 1789.

Groningen, botanic garden of, 43.

Grohman, ——, 83; his works on gardening, 2285. A. D. 1798.

Grisenthwaite, Mr., an attorney near Bath and agricultural writer, 414.

Grafting, 482. 892.

Grass of Parnassus, — see Parnassia.

Grape, — see Vitis.

Grape hyacinth, muscari botryoides.

Great burnet, — see Poterium.

Greek valerian, — see Polemonium.

Green dragon, arum dracontium.

Gromwell, — see Lithospermum.

Ground-ivy, — see Glechoma.

—— pine, ajuga chamæpitys.

Groundsel, — see Senecio.

Groundsel tree, baccharis halmifolia.

Grub, to, (groben, *Teut.* to delve or dig,) to root up trees which are not to be planted again: to clear the ground of ligneous vegetables by digging round and cutting their roots.

Grounds, the art of laying out, — see Landscape Gardening.

Ground, how to operate on in landscape gardening, 1964.

Greenstead-hall, Essex, 2150.

Guaiacum, lignum vitæ, decan. monog. and rutaceæ, a S. tr. W. Ind. which grows in loam and peat, and ripened cuttings taken off at a joint, root readily when thinly planted in a pot of sand, and plunged under a hand-glass in heat.

Guarea, octan. monog. and meliaceæ, a S. tr. S. Amer. which grows freely in loam and peat, and ripened cuttings root in sand under a hand-glass.

Guatteria, polyan. polyg. and anonaceæ, a S. tr. Jamaica, which requires a loamy soil, and ripe cuttings root in sand under a hand-glass.

Guettarda, monœc. hexan. and rubiaceæ, S. tr. which may be treated like gardenia.

Guilandina, nicker-tree, decan. monog. and leguminoseæ, a S. tr. India, which thrives in loam and peat, and cuttings root in sand under a hand-glass.

Gundelia, syngen. polyg. segr. and cynarocephaleæ, a H. peren. Levant, of common culture.

Gunnera, gynan. dian. and urticeæ, a G. peren. C.B.S. which may be treated as an aquatic.

Gustavia, monad. polyan. and myrtiaceæ, a S. tr. which thrives well in sandy loam, and cuttings root freely in sand under a hand-glass.

Guelder-rose, — see Viburnum.

Gum-succory, chondrilla juncea.

Gunnersbury, a seat in Middlesex, 2134.

Gunton-hall, Norfolk, 2160.

Guiting-park, Gloucestershire, 2168.

Guys cliff, a seat in Warwickshire, 2174.

Guerin, M——, a French author on gardening, 2234. A.D. 1732.

Guillemeau, J. L. M., his work on gardening, 2284. A.D. 1800.

Guerin and *Schwartz*, their works on gardening, 2284. A.D. 1813.

Gurnth, Amelia, her works on gardening, 2285. A.D. 1790.

Günther, J. Jac., his work on gardening, 2285. A.D. 1806.

Guimpel, F——, his works on gardening, 2285. A.D. 1810.

Gypsum, 414.

Gymnadenia, gynan. monan. and orchideæ, a H. peren. Brit. which grows best in sandy loam, peat, and chalk, and may be increased by seeds; if planted in pots they must be well drained.

Gymnema, pentan. dig. and asclepiadeæ, a S. tr. Ceylon, which grows in loam and peat, and cuttings root freely under a hand-glass.

Gymnocladus canadensis, diœc. decan. and leguminoseæ, a H. tr. Canada, which grows in common soil, and is increased by cuttings of the roots.

Gymnostyles, syngen. polyg. necess. and corymbifereæ, a G. an. S. Amer. of common culture.

Gypsophila, decan. dig. and caryophylleæ, H. peren. and an. Eur. well adapted for rock-work, and propagated by cuttings or seeds.

Gyrotheca, trian. monog. and hæmodoraceæ, a G. peren. N. Amer. which grows well in light soil, and may be increased by dividing at the root.

H.

Habenaria, gynan. monan. and orchideæ, H. peren. Eur. and Amer. requiring the same treatment as gymnadenia.

Hæmanthus, hexan. monog. and amaryllideæ, G. peren. C. B. S. which thrive best in sandy loam and peat, and like other bulbs require no water when in a dormant state.

Hæmatoxylon, logwood, decan. monog. and leguminoseæ, a S. tr. S. Amer. which grows in loam and peat, and cuttings root readily in sand under a hand-glass.

Hæmodorum, trian. monog. and hæmodoraceæ, a G. peren. N. S. W. a bulb which may be treated as hæmanthus.

Hakea, tetran. monog. and proteaceæ, G. tr. Austral. which thrive well in a third loam, a third peat, and a third sand, the pots well drained, and too much watering avoided; ripened cuttings root readily under a hand-glass in sand.

Halesia, snowdrop-tree, dodec. monog. and ebenaceæ, H. tr. N. Amer. which grow freely in common soil, and are increased by cuttings of the roots,

Halleria, didyn. angios. and scrophularineæ, a G. tr. C. B. S. which grows freely in loam and peat, and ripened cuttings root readily in sand under a hand-glass.

Hallia, diadel. decan. and leguminoseæ, a G. tr. and bien. and peren. C. B. S. which grow freely in loam and peat, and young cuttings root under a hand-glass in sand.

Haloragis, octand. tetrag. and onagrareæ, a G. tr. N. Zeal. which may be treated as hallia.

Hamamelis, tetran. dig. and berberideæ, a H. tr. N. Amer. which thrives in common soil, and is generally increased by layers.

Hamiltonia, oil-nut, polyan. diœc. and terebintaceæ, a G. tr. N. Amer. which grows in loam and peat, and cuttings root under a hand-glass in sand.

Hasselquistia, pentan. dig. and umbelliferæ, H. an. Egypt, of common culture, 1662.

Hardy trees, with shewy flowers, 1680; deciduous, 1681; evergreen, 1682.

Hamilton, the Hon. Charles, of Painshill, 109; a man of great taste in gardening, 1482.

Hardy fruits, catalogue of, 1420.

Hares, to prevent from barking trees, 1930.

Hawkins, Abraham, Esq. 920; his writings on gardening, 2283. A.D. 1609.

Hay, Mr. John, planner of gardens, 991; his writings on gardening, 2283. A.D. 1820.

Hawm, or haulm, (healm, *Sax.*) the lower part of the straw after the ears are cut off; in gardening, the term is generally applied to leguminous vegetables, after their produce has been gathered.

Hard wooded timber-trees, the most useful sorts of, described, 1911.

Hackney botanic nursery garden, 2132.

Hampshire, gardens and residences of, 2197.

Havod, a seat in Cardiganshire, 2210.

Hanmer-hall, Flintshire, 2209.

Haldon-house, Devonshire, 2203.

Hackwood-park, Hampshire, 2197.

Haddon-hall, Lancashire, 2191.

Haigh-hall, Lancashire, 2191.

Hardwick, a seat in the county of Durham, 2188.

——— hall, Derbyshire, 2178.

Harewood-house, Yorkshire, 112. 853; described, 2186.

Hackfall, scenery of, in Yorkshire, 2185.

Hackness, scenery of, in Yorkshire, 2185.

Haddon-hall, Derbyshire, 2178.

Hagley-hall, Staffordshire, 2173.

Hawkstone-park, Shropshire, 789; described, 2172.

Harewood, a seat in Herefordshire, 2171.

Hamcourt, Worcestershire, 2169.

Hanbury-hall, Worcestershire, 2169.

Hagley, Worcestershire, 107; described, 2169.

Hamels, a seat in Hertfordshire, 2152.

Hare-hall, Essex, 2151.

Hare-street cottage, Essex, 2150.

Halingbury-place, Essex, 2150.

Hayes-place, Kent-road, 2147.

Hathfield, a seat in Kent, 2147.

Haslewood, a seat in Sligo, 2273.

Hammer, 617, — see Instruments.

Hampton-court, Herefordshire, 2171.

——————, Middlesex, 107. 2137.

Hand-glasses, of different kinds, 620.

Ham-house, Middlesex, 107. 117.

Hamilton-palace, Lanarkshire, 113; described, 2229.

Hanworth, a seat in Norfolk, 2160.

Hatfield-house, Hertfordshire, 107; described, 2152.

Hatton-house, Midlothian, 113; described, 2218.

Hartlib, Samuel, 127; his works on gardening, 2283. A.D. 1651.

Harte, the Rev. Walter, 7. 98. 101; his work on husbandry, 2283. A.D. 1764.

Haga, gardens of, near Stockholm, 68.

Haynes, Thomas, 873; his works on gardening, 2283. A.D. 1811.

Hair-grass, — see Aira.

Hard-grass, — see Rottbœlia.

Hare's-ear, — see Bupleurum.

Hare's-foot fern, davallia canariensis.

Hare's-tail grass, lagurus ovatus.

Hart's-tongue, scolopendrium officinarum.

Hartwort, — see Tordylium.

Hassagay-tree, curtisia faginea.

Hatchet-vetch, — see Biserrula.

Hawkweed, — see Hieracium.

Hawthorn, mespilus oxyacantha.

Hack, a north country term for a pick-axe, — see Pick-axe.

To hack, (hacken, *Teut.* to hew,) to cut over or clear away, by cutting ligneous vegetables.

Hawick nursery, Roxburghshire, 2221.

Hassendean nursery, Roxburghshire, 2221.

Hall, Joseph, his work on gardening, 2283. A.D. 1645.

Haworth, Adrian Hardy, Esq. his writings on gardening, 2283. A.D. 1794.

Hawkins, Sir Christopher, Bart. his writings on gardening, 2283. A.D. 1813.

Hay, Mr., Alexander, his writings on gardening, 2283. A.D. 1814.

Hare, Thomas, Esq. F.L.S. his writings on gardening, 2283. A.D. 1817.

Haywood, Joseph, Gent., his writings on gardening, 2283. A.D. 1818.

Harrison, Mr., Charles, F.H.S. his writings on gardening, 2283. A.D. 1820.

Hallet, Robert, Esq. his writings on gardening, 2283. A.D. 1821.

Hamel du Monceau, or *Duhamel*, Henry Lewis de, a French author on gardening, 2284. A.D. 1730.

Harman, Jean, his work on gardening, 2284. A.D. 181. .

Hammer, F——, L——, and Dietricht, their works on gardening, 2284. A.D. 1802.

Harvey, Mons. Villé, his works on gardening, 2284. A.D. 179 .

Heading, the growing of the leaves of a plant into a roundish head or loaf, as in the common cabbage; called also cabbaging, or loaving.

Hebenstretia, didyn. angios. and verbenaceæ, G. tr. and peren. C. B. S. which thrive in loam and peat, and young cuttings root readily in the same soil under a hand-glass.

Hedeoma, dian. monog. and labiateæ, H. an. of common culture, 1662.

Hedera, ivy, pentan. monog. and caprifoliæ, a H. tr. Brit. a well-known creeper of easy culture.

Hedychium, garland-flower, monan. monog. and scitamineæ, S. peren. E. Ind. reedy marsh plants, of easy culture.

Hedyotis, tetran. monog. and rubiaceæ, a S. an. E. Ind. of easy culture.

Hedypnois, syngen. polyg. æqual. and cichoraceæ, H. an. Eur. and Candia, of common culture.

Hedysarum, diadel. decan. and leguminoseæ, S. and G. tr. India and Amer. which thrive well in loam and peat, and young cuttings root in sand under a bell-glass.

Helenium, syngen. polyg. super. and corymbifereæ, a F. peren. and H. peren. N. Amer. of easy culture.

Helianthemum, sun-rose, polyan. monog. and cistineæ, F. and H. tr. and H. an. Eur. and Amer. which grow in sandy loam and peat, and root readily by cuttings, or are raised by seeds.

Helianthus, sun-flower, syngen. polyg. frustran. and corymbifereæ, G. and H. peren. and an. Amer. of easy culture.

———— tuberosus, the jerusalem artichoke, 1321.

Heliconia, pentan. monog. and musaceæ, S. peren. Ind. which grow in rich loam kept moist, and are increased by dividing at the root.

Helicteres, screw-tree, monadelph. dodec. and malvaceæ, S. tr. C. B. S. which thrive in loam and peat, and are readily increased by cuttings taken off at a joint, and plunged under a hand-glass in a pot of sand.

Heliocarpus, dodec. dig. and tiliaceæ, a G. tr. Vera Cruz, which thrives in loam and peat, and cuttings root in sand under a hand-glass.

Heliophila, tetrad. siliq. and cruciferæ, G. tr. which grow in sandy loam, and may be increased by seeds or cuttings under a hand-glass; and H. an. of common culture.

Heliopsis, syngen. polyg. super. and corymbifereæ, a H. peren. N. Amer. of common culture.

Heliotropium, turnsole, pentan. monog. and boragineæ, S. tr. and bien. and G. tr. Ind. and Amer. which thrive in any rich, light soil, and cuttings will root freely under a hand-glass.

Helleborus, polyan. polyg. and ranunculaceæ, H. peren. Eur. of common culture.

Hellenia, monan. monog. and scitamineæ, a S. peren. E. Ind. a marsh plant.

Helminthia, syngen. polyg. super. and cichoraceæ, a H. an. Brit. of easy culture.

Helonias, hexan. trig. and melanthaceæ, H. peren. N. Amer. which delight in peat-soil and a moist situation, and are increased by dividing at the root or by seeds.

Hemerocallis, day-lily, hexan. monog. and hemerocallideæ, H. peren. Eur. and China, of easy culture in any soil.

Hemidesmus, pentan. dig. and asclepiadeæ, a S. tr. Ceylon, which delights in light, rich soil, and cuttings root readily under a hand-glass in a pot of sand plunged in a little heat.

Hemionitis, cryptog. filices, and filiceæ, S. peren. W. Ind. ferns of common culture, 1755.

Hepatica, polyan. polyg. and ranunculaceæ, H. peren. Eur. which prefer loam and peat, and are increased by dividing at the root. The roots are very liable to be eaten by snails.

Heracleum, cow-parsnip, pentan. dig. and umbelliferæ, H. peren. Eur. of common culture.

Heritiera, looking-glass plant, monœc.

monad. and malphigiaceæ, a S. tr. E. Ind. which grows in loam and peat, and ripened cuttings root readily in a pot of sand plunged under a hand-glass in a moist heat.
Hermannia, monadel. pentan. and tiliaceæ, G. tr. C. B. S. which grow in rich, light soil, and are increased by cuttings in the same soil under a hand-glass.
Hermas, polyg. monœc. and umbelliferæ, G. peren. C. B. S. which thrive in any light soil, and are increased by cuttings or dividing at the root.
Herminium, gynan. monan. and orchideæ, a H. peren. Eng. which thrives best in loam, peat, and chalk in pots, and is increased by seeds.
Herniaria, rupture-wort, pentan. dig. and amaranthaceæ, a G. and H. tr. Eur. which grow in rich, light soil, and are increased by cuttings under a hand-glass; and H. peren. which grow best in loam and peat, and are increased by cuttings or dividing at the root.
Hernandia, jack in a box, monœc. trian. and laurineæ, a S. tr. W. Ind. which grows freely in sandy loam and peat, and ripened cuttings not deprived of their leaves root readily under a hand-glass in sand.
Herpestis, didyn. angios. and scrophularineæ, a S. peren. and H. peren. India and Amer. which thrive well in rich, light soil, and root freely from cuttings.
Hesperantha, evening flower, trian. monog. and irideæ, G. peren. C. B. S. bulbs which may be treated as ixiæ.
Hesperis, rocket, tetrad. siliq. and cruciferæ, H. peren. bien. and an. Eur. of easy culture.
Hesperis matronalis, 1648.
Heterospermum, syngen. polyg. super. and corymbiferæ, a H. an. New Spain, of common culture.
Heuchera, pentan. dig. and saxifrageæ, H. peren. N. Amer. which thrive in rich, light soil, and are increased by dividing at the root.
Heynea, decan. monog. and meliaceæ, a S. tr. Napaul, which thrives in loam and peat.
Hepburn, Baron, his writings on gardening, 2283. A. D. 1812.
Heath, — see Erica.
Hedges, their formation and management, 1804.
Heat, 604. 681.
Heiligensee, a royal seat at Potsdam in Prussia, 65.
Hentzner, Peter, a travelling tutor to a German nobleman, who came to England during the reign of Elizabeth, and afterwards published his travels, 107.
Heathfield-park, Sussex, 2148.
Hendon-place, Middlesex, 2134.
Henllys, a seat in Caermarthenshire, 2217.
Herb-gardens, in Mid-lothian, 2218.
Headfort, a seat in Eastmeath, 2259.
Heely, Joseph, his works on gardening, 2283. A. D. 1777.
Henderson, Mr. John, his works on gardening, 2283. A. D. 1810.
————, Mr. William, his writings on gardening, 2283. A. D. 1811.
Herbert, the Hon. and Rev. William D. C. L., his writings on gardening, 2283. A. D. 1818.
Hedges, Mr. William, his writings on gardening, 2283. A. D. 1818.
Herissant, Louis Antoine Prosper, his work on gardening, 2284. A. D. 1771.
Hellbach, J. Ch. his works on gardening, 2285. A. D. 1801.
Hermes, J. Gf. his works on gardening, 2285. A. D. 1801.
Heppe, John Christopher, his work on gardening, 2285. A. D. 178. .
Henne, Sm. D. L. his work on gardening, 2285. A. D. 1771.
Hesse, Henry, his work on gardening, 2285. A. D. 1713.
Heresbachius, Conradus, his work on gardening, 2285. A. D. 1578.
Henriquez, Jean, his work on gardening, 2284. A. D. 1781.
Helix, the snail, to destroy, 1614.
Hempel, G. E. L. his work on gardening, 2285. A. D. 1816.
Hellenius, Charles Nicolas, his works on gardening, 2285. A. D. 1789.
Herrera, Gabriello Alphonso, his work on gardening, 2290. A. D. 1557.
Heart's-ease, viola tricolor.
Heart-seed, — see Cardiospermum.
Heath, — see Erica.
Hedge-hyssop, — see Gratiola.
Hedge-mustard, sisymbrium officinale.
Hedge-nettle, — see Stachys.
Hemlock, — see Conium.
Hemp, — see Cannabis.
Hemp-nettle, see Galeopsis.
Henbane, — see Hyoscyamus.
Henbit, lamium amplexicaule.
Herb-robert, geranium robertianum.
Heron's-bill, — see Erodium.
Head or upper gardener, 2065; who ought to recommend them, 2122.
Herbalists, — see Physic gardeners.
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Hertfordshire, gardens and residences of, 2152.
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Heaton-hall, Northumberland, 2189.
Hewel Grange, a seat in Worcestershire, 2169.
Heythorpe, a seat in Oxfordshire, 2163.
Henham, a se[illegible] in Suffolk, 2159.
Helmingham-hall, Suffolk, 2159.
Heveningham-hall, Suffolk, 2159.
Hedsor-lodge, Buckinghamshire, 2154.

Hemsted Bury, a seat in Hertfordshire, 2152.

High-clere, a seat in Hampshire, 2197.

High-meadow, Gloucestershire, 2168.

Highnam-court, Gloucestershire, 2168.

Hillington-park, Norfolk, 2160.

Hill-hall, Essex, 2151.

Hill-park, Kent, 2147.

Hillsborough-castle, a seat in Down, 2231.

Hill, *Hyll*, or *Hyle*, Thomas, his work on gardening, 2283. A. D. 1574.

Hill, Daniel, M. D. his work on vegetable physiology, 2285. A. D. 1800.

Hildt, J. Adf. his works on gardening, 2285. A. D. 1798.

Hiltenbrandt, Ant. his work on gardening, 2285. A. D. 1777.

Hiebern, John Christian, his work on gardening, 2285. A. D. 1671.

Hibbertia, polyan. trig. and magnoliaceæ, G. tr. Austral. which grow in sandy loam and peat, and cuttings root readily in the same soil under a hand-glass.

Hibiscus, monadel. polyan. and malvaceæ, S. tr. and G. peren. India, C. B. S. which thrive in rich, light soil, and ripen seeds, or root readily by cuttings in sand under a hand-glass.

———— esculentus, 1544.

Hieracium, hawkweed, syngen. polyg. æqual. and cichoraceæ, H. peren. and an. Eur. and Amer. of the easiest culture.

Hillia, hexan. monog. and rubiaceæ, S. tr. W. Ind. which grow in sandy loam and peat, and cuttings root in sand under a hand-glass.

Hippia, syngen. polyg. necess. and corymbifereæ, S. an. and G. tr. C. B. S. and E. Ind. which grow freely in any light soil, and cuttings planted under a hand-glass will root readily.

Hippocratea, trian. monog. and acereæ, a S. tr. S. Amer. which grows well in loam and peat, and cuttings root under a hand-glass in sand.

Hippocrepis, horseshoe-vetch, diadel. decan. and leguminoseæ, a G. tr. Minorca, which thrives in loam and peat, and cuttings root readily under a hand-glass; and a H. peren. and an. Europe, of common culture.

Hippomane, manchineel, monæc. monadel. and euphorbiaceæ, a S. tr. W. Ind. a powerful poison which grows in sandy loam, and cuttings root in sand under a hand-glass.

Hippophae, sea buckthorn, diœc. tetran. and elæagneæ, H. tr. Eur. and Amer. which grow in any common soil, and are increased by layers or cuttings of the roots.

Hippuris, mare's-tail, dian. monog. and naiadeæ, a H. peren. Brit. an aquatic.

Hirtella, pentan. monog. and rosaceæ, a S. tr. W. Ind. which grows in loam and peat, and cuttings root in sand under a a hand-glass.

Hip, the common name of the fruit of the rose tribe.

Hill, Sir John, M. D. his works on gardening, 2283. A.D. 1755.

Hitt, Thomas, 130; his works on gardening, 2283. A.D. 1755.

Hirchfeldt, Ch. Caius, 1683; his works on or Hirschfield, gardening, 1773.

Hinuber, gardens of, in Hanover, 61.

Hoffmanseggia, decan. monog. and leguminoseæ, a S. tr. Chili; which grows in loam and peat, and cuttings, not too ripe, will root under a hand-glass in sand.

Holcus, soft-grass, polyg. monœc. and gramineæ, H. peren. and an. Eur. and Amer. grasses of easy culture.

Holmskioldia, didyn. angios. and verbenaceæ, a S. tr. India; which grows in loam and peat, and cuttings will root in sand under a hand-glass in heat.

Holosteum, tetran. trig. and caryophylleæ, a H. an. Eng. of common culture.

Hopea, polyad. polyan. and ebenaceæ, a G. tr. Carolina, which grows in loam and peat, and cuttings root easily under a hand-glass.

Hordeum, barley, trian. dig. and gramineæ, H. peren. and an. Eur. As. and Amer. grasses of easy culture.

Hornemannia, didyn. angios. and scrophularineæ, a S. an. E. Ind. of common culture.

Hosta, didyn. angios. and verbenaceæ, a S. tr. S. Amer. which may be treated as holmskioldia.

Hottonia, water-violet, pentan. monog. and primulaceæ, a H. peren. an aquatic.

Hovea, diadel. decan. and leguminoseæ, G. tr. Austral. which thrive in loam and peat, and young cuttings may be struck under a bell-glass in sand.

Hovenia, pentan. monog. and rhamneæ, a G. tr. Japan; which grow in loam and peat, and ripened cuttings root readily under a hand-glass in sand.

Houstonia, tetran. monog. and rubiaceæ, H. peren. N. Amer. rock-work plants, which do well in peat soil in pots.

Hoya, pentan. dig. and asclepiadeæ, a S. tr. Asia; a climber of easy culture.

Hollyhock, — see Althæa.

Horticultural Catalogue, 1301.

Horticultural productions which a first-rate garden is calculated to afford monthly, 1547.

Hot-house, a garden structure, with the roof principally of glass, for the habitation of plants, 638; principles of design in, 639; how to obtain heat, 630; light, 631; air, 632; soil, 633; water, 634.

Hot-houses, details of the construction of their roofs, 643; fixed roofs, 645; moveable roofs, 644; roofs partaking of both characters, 645; materials of fixed roofs, 646; of moveable roofs, 647; uprights, 649; objections to metallic roofs, 650.

Hot-house roofs, different methods of glasing, *651*; common sash glazing, *652*; with a leaden lap, *653*; improved lead lap, *654*; copper lap, *655*; fragment glazing, *656*; rhomboidal glazing, *656*; perforated shield glazing, *657*; entire shield glazing, *658*; curvilinear lap, *659*; reversed curvilinear lap, *660*; ridge and furrow, *661*; anomalous surfaces, *662*; putty, *663*; paint, *664*.

Hot-houses, their walls and sheds, *665*; front wall, *666*; holes for vine stems, *667*; back wall, *668*; back shed, *669*.

Hot-house furnace and flues, 670; iron doors, 670; lime-kilns, 671; size of hot-house fire-places, 672; flues, 673; can-flue, 674; embrasure-flue, 675; cast-iron flue, *676*; size of flues, 677; and erection, 678; power of flues, 679; dampers or valves, 680; chimney-tops, 681.

Hot-houses, their steam boilers and tubes, 682; steam boilers, 682; of cast iron, of wrought iron, 683; of copper, 684; steam pipes, *685*; hot water pipes, 686.

Hot-houses, their trellises, 687; back wall trellis, 687; middle trellis, 688; front or roof trellis, 688; fixed rafter trellis, 689; moveable rafter trellis, 690; secondary trellis, 691; cross trellis, 692; Hot-house entrances, 693.

Hot-houses, their pits, stages, shelves, doors, paths, &c., 694; materials of the path, *695*; pits for tan or earth, 696; beds and borders, 697; shelves, 698; stages, 699.

Hot-houses, contrivances for water, wind, and air, 700; artificial rain, 701; wind, 702; ventilation, 703.

Hot-houses used in horticulture, 1156; pinery, 1156; vinery, 1159; peach-house, 1161; cherry and fig-house, 1162.

Hot-houses used in horticulture, their culture and management, 1156.

Hot-houses used in floriculture, 1594.

Hot-houses used in floriculture, their culture and management, 1619.

Holinshed, Ralph, an English historian, who died about 1580. 136.

Hot-beds, beds of vegetable matter in a state of active fermentation sufficient to heat a layer of earth placed over them; their formation, 864.

Hot-bed frames, bottomless boxes, with glass covers, for placing over hot beds; common sort, *625*; separating, moveable bottomed, Mallets, *625*. — see Structures.

Hot beds, their culture and management,— see Cucumis.

Honeydew, 41.

Hoffwyl, an agricultural establishment near Berne in Switzerland, 549.

Hoe, 616, — see Implements of Gardening.

Hoeing, 805, — see Operations of Gardening.

Hornor, Mr. T., an ingenious land-surveyor, 828.

Hortus pinguis, or the fat, the cook's or kitchen-garden.

Howison, James, M. D. 91. 93. 130; his writings on gardening, 2283. A. D. 1814.

————, William, M. D. his writings on gardening, 2283. A. D. 1819.

House, with carriage entrance, as a residence, 2029; with covered entrance, 2030; house and conservatory, 2031; house and flower-garden, 2032; house and French parterre, 2033; house and front garden, 2034.

Holyrood palace and park, Edinburgh, 113. 2039. 2218.

Horticultural society of London, 132; of Edinburgh, 133; of Winchester, 2197; of Leeds, 2184; of Glasgow, 2229; of Perth, 2236.

———————————— its transactions, 2283. A. D. 1815.

Horticultural societies, their gardens, 2128.

Howick, a seat in Northumberland, 2189.

Howsham, a seat in Yorkshire, 2185.

Holme, a seat in Yorkshire, 2185.

Holm Lacey, a seat in Herefordshire, 2172.

Hope-end, a seat in Herefordshire, 2172.

Holkham-hall, Norfolk, 2161.

Houghton-hall, Norfolk, 2161.

Holwood-house, Kent, 2147.

Holland-house, Middlesex, 2136.

Hopeton-house, Linlithgowshire, 2232.

Hollymount, a seat in Mayo, 2271.

Hooker, William, Esq., F. L. S. an eminent horticultural artist, his works on gardening, 2283. A. D. 1811.

Hogg, Mr. Thomas, his works on gardening, 2283. A. D. 1812.

Holden, Robert, Esq. his writings on gardening, 2283. A. D. 1820.

Hope, Thomas, Esq. 138. his writings on gardening, 2283. A. D. 1820.

Horizontal shelters, 620.

Hosack, David, M. D. F. R. S. L. S. &c. his works on gardening, 2283. A. D. 1818, and 2291. A. D. 1811.

Hooker, W. J. a distinguished botanist, professor of botany in the college of Glasgow, and author of several works, 125. 2229.

Home, Henry, Lord Kaimes, his works on gardening, 2283. A. D. 1762.

Hofland, Mrs. 2. her writings on gardening, 2283. A. D. 1762.

Hort. Kew. *Aiton's* Hortus Kewensis.

Hort. Trans., transactions of the London horticultural society.

Hog-plum, — see Spondias.

Hog-weed, — see Boerhaavia.

Holly, — see Ilex.

Honesty, — see Lunaria.

Honewort, — see Sison.

Honey-berry, melicocca bijuga.

Honey-flower, — see Melianthus.

Honeysuckle, — see Lonicera.

Honeywort, — see Cerinthe.

Hooded Milfoil, — see Utricularia.

Hop, — see Humulus.

Hop-hornbeam, — see Ostrya.
Hornbeam, — see Carpinus.
Horn poppy, — see Chelidonium.
Hornwort, — see Ceratophyllum.
Horse-chestnut, — see Æsculus.
Horse-radish, — see Cochlearia Armoracia.
———— tree, hyperanthera moringa.
Horse-shoe-vetch, — see Hippocrepis.
Horse-tail, — see Equisetum.
Horse-thistle, — see Cnicus.
Hottentot-cherry, cassine maurocenia.
Hound's-tongue, — see Cynoglossum.
Houseleek, — see Sempervivum.
Holt, (holtz, *Sax.*) a small wood or grove.
House, or mansion, situations best adapted, for 2003; aspect, 2005.
Horticultural architect, 2084.
Horticultural artist, 2085.
Hughes, William, his works on gardening, 2283, A.D. 1665.
Hunter, Alexander Gibson, Esq. his writings on gardening, 2283. A.D. 1811.
Hutts, as garden buildings, 750, — see Edifices.
Hübner, K. Jos. his works on gardening, 2285. A.D. 1801.
Huber, Cand. his works on gardening, 2285. A.D. 1792.
Hundeshagen, C ——, his works on gardening, 2285. A.D. 1819.
Huthem, ———, his work on gardening, 2287. A.D. 1817.
Hudsonia, dodec. monog. and ericeæ, a F. tr. N. Amer. an under-shrub, rather difficult to cultivate; it grows best in peat, shaded, and may be increased by layers, or cuttings under a bell-glass in sand.
Huernia, pentan. dig. and asclepiadeæ, D. S. tr. C.B.S. succulents, which grow in brick and lime-rubbish, little watered; cuttings root easily.
Humea, syngen. polyg. æqual. and corymbifereæ, a G. bien. N.S.W. of easy culture.
Humulus lupulus, hop, diœc. pentan. and urticeæ, a H. peren. Brit. — see 1549.
Hura, sand-box tree, monœc. monad. and euphorbiaceæ, S. tr. S. Amer. which grow freely in light loam, and large ripened cuttings root in sand under a hand-glass in heat.
Hutchinsia, tetrad. silic. and cruciferæ, H. peren. and a bien. Eur. rock work plants which grow in loam and peat, and root freely.
Hull, botanic garden, 121; described, 2184.
Hunter, Alexander, M.D. F.R.S.; his works on gardening, 2283. A.D. 1770.
Huber, Francis, a natural philosopher of Geneva, 724.
Huish, Robert, author and translator of some plays and novels, and of a work on bees, of which insect he is an enthusiastic admirer and cultivator, 724.
Humble plant, mimosa pudica.
Huntingdonshire, gardens and residences of, 2157.
Hurstbourne-park, Hampshire, 2197.
Hyacinthus, hyacinth, hexan. monog. and asphodeleæ, H. peren. Eur. bulbs of easy culture.
———— orientalis, 1627.
Hyænanche, diœc. dodec. and hydrocharideæ, a G. tr. C.B.S. which grows in loam and peat, and may be increased by cuttings in sand under a bell-glass.
Hydrangea, decan. dig. and saxifrageæ, F. and H. tr. Amer. and China, which grow in common soil, and ripened cuttings root readily.
Hydrangea hortensis, 1652.
Hydrastis, polyan. polyg. and ranunculaceæ, a H. peren. Canada, which grow best in light soil in rather a moist situation, and is increased by tubers of the roots.
Hydrocharis, frog-bit, diœc. enneandr. and hydrocharideæ, a H. peren. Brit. an aquatic.
Hydrocotyle, pennywort, pentan. dig. and umbelliferæ, G. and H. peren. Eur. Amer. and C.B.S. which grow best in peat soil kept moist, and are increased by division at the root.
Hydrolea, pentan. dig. and convolvulaceæ, a S. tr. S. Amer. which thrives best in loam and peat, and cuttings root in sand under a hand-glass.
Hydropeltis, polyan. polyg. and ranunculaceæ, N. Amer. a peren. will grow in loamy soil, or may be treated as an aquatic.
Hydrophyllum, water-leaf, pentan. monog. and borragineæ, H. peren. Amer. which grow freely in any light, rich soil, and are increased by suckers from the roots.
Hymenæa, decan. monog. and leguminoseæ, S. tr. E. Ind. which grow freely in loam and peat, and cuttings root in sand under a hand-glass in heat.
Hymenopappus, syngen. polyg. æqual. and corymbifereæ, a F. bien. Louisiana, of common culture.
Hymenophyllum, filmy leaf, cryptog. filices, and filiceæ, a H. peren. Eng. a fern, which grows best in small pots in loam and peat.
Hyoschyamus, henbane, pentan. monog. and solaneæ, G. tr. peren. and bien. Eur. which grow in loam and peat, and cuttings root without being covered by a glass; the H. peren. and an. are of common culture.
Hyoseris, swine's succory, syngen. polyg. æqual. and cichoraceæ, H. peren. and an. Eur. of common culture.
Hypecoum, tetran. dig. and papaveraceæ, a H. bien. and an. Eur. of easy culture.
Hyperanthera, horse-radish-tree, decan. monog. and leguminoseæ, a S. tr. E.

Ind. which thrives in light loam, and cuttings root under a hand-glass in sand.

Hypericum, St. John's wort, polyad. polyan. and hypericineæ, G. tr. Eur. and Amer. which grow in loam and peat, and young cuttings root freely under a bell-glass in sand; the H. tr. and peren. are of easy culture; some are increased by cuttings under a hand-glass, and others by division at the root.

Hypoxis, hexan. monog. and asphodeleæ, G. and H. peren. Amer. and C. B. S. which grow in loam and peat, and are increased by offsets from the roots.

Hypochæris, cat's-ear, syngen. polyg. æqual. and cichoraceæ, H. peren. and an. Eur. of easy culture.

———— maculata, 1401.

Hyptis, didyn. gymnos. and labiatæ, S. and G. tr. bien. and peren. Ind. and America, which grow freely in rich, light soil, and the hot-house sorts are increased by cuttings under a hand-glass in heat.

Hyssopus, didyn. gymnos. and labiateæ, H. tr. and peren. Eur. and N. Amer. of easy culture.

———— officinalis, the common hysop, 1397.

Hyacinth, — see Hyacinthus.

Hyssop, — see Hyssopus.

Hyæna poison, hyænanche globosa.

Hyde-park, London, 2037.

——— hall, Cheshire, 2193.

Hydrostatic-press, its use in gardening, 621.

Hygrometer, its use in gardening, 612. and 623.

I.

Iberis, candy tuft, tetrad. silic. and cruciferæ, G. and F. tr. Eur. which grow in common soil, and are readily propagated by cuttings; and H. peren. and an. of easy culture.

Ichnocarpus, pentan. monog. and apocyneæ, a S. tr. E. Ind. which thrives well in loam and peat, and cuttings root freely in sand under a hand-glass.

Ichneumon manifestator, 444. 1310.

Icolmkill, in the Hebrides, early improvements there, 113.

Ice-house, its construction, 721; management, 722.

Ice-plant, mesembryanthemum crystallinum.

Ickworth-park, Suffolk, 2159.

Ilex, holly, tetran. tetrag. and rhamneæ, G. and F. tr. Eur. and Amer. which thrive well in loam and peat, and ripened cuttings root freely under a hand-glass in sand; the commoner H. tr. are increased by seed, and the finer sorts by grafting and budding.

Ilex, aquifolium, the common holly, 1931.

Illecebrum, knot-grass, pentan. monog. and amaranthaceæ, a H. peren. Eng. a rock plant which grows best in pots in light soil, and seeds ripen abundantly.

Illicium, aniseed tree, polyan. polyg. and magnoliaceæ, a F. tr. Florida, which grows best in light loam, and is increased by layers, or ripened cuttings in sand under a hand-glass.

Ildephonso, near Madrid, gardens of, 99.

Implements of gardening, 616; tools, 616; the pick, lever, spade, fork, shovel, dibber, forester's dibber, planter's hack, planter's trowel, planter's pick-axe, garden trowel, transplanter, draw-hoe, prong-hoe, thrust-hoe, rake, drill-rake, hoe-rake, turfing-iron, turf-racer, turf-beetle, turf-scraper, wire-broom, dock-weeder, besom, wire-besom, 616.

Instruments of operation, 617; common garden knife, common pruning knife, folding pruning knife, grafting-knife, budding-knife, asparagus-knife, grafting chissel, forest-chissel, pruning-bill, forest-axe, pruning-saw, averuncator, (averunco, to cut or prune,) French pruning shears, hedge-shears, verge-shears, turf-shears, scythe, garden-scarifiers, or bark-scalers, moss-scraper, blunt-knife, forest-barking irons, garden-hammer, garden-pincers, weeding-pincers, grape-gatherer, peach-gatherer, pear-gatherer, berry-gatherer, apple-gatherer, seed and cherry-gatherer, 617.

Instruments of action, 618; garden-line, ground-measurer, timber-measurer, ground-compasses, borning-piece, levels, adjusting horizontal level, spirit-level, staff, straight-edge, stake, 618.

Instruments of designation, 619; designators or naming instruments, common talley, (tailler, to cut,) or number-stick, botanic-talley, written name stick, permanent label, temporary label, 619.

Utensils, 620; mould-screen, mould-sieve, mould-scuttle, mould-basket, flower-pot, store-pot, pot for bulbous roots, classic pot, stone-ware pot, glazed-pot, flower-pot guage, square pot, saucer, carnation-saucer, propagation-pot, blanching-pot, plant-box, plant basket, planter's basket, watering-pot, French watering-pot, watering-tube, garden-syringe, hand-forcing pump, portable canvas, or gauze-case, oiled paper shade, straw-net, garden-net, horizontal shelter, plant umbrella, earthenware shelter, leaden hand glass, copper hand glass, cast-iron hand-glass, wrought iron hand glass, green bell glass, chrystal bell, or receiver, 620.

Machines of labour, 621; common wheelbarrow, separating barrow, new ground-work barrow, water-barrow, hand-barrow, barrow watering-engine, curved barrel engine, self-acting green-house engine, roller, carriage water barrel, watering-roller, hand-spokes, common garden-ladder, rule jointed ladder, step-ladder, wheel platform, boat-scythe, grindstone, tree transplanter, German devil, hydrostatic-press, 621.

Machines of defence, 622; scare, bird-trap, bird-net, mouse-trap, garden rat-trap, mole-trap, earwig and beetle-trap, wasp and fly-trap, man-trap, humane man-trap, spring-gun, concealed-alarum, common gun or musket, (from mangor, a warlike machine, used before the invention of fire-arms, or musquet, from mosquet, *Fr.*) fumigating bellows, various means, 622.

Machines of designation, 623; barometer, hydrometer, (udor, water, and meter, to measure,) pluviometer (pluvia, æ, rain, and meter, to measure,) Æolian index, (æolus, king of storms and winds,) thermometer, (thermes, heat, and meter, to measure,) Sikes's registering thermometer, Kewley's alarum thermometer, automaton gardener, 623.

Miscellaneous articles, 624; flower-stand, basket-flower border, parterre-edgings, earthenware border, bass-mats, prepared coverings, straw-coverings, reed-coverings, protecting-bags, feet or shoe-scraper, props for plants, spray or branches, wall-tree nails, lists, mat ties, osier twigs, boards and planks, tressels, 624, — see Structures of gardening.

Implements used in gardening, their further improvement, 790.

Ingestree-hall, Staffordshire, 2173.

Invercauld-house, Aberdeenshire, 2239.

Invergordon-castle, Rosshire, 2247.

Inverness nursery, 2248.

Inverness-shire, gardens of, 2248.

Inverary-castle, Argyleshire, 2249.

Impatiens, balsam, pentan. monog. and geraniaceæ, H. bien. S. an. Ind. Amer. Eng. of easy culture in rich soil.

——— balsamina, the garden balsam, 1653.

Imperatoria, masterwort, pentan. dig. and umbelliferæ, a H. peren. Scot. of easy culture.

Improvement, forming a plan of, 2053.

——— rural, — see Landscape Gardening.

Improver, rural, — see Landscape Gardener.

Ingatestone-hall, Essex, 2152.

Indigofera, indigo, diadel. decan. and leguminosæ, S. tr. bien. and an. Ind. and C. B. S. which grow in loam and peat, and cuttings root readily in young wood under a bell-glass in sand; the H. an. are of easy culture.

Inga, polyg. monœc. and leguminosæ, S. tr. E. and W. Ind. which grow in loam and peat, and cuttings root in sand in bottom heat under a bell-glass.

Inocarpus, Otaheite-chestnut, decan. monog. and sapoteæ, a S. tr. South Sea Islands, which thrives well in loam and peat, and ripened cuttings will root in sand under a hand-glass.

Inula, syngen. polyg. super. and corymbiferæ, S. an. and H. peren. Eur. and Asia, of the easiest culture.

——— crithmifolia, samphire, 1408.

——— helenium, 1399.

Inarching, 889.

Inoculating, 909 to 921.

Insects, general operations for their destruction, 1020; in the open garden, 1030; in exotic culture, 1019. The insects which infest particular plants, and the mode of extirpation, &c. are treated of in giving the culture and management of the plant, or the department in the garden to which it belongs, — see Acarus, Thrips, Coccus, Papilio, &c. and those plants or departments of gardening which these insects attack.

Indian-corn, — see Zea.

——— cress, — see Tropeolum.

Ingram, Mr. Robert, 1042; his writings on gardening, 2283. A.D. 1811.

Indian-fig, cactus opuntia.

——— cucumber, medeola virginica.

——— millet, sorghum vulgare.

——— shot, canna indica.

Inscriptions, their use and abuse in gardening, 788.

Indigo, — see Indigofera.

Ionidium, pentan. monog. and violaceæ, a G. peren. S. Amer. which grows freely in loam and peat, and young cuttings root readily under a hand-glass.

Ipomœa, pentan. monog. and convolvulaceæ, S. peren. bien. and an. Ind. Amer. Eur. twiners which grow in rich light soil, and young cuttings root freely in sand under a hand-glass; the H. peren. and an. are of the easiest culture.

Ipomopsis, pentan. monog. and polemoniaceæ, a G. bien. and H. an. N. Amer. of common culture.

Iresine, diœc. pentan. and amaranthaceæ, a F. peren. Amer. which grows in loam and peat, and is increased by dividing at the root.

Iris, trian. monog. and irideæ, G. and H. peren. Eur. As. and Amer. of easy culture in loam and peat, and increased by dividing at the root; some of them may be treated as marsh-plants.

——— persica, tuberosa, susiana, xiphium, &c. 1633.

Irrigation, 571.

Iron-tree, siderodendrum triflorum.

Iron-wort, — see Sideritis.

Ireland, gardens and residences of, 2250.

Isatis, woad, tetrad. silic. and cruciferæ, a H. peren. bien. and an. Eur. of easy culture.

Ischæmum, polyg. monœc. and gramineæ, a S. peren. and an. E. Ind. grasses of common culture.

Isnardia, tetran. monog. and onagrareæ, a H. an. Eur. of common culture.

Isochilus, gynan. monan. and orchideæ, S. peren. W. Ind. parasites which may be treated as aërides, epidendrum, &c.

Isoetis, quillwort, crytog. hydrop. and marsiliaceæ, a H. peren. Brit. a marsh-plant, 1670.

Isolepis, trian. monog. and cyperaceæ, a H. peren. and an. Brit. grasses of common culture.

Isopogon, tetran. monog. and proteaceæ, G. tr. N. Holl. which grow in loam, peat and sand well-drained, and ripened cuttings root under a hand-glass, care being had to take off the glass occasionally to avoid damps.

Isopyrum, polyan. polyg. and ranunculaceæ, a H. peren. and an. Eur. of easy culture.

Isles of Jersey and Guernsey, as to gardening, 2201.

Italian books on gardening, 2286.

Isle of Man, as to gardening, 2191.

Isle of Anglesea, gardens and residences of, 2206.

Itea, pentan. monog. and saxifragea, a H. tr. N. Amer. which thrives well in sandy loam, and is increased by layers.

Iva, syngen. polyg. necess. and corymbiferæ, a S. an. and H. tr. Amer. both of common culture.

Ivy, — see Hedera.

Ixia, trian. monog. and irideæ, G. peren. C. B. S. bulbs which grow best in sandy loam and decayed leaves or peat, and require no water after they have done flowering: they will do well in beds in the open garden treated in the same manner as ranunculus, guarding against frost and heavy rains — see 1637.

Ixodia, syngen. polyg. æqual. and corymbiferæ, a G. tr. N. Holl. which thrives best in sandy loam and peat, and young cuttings root freely in the same kind of soil under a hand-glass.

Ixora, tetran. monog. and rubiaceæ, S. tr. E. Ind. and China, of great beauty, which thrive well in loom and peat, and cuttings root freely in sand under a hand-glass.

Iwan Wilika, (Old John,) a tower in Moskwa, 1780.

J.

J. or Jus. A. L. de Jussieu's Genera Plantarum.

Jacksonia, decan. monog. and leguminoseæ, G. tr. N. Holl. which grow in sandy loam and peat, and young cuttings may be rooted in sand under a bell-glass, or ripened ones under a hand-glass.

Jacquinia, pentan. monog. and sapoteæ, S. tr. W. Ind. which thrive well in loam and peat, and cuttings (with care) will root in sand under a hand-glass in heat.

Jambolifera, octan. monog. and onagrareæ, a S. tr. which grows in light loam, and cuttings root freely in sand under a hand-glass.

Jasione, sheep's scabious, pentan. monog. and campanulaceæ, a H. peren. and an. Eur. which do well in common soil, or in pots, (being rather tender of frost,) and is increased by cuttings or seeds.

Jasminum, dian. monog. and jasmineæ, S. and G. tr. E. Ind. and C. B. S. chiefly climbers, which grow in loam and peat, and cuttings root readily in sand under a hand-glass in heat; the H. tr. Eur. grow in common soil, and are increased by layers or cuttings.

Jatropha, physic-nut, monœc. monad. and euphorbiaceæ, S. tr. peren. and an. W. Ind. which thrive well in loamy soil, and cuttings root best stuck in the tan in a good heat.

Jacob, R., his works on gardening, 2285. A.D. 1797.

Jacobsdahl, a seat in Sweden, 74.

Jardin electoral de Saxe, at Warsaw, 89.

Jacques, a German gardener, employed by the Grand Seignor at Constantinople, 105.

Jaunez, I —— P ——, his works on gardening, 2284. A.D. 1816.

Jaume, St. Hillaire, his works on gardening, 2284. A.D. 1805.

Japan, gardens of, 155.

Jamaica, botanic garden of, 168.

Jaca-tree, artocarpus integrifolia.

Jasmine, — see Jasminum.

Jac. aust. N. J. Jacquin Flora Austriaca.

Jac. ic. icones plantarum rariorum. Edita à N. J. Jacquin.

Jac. vind. N. J. Jacquin hortus botanicus vindobonensis.

Jack-in-a-box, hernandia sonora.

Jalap, ipomœa jalapa.

Jardins de plantes at Paris, described, 2043.

Jeffersonia, octan. monog. and papaveraceæ, a H. peren. N. Amer. which grows best in peat, and is increased by seeds or dividing at the root.

Jenkins, Mr. Thomas, F. H. S. 1171; his writings on gardening, 2283. A.D. 1819.

Jeeves, Mr. Joseph, his writings on gardening, 2283. A.D. 1816.

Jet d'eau, spout or fountain of water, 777 and 778.

Jock's lodge nursery, Midlothian, 2218.

Johnston, Thomas, M.D. his work on gardening, 2283. A.D. 1629.

Jones, Henry, his poem on gardening, 2283. A.D. 1766.

Johnston, Cuthbert William, his writings on gardening, 2282. A.D. 1821.

Jerdaens, J. H., his works on gardening, 2285. A.D. 1798.

Johnston, John B., his work on the vine, 2291. A.D. 179 .

Journeymen gardeners, 2062.

Jonesia, heptan. monog. and..............., a S. tr. E. Ind. which grows freely in light loam, and large cuttings root well in sand under a hand-glass.

Jour. R. Inst. Journal of the Royal Institution of Great Britain, 155.

Juglans, walnut, monoec. polyan. and terebintaceæ, H. tr. N. Amer. increased by layers or seeds, and some kindly budding and inarching.

——— regia, the common walnut, 1477 and 1920.

Juncus, rush, hexan. monog. and junceæ, H. peren. Brit. grasses, generally marsh-plants.

Juniperus, diœc. monad. and coniferæ, F. and H. tr. Eur. and Amer. the more delicate species prefer peat and soil; but the cedars and savin grow in common garden earth: they are best managed by seeds, but cuttings may be rooted under a hand-glass.

Jussieuia, decan. monog. and onagrareæ, S. and G. peren. and bien. Ind. and Amer. chiefly aquatics of common culture.

Justicia, dian. monog. and acanthaceæ, S. and G. tr. and an. Ind. and Amer. of easy culture in loam and peat, and cuttings root freely in heat under a hand-glass.

Jussieu, Bernard de, 55. 193; his works on gardening, 2284. A.D. 1735.

Justice, James, Esq., F. R. S. 123; his works on gardening, 2283. A.D. 1754.

Judd, Mr. Daniel, F.H.S. his writings on gardening, 2283. A.D. 1816.

Julien, A ——, his work on gardening, 2285. A.D. 1816.

K.

Kæmpferia, galangale, dian. monog. and scitamineæ, S. peren. E. Ind. which grow freely in rich light soil, requiring little water when not in a growing state, and are increased by dividing at the root.

Kalmia, decan. monog. and rhodoraceæ, H. tr. N. Amer. under shrubs which require peat soil, or very sandy loam, and are increased by layers or seeds.

Kalimar, gardens of, in the East Indies, 154.

Kanguru vine, cissus antarctica.

Kaleidescope of Dr. Bradley, 1572.

Kalb, Bhd. H., his works on gardening, 2285. A.D. 1810.

Kalm, Peter, his works on gardening, 165. 193. 2283. A. D. 1754.

Kannegiesser, F. A. his works on gardening, 2285. A. D. 1805.

Keyser, G. Ad. his work on gardening, 2285. A. D. 1800.

Kentchurch, a seat in Herefordshire, 2171.

Kempton Park, Middlesex, 2134.

Kent, gardens and residences of, 2146.

Kennedia, diadel. decan. and leguminoseæ, G. tr. Austral. climbers which grow in sandy loam and peat, and young cuttings root freely in sand under a bell-glass in a little bottom heat.

Kernel fruits, 1421.

Kelham-house, in Nottinghamshire, 1200.

Kent, William, an eminent landscape-gardener, 108. 122. 137.

Kew gardens, Surrey, 120. 143. 2142.

Kerim Khan, gardens of, 153.

Kensington gardens, Middlesex, 107. 2137.

Kensington nursery, 2132.

Keddleston, a seat in Derbyshire, 2177.

Kelmarsh, a seat in Northamptonshire, 2183.

Kerry, gardens and residences of, 2268.

Kenmore lodge, in Kerry, 2268.

Kenmore-house, in Kerry, 2268.

Kelly, Mr. Thomas, his writings on gardening, 2283. A. D. 1813.

Keens, Mr Michael, F. H. S. his writings on gardening, 2283. A. D. 1814.

Kent, William, Esq. his writings on gardening, 2283. A. D. 1817.

Keith, Alexander, Esq. his writings on gardening, 2283. A. D. 1820.

Ker, Henry Bellenden, Esq. his writings on gardening, 2283. A.D. 1821.

Kewley's alarum thermometer, 623.

——— automaton gardener, 623.

Kellermann, ——, his works on gardening, 2285, A. D. 1813.

Kecht, J. C. his works on gardening, 2285, A. D. 1813.

Kitchen-garden, formation of, 1073.

——————— situation, 1074 and 2010; exposure and aspect, 1075; extent, 1076; shelter and shade, 1077; soil, 1078; water, 1079; form, 1080; walls, 1081; aspect of walls, 1082; height of walls, 1083; construction of walls, 1084; materials of walls, 1085; open railings instead of walls, 1086; hot or flued walls, 1087; cross-walls, 1088; of coloring walls, 1090; ring-fence, 1091; placing the culinary hot-houses, and melonry, 1092; situation of the melonry, 1093; laying out the area, 1094; laying out the quarters, 1095; making the borders, 1096; laying out the walks, 1097; laying out the slips, 1098; laying out a nursery, or reserve department, 1099; season for forming a garden, 1099; distribution of fruit trees, 1100; selection and arrangement of wall trees, 1100; sorts, 1102; selection and arrangement of espaliers and dwarf standards, 1103; of dwarf standards, 1104; distances, 1105; of tall standard fruit-trees, 1106; fruit-shrubs, 1107; choice of plants, 1109; record of sorts, 1109.

———————, its culture and management, 1115; culture of the soil, 1115; manure, 1116; recent dung, 1117;

cropping, 1118; rotation of crops, 1119; thinning, 1122; thinning stone-fruits, 1124; pruning and training, 1125; summer pruning, 1126; winter pruning, 1127, 1128; pruning edgings and hedges, 1128; weeding, stirring the soil, protecting, supporting, shading, 1129; earthing, 1130; watering, 1133; vermin, incidents, accidents, 1134; gathering and preserving vegetables, and sending them to a distance, 1135; proportioning the quantity of vegetables to be grown, 1138; miscellaneous operations of culture and management, 1139.

Kingsland nursery, 2132.

Kingswood-lodge, Surrey, 2140.

Kimberley-hall, Norfolk, 2160.

King's Weston, a seat in Gloucestershire, 2168.

Kirklington-hall, Nottinghamshire, 2179.

Kirkleatham-hall, Yorkshire, 2185.

Kingston-hall, Dorsetshire, 2201.

Kilmarnock nursery, Ayrshire, 2227.

Kilravock, a seat in Invernesshire, 2248.

Kilkenny, gardens of, 2254.

Kildare, gardens and residences of, 2255.

Kiladoon, a seat in Kildare, 2255.

King's County, gardens of, 2256.

Kilmore, a seat in Tipperary, 2265.

Killcooly, a seat in Tipperary, 2268.

Killarney, lakes of, in Kerry, 2268.

Kirk, Mr. James, his writings on gardening, 2283. A. D. 1813.

Kinment, Mr. John, his writings on gardening, 2283. A. D. 1814.

Kiosque, as an ornamental building, 763.

Kirchner, J. F. his works on gardening, 2285. A. D. 1796.

Kiggelaria, diœc. decan. and euphorbiaceæ, a G. tr. C. B. S. which grows freely in loam and peat, and ripened cuttings root under a hand-glass in sand.

Kitaibelia, monad. polyan. and malvaceæ, a H. peren. Hungary, of easy culture, and very prolific in seeds.

Kiosque, 103. 763.

Kidney-bean, — see Phaseolus.

Kidney vetch, — see Anthyllis.

Kircaldy nursery, Fifeshire, 2235.

Kinrosshire, gardens of, 2234.

Kincardineshire, as to gardening, 2238.

Kleinhofia, dodec. monog. and malvaceæ, a S. tr. E. Ind. which grows in light loamy soil, and cuttings are not difficult to root under a hand-glass in sand.

Kleinia, syngen. polyg. æqual. and corymbiferœ, a S. an. N. Amer. of easy culture.

Klüpfil, J— Alb. his works on gardening, 2285. A. D. 1713.

Knocklofty, a seat in Tipperary, 2265.

Knappia, trian. dig. and gramineæ, a H. an. Wales, a grass of common culture.

Knautia, tetran. monog. and dipsaceæ, a H. bien. and an. Levant, of common culture.

Knowltonia, polyan. polyg. and ranunculaceæ, G. peren. C. B. S. which grow freely in loam peat, and are increased by dividing at the root, or by seeds.

Knight, T. A. Esq. F. R. S. Pres. Hort. Soc. 132; his pinery, 1158; his works on gardening, 2283. A. D. 1795.

Knight, Mr. Joseph, F. H. S. his works on gardening, 2283. A. D. 1809.

Knoop, Jean Herman, his work on gardening, 2287. A. D. 1771.

Kn. Pom. Knoop's Pomologie,—see Knoop.

Knife, garden, different sorts of, 617, — see Implements.

Knowle, a seat in Kent, 112. 2148.

Knowlsley, a seat in Lancashire, 745. 2192.

Knorr. thes. Thesaurus Rei herbariæ hortensisque universalis. Apud Ge. Wolfg. Knorrii Hæredes.

Knapweed, centaurea scabiosa.

Knawel, — see Scleranthus.

Knot-grass, illecebrum verticillatum.

Kochia, pentan. dig. and chenopodeæ, H. an. Amer. and Siberia, of common culture.

Kœleria, trian. dig. and gramineæ, H. peren. and bien. Eur. grasses of easy culture.

Koelreuteria, octan. monog. and sapindeæ, a H. tr. China, which grows well in common soil, and is propagated by layers or cuttings of the roots.

Kœnigia, tetran. trig. and polygoneæ, a H. an. Ireland, of easy culture.

Körmond, a seat in Hungary, 63.

Kob, J. And. his work on gardening, 2285. A. D. 1786.

Krigia, syng. polyg. æqualis, and cichoraceæ, a H. an. N. Amer. of common culture.

Kraft, John, his works on gardening, 2285. A. D. 1792.

Kraft, John Charles, his works on gardening, 2284. A. D. 1810.

Krause, Ch. L. his work on gardening, 2285. A. D. 1773.

Krause, L. Ph. his work on gardening, 2285. A. D. 1738.

Kyllinga, trian. monog. and cyperaceæ, S. peren. India, grasses of common culture.

Kyre Wyre, a seat in Worcestershire, 2169.

Kyle, Thomas, his work on gardening, 2283. A. D. 1785.

Kyle, Mr. John, his writings on gardening, 2283. A. D. 1811.

Kulzean, or Culzean castle, Ayrshire, 115; described, 2227.

L.

Lachenalia, hexan. monog. and asphodeleæ, G. peren. C. B. S. bulbs, which thrive well in loam and peat, or loam and leaf-mould, and are increased by offsets or seeds.

Lachnæa, octan. monog. and thymeleæ, G. tr. C. B. S. which thrive only in sandy peat, and young cuttings root freely in sand under a bell-glass.

Lactuca, lettuce, syngen. polyg. æqual. and cichoraceæ, H. bien. and an. Eur. and Amer. of easy culture.

———, sativa, the garden lettuce, 1352; to force, 1287.

Lagasca, syngen. polyg. æqual. and corymbifereæ, a S. an. S. Amer. of common culture.

Lagerstrœmia, polyan. monog. and salicariæ, S. tr. E. Ind. which thrive in peat loam; L. reginæ, is a splendid plant, which requires a great deal of heat and little water in winter; all the species increase by cuttings in sand under a bell-glass.

Lagetta, octan. dig. and thymeleæ, a S. tr. Jamaica; which grows in loam and peat, and ripened cuttings root in sand under a hand-glass.

Lagœcia cumin, pentan. monog. and umbelliferæ, a H. an. Levant; of common culture, 1662.

Lagunea, monad. polyan. and malvaceæ, a S. an. Bourbon; of common culture.

Lagurus, hare's tail-grass, trian. dig. and gramineæ, a H. an. Guernsey; a grass of the easiest culture.

Lambertia, tetran. monog. and proteaceæ, a G. tr. N. S. W. which thrives well in loam and peat, but is easily injured by over-watering. Ripened cuttings taken off at a joint just before they begin to grow afresh, will root in sand under a hand-glass, avoiding damp.

Lamium, archangel, didyn. gymnos. and labiateæ, H. peren. S. Eur. of easy culture, 1656 and 1662.

Lanaria, hexan. monog. and hæmodoraceæ, a G. peren. C. B. S. which thrives in loam and peat, and is increased by dividing at the root.

Lantana, didyn. angios. and verbenaceæ, S. tr. and an. Ind. and Amer. of easy culture in loam and peat, and cuttings root readily under a hand-glass in sand or mould.

Lapeyrousia, trian. monog. and irideæ, G. peren. C. B. S. bulbs which may be treated as ixia.

Lappago, trian. dig. and gramineæ, a H. an. S. Eur. a grass of common culture.

Lappula, pentan. monog. and boragineæ, H. bien. and an. Amer. of common culture.

Lapsana, nipplewort, syngen. polyg. and cichoraceæ, H. peren. and an. Eur. of easy culture.

Larochea, pentan. pentag. and semperviveæ, G. tr. C. B. S. succulents which may be treated as crassula.

Laserpitium, laserwort, pentan. dig. and umbelliferæ, H. peren. and bien. Eur. of common culture.

Larivière, de, et M——, Dumoulin, their work on gardening, 2284. A. D. 1769.

Latapie, ——, his work on gardening, 2284. A. D. 1771.

Larochefocauld, Liancourt, his works on gardening, 2284. A. D. 181..

Lasteryie, Comte de, his works on gardening, 2284. A. D. 181..

Laborde, Alexander, Count de, his works on gardening, 2284. A. D. 181..

Lair, P. A. his works on gardening, 2284. A. D. 181..

Lambray, M ——, his works on gardening, 2284. A. D. 1817.

Lalos, J——, his work on gardening, 2284. A. D. 1818.

Laurenburg, Peter, his works on gardening, 2285. A. D. 1631.

Layers, to propagate by, 882.

Laurop, P——, his works on gardening, 2285. A. D. 1810.

Lasiopetalum, pentan. monog. and sterculiaceæ, G. tr. N. Holl. which grow freely in loam and peat, and ripened cuttings root in sand under a hand-glass.

Latania, Bourbon palm, polyg. monœc. and palmeæ, a S. tr. Mauritius, which grows in light soil, and requires a strong moist heat.

Lathræa, toothwort, didyn. angios. and orobancheæ, a H. peren. Brit. of common culture in loam and peat.

Lathyrus, diadel. decan. and leguminoseæ, H. peren. and an. Eur. of easy culture, —see 1412.

Lavandula, lavender, didyn. gymnos. and labiateæ, G. F. and H. tr. peren. and and an. Eur. and Ind. which succeed well in light, rich soil, and ripened cuttings root in sand under a hand-glass.

——— spica, the common lavender, 1387.

Lavatera, monadel. polyan. and malvaceæ, G. tr. Eur. and Afr. which thrive well in loam and peat, or any light, rich soil, and ripened cuttings root in sand under a hand-glass; most of the species ripen seeds. The H. bien. and an. are of easy culture.

Lavenia, syngen. polyg. æqual. and corymbifereæ, a H. an. E. Ind. of common culture.

Laurophyllus, polyg. diœc. and ...., a G. tr. C. B. S. which grows in loam and peat, and ripened cuttings root under a hand-glass in sand.

Laurus, laurel, ennean. monog. and laurineæ, S. and G. tr. E. Ind. and Amer. which thrive in loam and peat, and ripened cuttings root in sand under a hand-glass, taking care to avoid damps.

——— persea, the alligator pear, 1521.

Lawsonia, octan. monog. and salicariæ, S. tr. Ind. which thrive in loam and peat, and cuttings root readily in sand under a hand-glass.

Langport, Somersetshire, pine and grape stove at, 1158.

Landscape gardening, 1941; principles of, 1942; materials of, 1963; practice of, 2052.

Laurentinum, a villa of Pliny, 13.

Laying out grounds, — see Landscape Gardening.

Lakes, how to form or improve in garden scenery, 1981.

Lawn in gardening, a surface of turf or grasses, kept short by frequent mowing, and generally situated near the house, 2012.

Labourer's cottage and garden, 2036.

Landscape gardener, or layer-out of grounds, 2086.

Layer-out of grounds, — see Landscape Gardener.

Lancashire, gardens and residences of, 2191.

Landridge, a seat in Devonshire, 2203.

Lambton-hall, Durham, 2188.

Latimers, a seat in Buckinghamshire, 2154.

Langford hall, Essex, 2151.

Lawranny-hall, in Pembrokeshire, 2212.

Langham-cottage, Dumfrieshire, 2224.

Lanarkshire, gardens and residences of, 2229.

Lacken, a seat in Westmeath, 2260.

Lawson, William, his work on gardening, 2283. A. D. 1597.

Langley, Batty, his works on gardening, 2283. A. D. 1728.

Lang. or L. Pom. Langley's Pomona,—see Langley.

Ladies' slipper, — see Cypripedium.

——— smock, — see Cardamine.

Lady fern, nephrodium thelypteris.

Lancashire asphodel, — see Narthecium.

Laserwort, — see Laserpitium.

Lavender, — see Lavandula.

——— cotton, — see Santolina.

Laurestine, — see Viburnum.

Lawrence, Anthony, his work on gardening, 2283. A. D. 1677.

———, John, M. A. his works on gardening, 2283. A. D. 1714.

Langford, T——, his work on gardening, 2283. A. D. 1681.

Laird, Mr. James, his writings on gardening, 2283. A. D. 1813.

Laying in by the heels, (sheuching, *Scotch*,) a temporary earthing or planting, to prevent plants taken up for removal or replanting, from suffering between the operations.

Ladder, different sorts of, used in gardening, 621.

Lataillé-des-Essarts, his writings on gardening, 2284. A. D. 1766.

Lamoignon-Malsherbes, C. G. his works on gardening, 2284. A. D. 1780.

Lam. ill. Tableau Encyclopédique et Methodique des trois Regnes de la Nature. Botanique: Illustrations des Genres. Par M. de Lamarck.

Layering, to propagate by, 882, — see Operations.

La Zenki, (or the bath, *Polish*,) a royal esidence at Warsaw, 89.

Landbaumeister, 82.

Labyrinth, a convoluted, plicated, (or otherwise rendered intricate) disposition of walks, separated by hedges or shrubbery, sometimes called a wilderness, 107.

Laburnum, — see Cytisus.

Ladies mantle, — see Alchemilla.

Lambs lettuce, — see Fedia.

Larch, — see Pinus.

Larkspur, — see Delphinium.

Laurel, — see Laurus.

Lasiocampa, or egger-moth, 1912.

Labels for naming plants, different kinds of, 619.

Lebeckia, diadel. decan. and leguminoseæ, G. tr. C. B. S. which thrive well in sandy loam and peat, and young cuttings root freely in sand under a bell-glass.

Lechea, trian. trig. and caryophylleæ, H. peren. Canada, which grow best in small pots of loam and peat, and are increased by cuttings under a hand-glass.

Ledum, decan. monog. and rhodoraceæ, H. tr. Eur. and Amer. dwarf shrubs, which grow in peat or sandy loam, and are increased by layers or seeds.

Leea, pentan. monog. and meleaceæ, S. tr. and peren. E. Ind. which grow freely in light loam, and cuttings soon strike root under a hand-glass in heat.

Leersia, trian. dig. and gramineæ, a H. peren. and an. Amer. grasses of common culture.

Lemna, duck-weed, monœc. dian. and naiadeæ, H. an. Brit. aquatics which may be treated as callitriche.

Leonotis, lion's-tail, didyn. gymnos. and labiateæ, G. tr. and a S. an. E. Ind. and C. B. S. which thrive in light rich soil, and young cuttings root readily under a hand-glass.

Leontice, hexan. monog. and berberideæ, a G. and H. peren. Levant; which grow freely in loam and peat, and may be increased by dividing at the root or by seeds.

Leontodon, dandelion, syngen. polyg. æqual. and cichoraceæ, H. peren. Eur. of easy culture.

———, taraxacum, the common dandelion, 1355.

Leonurus, motherwort, didyn. gymnos. and labiateæ, H. peren. bien. and an. Eur. of common culture.

Lepechinia, didyn. gymnos. and labiateæ, a H. peren. Mexico; of common culture, 1656.

Lepidium, pepperwort, tetrad. silic. and crucifereæ, G. and F. tr. and H. an. Eur. and Amer. of common culture.

Leptanthus, trian. monog. and ...., a H. peren. N. Amer. which thrives in peat soil, and is increased by offsets from the roots.

Leptospermum, icosan. monog. and myrteaceæ, G. tr. Austral. which grow well in an equal mixture of sandy loam and peat, and young cuttings root readily in sand under a bell-glass.

Lessertia, diadel. decan. and leguminoseæ, a G. peren. and an. C. B. S. which grow in sandy loam and peat, and are readily increased by cuttings or seeds.

Lestibudesia, pentan. monog. and amaranthaceæ, a S. tr. and bien. W. Ind. which grows freely in light, rich soil, and is readily increased by cuttings or seeds.

Leucadendron, diœc. tetran. and proteaceæ, G. tr. C. B. S. which grow best in light loam mixed with more than one-third sand, the pots well drained, and overwatering avoided. Ripened cuttings taken off early in spring at a joint, root in sand under a hand-glass.

Leek, — see Allium.

Lettuce, — see Lactuca.

Leadwort, — see Plumbago.

Leatherwood, dirca palustris.

Lee-Chee, dimocarpus litchi.

Lemon-grass, andropogon schœnanthus.

Lentil, ervum lens.

Leopard's bane, — see Doronicum.

Leicestershire, gardens and residences of, 2176.

Lewisham nursery, 2146.

Ledstone-lodge, Yorkshire, 2185.

Lee-castle, Worcestershire, 2169.

Lee, a seat in Kent, 2147.

Leithwalk nursery, 2218.

Leitrim, county of, as to gardening, 2272.

Lettsom, John Coakley, M. D. F. R. S. his work on gardening, 2283. A. D. 1781.

Lemarie, Fr——, a French author on gardening, 2284. A. D. 17. .

Lemaistre, M——, curate of Joinville, a French author on gardening, 2283. A. D. 1719.

Lezay de Marnesia, his works on gardening, 2284. A. D. 1787.

Lemoine, Leonor, his work on gardening, 2284. A. D. 1801.

Lefebre, E——, A——, his writings on gardening, 2284. A. D. 1801.

Leschevin, C——, his works on gardening, 2284. A. D. 1805.

Lebret, M—— Isidore, his works on gardening, 2284. A. D. 1821.

Lehmann, John Christian, his works on gardening, 2285. A. D. 1550.

Leibitzer, J——, his work on gardening, 2285. A. D. 1794.

Leonharde, F. G. and J. H. Seidel, their works on gardening, 2285. A. D. 1803.

Leucas, didyn. gymnos. and labiateæ, S. an. Ind. of common culture, 1749.

Leucojum, snow-flake, hexan. monog. and amaryllideæ, H. peren. Eur. bulbs of easy culture, 1658.

Leucopogon, pentan. monog. and epacrideæ, G. tr. N. S. W. which thrive in sandy loam and peat, and the tops of the very young shoots taken off for cuttings, will root in sand under a bell-glass.

Leucospermum, tetran. monog. and proteaceæ, G. tr. which may be treated as leucadendron.

Leysera, syngen. polyg. super. and corymbifereæ, G. tr. C. B. S. which grow freely in peat-soil with a little loam, and cuttings planted under a hand-glass in the same kind of soil will root freely.

Leguminous culinary plants, 1301. 1311.

———— wild plants, which are edible, 1301. 1412.

Lemon, 1614, — see Citrus.

Leibnitz, his principle of a sufficient reason, 1951.

Leland, John, an English antiquary, who died about 1552, 107. 127.

Leeswold, a seat in Flintshire, 107. described, 2209.

Leasowes, Shropshire, 109. described, 2172.

Lee, James, 122. 2132; his works on gardening, 2283. A. D. 1760.

—— James, Filius, of the Vineyard, 2132.

Level, different kinds of, 618, — see Implements.

Leveling, 800. 843, — see Operations.

Leaves, their importance in vegetation, 420; more especially to bulbs, 1658; to cuttings, 1720.

——— to ferment for hot-beds, 866.

Lever, its form and uses in gardening, 616.

Liatris, syngen. polyg. æqual. and corymbifereæ, a G. and H. peren. N. Amer. which grow freely in rich, light soil, and may be increased by seed or dividing at the root.

Licuala, hexan. monog. and palmeæ, a S. tr. E. Ind a palm which may be treated like latonia.

Lidbeckia, syngen. polyg. super. and corymbifereæ, a G. tr. C. B. S. which grows freely in loam and peat, and cuttings root readily in the same soil under a hand-glass.

Lightfootia, bell-flower, pentan. monog. and campanulaceæ, a G. tr. and peren. Eur. and C. B. S. which grow freely in loam and peat, and cuttings root readily in the same soil under a hand-glass.

Ligusticum, lovage, pentan. dig. and umbelliferæ, H. peren. Eur. and a bien. of common culture.

Ligustrum, privet, dian. monog. and oleineæ, H. tr. Brit. and China, of the easiest culture, and increased by cuttings or seeds.

Lilium, lily, hexan. monog. and liliaceæ, H. peren. Eur. Amer. and India, bulbs, — see 1635.

Limeum, heptan. dig. and portulaceæ, a G. peren. which grows in sandy loam and peat, and cuttings under a hand-glass root readily.

Limnetis, trian. monog. and gramineæ, H. peren. Eur. and Amer. grasses of easy culture.

Limosella, mudwort, didyn. angios. and

scrophularineæ, a H. an. Brit. a marsh plant of easy culture, 1670.

Limodorum, gynan. monan. and orchideæ, a G. peren. Japan, which thrives best in loam and peat and some bits of sticks and stones mixed with it, and is increased by dividing at the root.

Limonia, decan. monog. and auranteæ, S. tr. India and China, which grow in loam and peat with some rotten-dung; ripened cuttings root in sand under a hand-glass in a moist heat.

Linaria, toad-flax, didyn. angios. and scrophularineæ, F. and H. peren. and an. Eur. and Amer. which grow freely in common soil, and the more delicate kinds root readily by cuttings under a hand-glass.

Lindernia, didyn. angios. and scrophularineæ, a H. an. S. Eur. of common culture.

Linnæa, didyn. angios. and caprifoleæ, a H. peren. Scot. a trailing plant, which answers well for pots or rockwort; it grows in loam and peat, and strikes freely by cuttings.

Linociera, dian. monog. and oleinæ, a S. tr. W. Ind. which grows freely in loam and peat, and cuttings root under a hand-glass in sand.

Linum, flax, pentan. pentag. and caryophylleæ, G. tr. Eur. and India, which grow in loam and peat, and cuttings root readily in the same kind of soil under a hand-glass; the H. peren. and an. are of easy culture.

Liparia, diadel. decan. and leguminoseæ, G. tr. C. B. S. which thrive well in loam and peat with little water; and very young tops root in sand under a bell-glass.

Liquidamber, monœc. polyan. and amentaceæ, H. tr. Amer. which grow in any common soil, and are increased by layers.

Liriodendron, tulip-tree, polyan. polyg. and magnoliaceæ, a H. tr. N. Amer. which grows in loamy soil, and is generally increased by seeds brought from America, which are two years of coming up.

Lisianthus, pentan. monog. and gentianeæ, S. tr. and a peren. W. Ind. which grow in loam and peat, and cuttings root readily in sand under a bell-glass.

Listera, gynan. monan. and orchideæ, H. peren. Brit. which grow best in a light soil and shady situation, even under trees, and is increased by dividing at the roots.

Lithospermum, gromwell, pentan. monog. and boragineæ, H. peren. and an. Eur. of common culture, 1656. 1662.

Littorella, shore weed, monœc. tetran. and plantagineæ, a H. peren. Brit. an aquatic.

Literature of gardening, 2283.

Lilac, — see Syringa.

Lily, — see Lilium.

Lily of the valley, — see Convallaria.

Lime-tree, — see Tilia.

Liquorice, — see Glycyrrhiza.

Ligne, Prince de, a German soldier and statesman of great personal acquirements, and a favorite at most of the courts of Europe. He published fourteen volumes on miscellaneous subjects, among which are various remarks on gardens, and especially on those of England. He flourished during the reigns of Frederick the Great of Prussia and Catharine the II. of Russia, and died at an advanced age at Vienna, in 1814.

Limerick, gardens of, 2266.

Lissige, a seat in Down, 2281.

Lightoler, J ——, his works on gardening, 2283. A. D. 1766.

Linnean Society, their published transactions as to gardening, 2283. A. D. 1791.

Lindley, Mr. George, his writings on gardening 2283. A. D. 1796.

Livingston, John, Esq. of Bath, 1045, his writings on gardening, 2283. A. D. 1818.

Livingstone, John, Esq. of the British factory at Maccao, 1833, his writings on gardening, 2283. A. D. 1820.

Liger, Louis, a French author on gardening, 2284. A. D. 1703.

Lists, and other ties used for fastening wall and espalier trees, 624.

Lindegaard, Peter, C. M. H. S. 1159, his tract on forcing grapes, 2285. A. D. 1817.

Linnæus, Sir Charles Von, &c. 193, his works on gardening, 2288. A. D. 1739.

Lissander, Andrew, his works on gardening, 2288. A. D. 1768.

Limax, the slug, to destroy, 1614.

Liancourt, palace and gardens of, in France, 49.

Liebault, Stephen, 49, his works on gardening, 2284. A. D. 1570.

Light, the importance of, to vegetables, 514. 604. 631.

Liquid manures, 871.

Liverpool botanic garden, 121; described, with a plan, 2191.

Lignum vitæ-tree, guaiacum officinale.

Lily-pink, aphyllanthes monspeliensis.

Lily-thorn, — see Catesbæa.

Lion's-tail, — see Leonotis.

Lizard's-tail, saururus cernuus.

Lincolnshire, gardens and residences of, 2180.

Little Aston, Staffordshire, 2173.

Livermere, a seat in Suffolk, 2159.

Linlithgowshire, gardens of, 2232.

Lismore, a seat in the county of Waterford, 2263.

Llanerth-house, Denbighshire, 2208.

Llantryddyd, a seat in Glamorganshire, 2211.
Llanarth-house, Monmouthshire, 2170.
Llanwern-house, Monmouthshire, 2170.
Llangard-castle, in Merionethshire, 2215.
Loaving, — see Heading.
Lobelia, pentan. monog. and campanulaceæ, G. tr. and F. peren. Amer. C. B. S. and Eur. which thrive in any light rich soil, and cuttings root freely; the H. peren. are of easy culture, chiefly as marsh-plants; L. dortmanna is an aquatic.
——— cardinalis fulgens and splendens, 1649.
Loddigesia, diadel. decan. and leguminoseæ, a G. tr. C. B. S. which grows best in equal parts of sandy loam and peat, and young cuttings root freely in sand under a bell-glass.
Lœflingia, trian. monog. and caryophylleæ, a H. an. Spain, of common culture, 1662.
Logania, pentan. monog. and gentianeæ, G. tr. Austral. which thrive best in sandy loam and peat, and ripened cuttings may be struck in sand under a hand-glass.
Lolium, darnel, trian. dig. and gramineæ, H. peren. and an. Eur. grasses of easy culture.
Lomatia, tetran. monog. and proteaceæ, G. tr. N. S. W. which grow in sandy loam and peat, and ripened cuttings, taken off at a joint, root in sand under a hand-glass.
Lonchitis, cryptog. filices, and filiceæ, a S. peren. W. Ind. a fern of the usual culture.
Lonicera, honeysuckle, pentan. monog. and caprifoliæ, F. and H. tr. Eur. and Amer. climbers and twiners, which grow in any common soil, and cuttings taken off in autumn, and planted in a sheltered situation, root readily.
Lopezia, dian. monog. and onagrareæ, S. bien. and a H. an. Mex. of common culture.
Lophiola, hexan. monog. and hæmodoraceæ, a H. peren. N. Amer. which thrives best in a peat soil in moist situations, and is increased by dividing at the root.
Lotus, bird's foot trefoil, diadel. decan. and leguminoseæ, G. tr. Eur. and Asia, which grow freely in any light rich soil, and young cuttings root freely under a hand-glass.
Loureira, diœc. monad. and ...., a S. tr. Mex. which grows in loam and peat, and may be increased by cuttings in sand under a bell-glass in heat.
Loquat-apple, — see Mespilus.
Lovage, — see Ligusticum.
Love-apple, — see Solanum.
Loader, an anchorsmith and anabaptist, at Greenwich, who had a fine garden and conservatory in Evelyn's time, 107.
London and *Wise*, their works on gardening, 2283. A. D. 1699.
Loddiges', Conrad and Sons, 122; their works on gardening, 2283. A. D. 1777.
Loudon, John Claudius, his works on gardening, 2283. A. D. 1803.
Lombardy, gardening of, 183.
Lob. ic. Plantarum seu Stirpium icones.
Locust-tree, ceratonia siliqua.
Logwood, hæmatoxylon campechianum.
Looking-glass plant, heritiera littoralis.
Loose-strife, — see Lysimachia.
Lovage, ligusticum levisticum.
Love-grass, poa megastachya.
Lousewort, — see Pedicularis.
Lop, (from loop, *Dut.* or laud, *Teut.* a leaf,) the leaf or tops of trees. To lop, *i. e.* to cut off the tops of trees.
Longleat, a seat in Wiltshire, 2200.
Locke-park, Derbyshire, 2177.
Lockington-hall, Leicestershire, 2176.
Longworth, Herefordshire, 2171.
Loudon-castle, Ayrshire, 2227.
Longford, county of, as to gardening, 2261.
Lowth, county of, as to gardening, 2262.
Lock, John, his writings on gardening, 2283. A. D. 1766.
Lorimer, Charles, Esq. his writings on gardening, 2283. A. D. 1810.
Lowe, Mr. George, his writings on gardening, 2283. A. D. 1819.
London Horticultural Society, their transactions, 2283. A. D. 1815.
Lorentz, J —— B ——, his works on gardening, 2284. A. D. 1803.
Loisleur de Longchamps, M. D. 56; his works on gardening, 2284. A. D. 181. .
Lomonosow, his poem on gardening, 2289. A. D. 18 .
Ludwigia, tetran. monog. and onagrareæ, a H. peren. and an. N. Amer. marsh-plants.
Luffa, monœc. pentan. and cucurbitaceæ, a F. an. India, of common culture, 1664.
Lunaria, honesty, tetrad. siliq. and cruciferæ, a H. peren. and bien. Germ. of common culture.
Lupinaster, bastard-lupine, diadel. decan. and leguminoseæ, a H. peren. Siber. which thrives in light loam, and is increased by seeds.
Lupinus, lupine, diadel. decan. and leguminoseæ, H. and F. peren. and an. Eur. which thrive in light rich soil, and are increased by seeds, or the peren. sorts by pieces of the roots.
Luzula, hexan. monog. and junceæ, H. peren. Eur. grasses of easy culture.
Lupine, — see Lupinus.
Luxembourg, gardens of, at Paris, 49. 57.
Lungwort, — see Pulmonaria.
Luscombe-house, Devonshire, 2203.
Lullworth-castle, Dorsetshire, 2201.
Luton-hoo, Bedfordshire, 2156.
Lundie-house, a seat in Perthshire, 2236.
Lurgan, a seat in the county of Leitrim, 2272.
Lurgan-house, a seat in Armagh, 2280.

Lundrie, ——, a French author on gardening, 2284. A.D. 1580.

Luder, Fr. Hm. H., his works on gardening, 2285. A.D. 1768.

Lupin, ——, his work on gardening, 2285. A.D. 1820.

Lychnis, decan. pentag. and caryophylleæ, G. and H. peren. and an. Eur. and China, of common culture in peat and loam.

Lycium, box-thorn, pentan. monog. and solaneæ, S. and G. tr. Eur. Afr. and Asia, which thrive in loam and peat, and ripened cuttings in sand under a hand-glass, root freely.

Lycopodium, club-moss, cryptog. stachyopterides, and lycopodineæ, H. peren. Eur. and Amer. bog-plants, which grow in peat soil in pots placed in pans of water, and are increased by suckers or cuttings.

Lycopsis, wild bugloss, pentan. monog. and boragineæ, H. peren. and an. Eur. of common culture, 1656 and 1662.

Lycopus, water-horehound, dian. monog. and labiateæ, H. peren. Brit. of common culture, 1656.

Lygeum, trian. monog. and gramineæ, a H. peren. Spain, a grass of easy culture.

Lygodium, snake's tongue, cryptog. schismatopterides, and filiceæ, a H. peren. E. Ind. a climbing fern, which grows freely in loam and peat, and may be increased by dividing at the root or by seed.

Lysimachia, loose-strife, pentan. monog. and primulaceæ, H. peren. bien. and an. Eur. and Amer. most of them marsh-plants, some trailers or creepers, and all of easy culture.

Lysinema, pentan. monog. and epacrideæ, a G. tr. N. S. W. which grows best in rough sandy peat, and cuttings not too young, planted in sand under a bell-glass, root freely.

Lythrum, dodec. monog. and salicareæ, a G. peren. and H. peren. and an. Brit. and Amer. which grow freely in any rich light soil, and are increased by cuttings under a hand-glass, by division at the root, or by seeds.

Lyon, Peter, 985; his writings on gardening, 2283. A.D. 1813.

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Marsham, Robert, Esq. F.R.S. his writings on gardening, 2283. A.D. 1758.

Mawe, Thomas, as an author on gardening, 2283. A.D. 1767.

Mason, George, Esq. his work on gardening, 2283. A.D. 1768.

Marshal, the Rev. Charles, his work on gardening, 2283. A.D. 1796.

————, Humphrey, his work on gardening, 2291. A.D. 1785.

Macdonald, Alexander, a fictitious name adopted by the author of a gardener's dictionary, 2283. A.D. 1805.

————, Mr. James, his writings on gardening, 2283. A.D. 1810.

Macmurray, Mr. John, his writings on gardening, 2283. A.D. 1810.

Mason, John, and Co., their catalogue of bulbous roots, 2283. A.D. 1811.

Macculloch, John, M.D. F.L.S. his writings on gardening, 2283. A.D. 1813.

Mackenzie, Sir George, Bart. his writings on gardening, 2283. A.D. 1815.

Maher, Mr. John, F.H.S. his writings on gardening, 2283. A.D. 1815.

Macwilliam, Robert, his work on timber-trees, 2283. A.D. 1818.

Masters, Mr. William, his writings on gardening, 2283. A.D. 1819.

Maret, ——, a French author on gardening, 2284. A.D. 17. .

Marchant, ——, a French author on gardening, 2284. A.D. 1701.

Maddock, James, his work on gardening, 2283. A.D. 1792.

Martyn, Thomas, B.D. F.R.S. his works on gardening, 2283. A.D. 1792.

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Mandirola, ——, his works on gardening, 2284. A.D. 1763.

Masse, Jean, his works on gardening, 2284. A.D. 1766.

Mabil, ——, his tract on gardening, 2286. A.D. 1817.

Madder, — see Rubia.

Madwort, — see Alyssum.

Mahogany, — see Swietenia.

Maiden-hair, — see Ceterach.

Malabar night-shade, — see Basella.

Maiden-plum, — see Comocladia.

———— nut, justicia malabarica.

Malay apple, Eugenia malaccensis.

Mallow, — see Malva.

Mammee tree, — see Mammea.

Manchineel, hippomane mancinella.

Mandrake, — see Mandragora.

Mangosteen, — see Garcinia.

Mango-tree, mangifera indica.

Maple-tree, — see Acer.

Mare's-tail, — see Hippurus.

Marjoram, — see Marjorana.

Marsh-mallow, — see Althæa.

Marsh-marygold, — see Caltha.

Martagon, — see Lilium.

Marvel of Peru, — see Mirabilis.

Marygold, — see Calendula.

Masterwort, — see Imperatoria.

Mastick-tree, pistacia lentiscus.

Mat-grass, — see Nardus.

May-apple, — see Podophyllum.

Macaw-tree, cocos fusiformis.

Maba, dioec. hexan. and dioscoreæ, a S. tr. E. Ind. which thrives well in loam and peat, and ripened cuttings root in sand under a hand-glass.

Macrocnemum, pentag. monog. and rubiaceæ, a S. tr. Jamaica, which grows in loam and peat, and strikes by cuttings freely.

Macropodium, tetrad. siliq. and crucifereæ, a H. peren. Siber. which grows in light, rich loam, and cuttings root freely under a hand-glass.

Madia, syngen. polyg. super. and corymbifereæ, a H. an. Chili, of common culture.

Magnolia, polyan. polyg. and magnoliaceæ, G. and H. tr. Amer. which require a peat soil and a moist situation, and are generally increased by layers or seeds; the leaves are large, and must not be cut off when the layers are removed from the stools; — see 1689.

Mahernia, pentan. pentag. and tiliaceæ, G. tr. C.B.S. which grow in loam and peat, and young cuttings taken off at a joint, and planted under a hand-glass, in the same soil, readily strike root.

Malachra, monadel. polyan. and malvaceæ, a S. an. W. Ind. of common culture.

Malaxis, gynan. monan. and orchideæ, H. peren. Eng. and N. Amer. which grow in sandy loam and peat, and are increased by offsets from the root or seeds.

Malcomia, tetrad. siliq. and cruciferæ, H. an. Eur. and Afr. of common culture.

Malope, monad. polyan. and malvaceæ, a G. bien. and an. Barb. of easy culture.

Malpighia, Barbadoes-cherry, decan. trig. and malpighiaceæ, S. tr. W. Ind. and Amer. which grow in light loam, and ripened cuttings are not difficult to root under a hand-glass in sand.

Malva, mallow, monad. polyan. and malvaceæ, G. tr. Eur. As. Afr. and H. an. and bien. Eur. which succeed in any light, rich soil, and cuttings root freely under a bell-glass in sand, or under a hand-glass in any light soil; seeds are also frequently produced.

Mammea, mammee-tree, polyan. monog. and guttifereæ, a S. tr. S. Amer. the mammee-tree.

Mandragora, mandrake, pentand. monog. and solaneæ, a H. peren. Levant, which succeeds well in light, sandy soil, and is increased by seeds.

Manettia, tetran. monog. and rubiaceæ, a S. tr. Guiana, which grows in loam and peat, and cuttings root in sand under a bell-glass.

Mangifera, mango-tree, pentan. monog. and terebintaceæ, a S. tr. E. Ind. — see 1530.

Manisuris, polyg. monœc. and gramineæ, S. an. E. Ind. of common culture, 1749.

Manulea, didyn. angios. and scrophularineæ, G. tr. bien. and an. C.B.S. which grow in light, rich soil, and are readily increased by young cuttings planted under a hand-glass.

Maranta, arrow-root, monan. monog. and canneæ, S. peren. S. Amer. which thrive in light, rich soil, and are increased by dividing at the root.

Marattia, cryptog. poropterides and filiceæ, a S. peren. Jamaica, a fern of common culture, 1755.

Marcgravia, polyan. monog. and cappartideæ, a S. tr. W. Ind. which grows in loam and peat, and roots by cuttings.

Marica, trian. monog. and irideæ, S. tr. and peren. S. Amer. which grow in loam and peat, and are increased by offsets from the roots or seeds.

Mariscus, trian. monog. and cyperaceæ, S. peren. E. Ind. mosses of easy culture.

Marrubium, horehound, didyn. gymnos. and labiateæ, G. tr. and H. peren. Eur. and C.B.S. of easy culture.

Marsdenia, pentan. dig. and asclepiadeæ, a S. and G. tr. Syria, and N.S.W. which thrive in loam and peat, and cuttings root freely in sand under a hand-glass.

Marshallia, syngen. polyg. æqual. and corymbifereæ, F. peren. Carol. which grow in loam and peat, and are increased by cuttings or dividing at the root.

Martynia, didyn. angios. and bignoniaceæ, S. and G. an. Amer. of easy culture.

Massonia, hexan. monog. and asphodeleæ, G. peren. C.B.S. bulbs which grow in loam and peat with little water, and are increased by offsets or by seeds.

Mathiola, stock, tetrad. siliq. and crucifereæ, G. tr. and bien. and H. an. Eur. of easy culture, and increased by cuttings and seeds.

Matricaria, syngen. polyg. super. and corymbifereæ, a G. bien. and H. an. Eur. and C.B.S. of easy culture.

Maurandia, didyn. angios. and scrophularineæ, G. tr. Mex. climbers which thrive in any light, rich soil, and are increased by seeds or young cuttings under a hand-glass.

Mazus, didyn. angios. and scrophularineæ, F. an. China, of common culture, 1664.

Marjoram,—see Origanum.

Marsh-marygold,—see Caltha.

Martagon,—see Fritillaria.

Marygold,—see Calendula.

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Mackay, Mr. George Townshend, A.L.S. curator of the Trinity-college garden, Dublin, 2251.

Machines of gardening, 621;—see Implements.

Marginal banks of water, how to improve, 1983.

Materials of landscape-gardening, their union in forming the constituent scenes of a country residence, 2002.

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Mason, the Rev. William, the poet, his works on gardening, 2283. A.D. 1772.

Maurice, the Rev. Thomas, M.A. his works on gardening, 2283. A.D. 1777.

Marshal, William, Esq. his works on gardening, 2283. A.D. 1785.

Mallet, Robert Xavier, his works on gardening, 2284. A.D. 1775.

Marechal, Pierre Sylvain, his works on gardening, 2284. A.D. 1780.

Masson de Blamont, C. F. P., his work on gardening, 2284. A.D. 1790.

Malo, Charles, his work on gardening, 2284. A.D. 1815.

Märter, Fr. Jos. his works on gardening, 2285. A.D. 1781.

Mayer, or, Meyer John, his work on gardening, 2285. A.D. 1776.

———, J. Jac. his works on gardening, 2285. A.D. 1793.

———, Frederick, his gardener's kalendar, 2285. A.D. 1805.

———, J. F. his works on gardening, 2285. A.D. 1778.

M'Mahon, B. 163. his work on gardening, 2291. A. D. 1806.

M'Phail, Mr. James, 130. his works on gardening, 2283. A. D. 1794.

M'Leash, Mr. Alexander, a landscape-gardener, resident in Dublin, 115 and 2250.

Medeola, hexan. trig. and smilaceæ, a H. peren. Virginia, which succeeds best in light soil, and is increased by dividing the root.

Medicago, medick, diadel. decan. and leguminoseæ, F. and H. tr. and H. peren. Eur. all of easy culture in light soil.

Melaleuca, polyad. icos. and myrteaceæ, S. and G. tr. Austral. which grow in sandy loam and peat, and ripened cuttings not too old will root in sandy loam under a bell-glass.

Melampodium, syngen. polyg. necess. and corymbifereæ, H. an. W. Ind. of common culture, 1662.

Melampyrum, cow-wheat, didyn. angios. and scrophularineæ, H. an. Eng. of common culture, 1662.

Melananthera, syngen. polyg. æqual. and corymbifereæ, a S. bien. and G. peren. Amer. which thrive well in loam and peat, and cuttings root freely under a hand-glass.

Melanthium, hexan. trig. and melanthaceæ, G. peren. C. B. S. bulbs which may be treated like ixia.

Melasphærula, trian. monog. and irideæ, a G. peren. C. B. S. a bulb which may be treated as ixia.

Melastoma, decan. monog. and melastomeæ, S. tr. which thrive in loam and peat, require little water in winter, and young cuttings root readily under a hand-glass in moist heat.

Melhania, monad. pentan. and malvaceæ, S. tr. St. Helena, which grow freely in sandy loam, and cuttings root in sand under a bell-glass.

Melia, bead-tree, decan. monog. and meliaceæ, a S. tr. and G. tr. E. and W. Ind. and Syria, which grow in loam and peat, and cuttings root under a hand-glass in sand.

Melianthus, honey-flower, didyn. angios. and rutaceæ, G. tr. which thrive in rich, light soil, and cuttings planted under a hand-glass will root freely.

Melica, melic grass, trian. dig. and gramineæ, H. peren. Eur. and Amer. grasses of easy culture.
Melicocca, honey-berry, octan. monog. and sapindeæ, a S. tr. Jam. which thrives best in light loam, and cuttings root in sand under a hand-glass in heat.
Melilotus, melilot, diadel. decan. and leguminoseæ, H. bien. and an. Eur. of easy culture, and increased by seed.
Melissa, balm, didyn. gymnos. and labiateæ, a H. peren. S. Eur. — see 1403.
Melittis, bastard-balm, didyn. gymnos. and labiateæ, a H. peren. Eur. of easy culture, 1656.
Melochia, monad. pentan. and malvaceæ, S. tr. and an. W. and E. Ind. which grow in light loam, and cuttings root under a hand-glass in heat.
Melodinus, pentan. dig. and apocyneæ, a S. tr. N. Caledonia, a climber which grows freely in loam and peat, and cuttings root readily in sand under a bell-glass.
Melothria, trian. monog. and cucurbitaceæ, a H. an. Amer. of common culture.
Memecylon, octan. monog. and santalaceæ, a S. tr. E. Ind. which grows in sandy loam and peat, and young cuttings in sand under a hand-glass root freely.
Meniscium, cryptog. filices, and filiceæ, a S. peren. Martinico, a fern of common culture, 1755.
Menispermum, moon-seed, monœc. dodec. and menispermeæ, a H. tr. N. Amer. which thrives in loam and peat, and cuttings root readily under a hand-glass.
Mentha, mint, didyn. gymnos. and labiateæ, a S. peren. and H. peren. Eur. and Asia, of the easiest culture.
Mentha piperita, the peppermint, m. viridis, the spearmint, and m. pulegium, the penny-royal, 1382.
Mentzelia, polyan. monog. and loaseæ, a S. an. and G. peren. Amer. which grow readily in loam and peat, and cuttings root in sand under a hand-glass.
Menyanthes, buckbean, pentan. monog. and gentianeæ, a H. peren. Brit. a marsh plant, 1670.
Menziesia, octan. dig. and rhodoraceæ, H. tr. Eur. and Amer. which thrive in peat-soil, and are propagated by layers.
Mercurialis, diœc. ennean. and euphorbiaceæ, H. peren. and an. Eur. of the easiest culture.
Mesembryanthemum, fig-marygold, icos. di-pentag. and ficoideæ, G. tr. peren. and an. C. B. S. and Austral. succulents of easy culture in loam and lime rubbish; and the annual species in rather richer soil.
Mespilus, icos. di-pentag. and rosaceæ, G. and H. tr. Amer. and Eur. which grow in any common soil, and are increased by seeds or by budding on the common thorn, m. oxyacantha.
Mespilus oxyacantha, the hawthorn, 1935.
———— germanica, the medlar, 1440.
———— japonica, the loquat apple, 1529.
Metrosideros, icos. monog. and myrteaceæ, G. tr. which grow in loam and peat, and ripened cuttings may be rooted, but not without difficulty, in sand under a bell-glass.
Meum, bawd-money, pentan. dig. and umbelliferеæ, H. peren. and bien. Eur. of common culture.
Merulius destruens, a fungus, commonly called the dry-rot, 1866.
Medhurst, his weighing machine, preferable for the gardener's seed and fruit-room, 708.
Mem. Caled. Hort. Soc. Memoirs of the Caledonian Horticultural Society, — see 2283. A. D. 1810.
Melimala, (melimellis, honey, and malum, i, an apple,) sweet apples, 20.
Menageries, 747; that of the Paris garden, 2043.
Medikus, Frederick Kasimir, his work on gardening, 2285. A. D. 1782.
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Meadow-grass, — see Poa.
Meadow-rue, — see Thalictrum.
Meadow-saxifrage, — see Seseli.
Medick, — see Medicago.
Medlar, — see Mespilus.
Melic-grass, — see Melica.
Melilot, trifolium melilot.
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Meadow-promenade, Edinburgh, 2037.
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Meader, James, 84; his works on gardening, 2283. A.D. 1771.
Menzies, Mr. William, his writings on gardening, 2283. A.D. 1814.
Mean, Mr. James, his writings on gardening, 2283. A.D. 1816.
Mearns, Mr. John, his writings on gardening, 2283. A.D. 1820.
Melross, Mr. Adam, his writings on gardening, 2283. A.D. 1820.
Merlet, Jean, a French author on gardening, 2284. A.D. 1675.
Meursius, John, his work on gardening, 2287. A. D. 1613.
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Michauxia, octan. monog. and campanulaceæ, a G. bien. Levant, of common culture.
Mitchelia, polyan. polyg. and magnoliaceæ, a H. tr. E. Ind. a diminutive creeper which grows in peat-soil, and is readily increased by layers.
Microchloa, trian. dig. and gramineæ. a H. an. E. Ind. a grass of common culture.
Microloma, pentan. dig. and asclepiadeæ, a G. tr. C. B. S. which thrives in loam and peat, and cuttings root readily in sand under a bell-glass.
Micropus, syngen. polyg. necess. and corymbifereæ, H. an. S. Eur. of common culture, 1662.
Mikania, syngen. polyg. æqual. and corymbifereæ, S. tr. and a G. peren. W. Ind. which grow freely in rich, light soil, and cuttings root readily.
Milium, millet-grass, trian. dig. and gramineæ, H. peren. and an. Eur. grasses of common culture.
Milleria, syngen. polyg. necess. and corymbifereæ, S. an. S Amer. of common culture.
Mimetes, tetran. monog. and proteaceæ, G. tr. C. B. S. which thrive in two-thirds loam and one-third sand, with the pots well drained; ripened cuttings root in sand under a hand-glass, care being taken to prevent damping off.
Mimosa, polyg. monœc. and leguminoseæ, S. tr. bien. and an. E. and W. Ind. which thrive well in loam and peat, and cuttings of such sorts as do not ripen seed will root, if planted young, in sand under a bell-glass.
Mimulus, monkey-flower, didyn. angios. and scrophularineæ, a G tr. G. and F. and H. peren. Amer. which thrive in common soil; the woody species is increased by cuttings, and the others by dividing at the root or seeds.
Mimusops, octan. monog. and sapoteæ, S. tr. E. Ind. which grow in loam and peat, and ripened cuttings root readily in sand under a hand-glass.
Minuartia, trian. trig. and caryophylleæ, H. an. Spain, of common culture.
Mirabilis, marvel of Peru, pentan. monog. and nyctagineæ, G. peren. India, which grow in light, rich soil, and will flower well in the open air in summer; but their roots, which are fusiform, must be taken up and replanted next year. They are readily increased by seeds, and are generally treated as half hardy annuals.
Mirbelia, decan. monog. and leguminoseæ, G. tr. Austral. which grow in loam and peat, and young cuttings root without difficulty in sand under a bell-glass.
Michelia, tetran. monog. and rubiaceæ, a S. tr. N. Amer. which succeeds well in light, loamy soil, and ripened cuttings do best under a hand-glass in sand in heat.
Mitella, decan. dig. and saxifrageæ, H. peren. N. Amer. rockwort plants which prefer light, rich soil, and are increased by dividing at the root.
Middleton-stoney, a seat in Oxfordshire, 2162.
Milton-abbey, Dorsetshire, 2201.
Middleton-hall, Caernarvonshire, 2217.
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Miller, Philip, F. R. S. 119; his works on gardening, 2283. A. D. 1724.
Mitchell, Mr. John, his writings on gardening, 2283. A.D. 1811 and 1814.
Middleton, Mr. John, his writings on gardening, 2283. A.D. 1814.
Mills, Mr. George, F. H. S. his writings on gardening, 2283. A.D. 1818.
Milne, Mr. Thomas, A. L. S. his writings on gardening, 2283. A. D. 1819.
Mizauld, ——, a French writer on gardening, 2284. A.D. 1564.
Michaux, F. A. his works on gardening, 2284. A.D. 1505.
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Misseltoe, — see Viscum.
Milburn Tower, a seat near Edinburgh, 125.
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Mich. amer. Andr. Michaux, Flora Boreali-Americana.
Mich. querc. Histoire des Chênes de l'Amérique septentrionale, par André Michaux.
Mill. Dict. professor Martyn's edition of Phil. Miller's Gardener's Dictionary, 4 vols. folio, 1807.
Mill. ic. Figures of plants, desribed in the Gardener's Dictionary, by Phil. Miller.
Mignonette, — see Reseda.
Milfoil, — see Achillea.
Milk-parsley, — see Selinum.
Milk-vetch, — see Astragalus.
Milk-wood, brosimum spurium.
Milk-wort, — see Polygala.
Millet-grass, — see Milium.
Misseltoe, — see Viscum.
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Michael-grove, Sussex, 2141.
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Mœhringia, octan. dig. and caryophylleæ, a H. peren. S. Eur. a rockwort plant, or one well adapted for small pots; it grows in loam and peat, and is increased by dividing at the root.
Mœnchia, tetran. tetrag. and caryophylleæ, a H. an. Brit. of easy culture, 1662.
Mollia, pentan. monog. and amaranthaceæ,

a G. tr. and an. Canarics, which grow in light soil, and cuttings root readily under a hand-glass

Mollugo, trian. trig. and caryophylleæ, a H. an. Virginia, of common culture, 1662.

Moluccella, a H. peren. and an. Eur. and Asia, of easy culture, 1656. 1662.

Momordica, monœc. monad. and cucurbitaceæ, a H. peren. and F. an. E. and W. Indies, of easy culture in rich soil, and increased by seeds.

Monarda, dian. monog. and labiateæ, H. peren. of the easiest culture, 1656.

Monetia, tetran. monog. and ...., a S. tr. E. Ind. which grows in sand and peat, and roots in sand under a hand-glass in heat.

Monnieria, diadel. pentan. and . . . . a S. an. Guiana, of common culture, 1749.

Monotoca, pentan. monog. and epacrideæ, G. tr. Austral. which grow in loam and peat well drained, and young cuttings root in sand under a bell-glass.

Monotropa, yellow bird's-nest, decan. monog. and Ericineæ, a H. peren. Brit. which may be treated as cuscuta.

Monsonia, monad. dodecan. and geraniaceæ, a G. tr. peren. and a bien. C. B. S. which may be treated as pelargonium.

Montia, water-chickweed, trian. dig. and portulaceæ, a H. an. Brit. of common culture.

Montinia, diœc. tetran. and onagrariæ, a G. tr. C. B S. which grows well in loam and peat, and cuttings root freely under a hand-glass.

Moræa, trian. monog. and irideæ, G. and H. peren. C. B. S. chiefly bulbs which grow in loam and decayed leaves, require no water when not in a growing state, and should be fresh potted once a year; they are increased by offsets and seeds.

Morina, dian. monog. and dipsaceæ, a G. peren. Persia, which grows in rich, light soil, and may be increased by dividing at the root, or by seed.

Morinda, pentan. monog. and rubiaceæ, S. tr. Ind. which grow in loam and peat, and cuttings root readily in sand under a hand-glass.

Morus, mulberry, monœc. tetran. and urticeæ, a S. tr. and H. tr. Ind. Italy, and Amer. which prefer rich soil and are increased by seeds, layers, or cuttings.

Morus nigra, the garden mulberry, 1461.

Moist-stove, — see Bark-stove.

Montreuil, gardens of, 59.

Monthly Catalogue of Horticultural Productions, 1548.

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Morier, James, author of two journies in Persia, 1812 and 1818. 150. 1263.

Moon, influence of in gardening, 146.

Mordun, (more done), a seat near Edinburgh, 114. 744.

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Moat, a seat in the county of Mayo, 2271.

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Mountain, Dydimus, his works on gardening, 2283. A. D. 1571.

Mortimer, John, his work on husbandry, 2283. A. D. 1707.

More, Sir Thomas, his works on gardening, 2283. A. D. 1732.

Moriarty, Mrs. Henrietta Maria, her works on gardening, 2283. A.D. 1803.

Mosley, Sir Oswald, his writings on gardening, 2283. A.D. 1818.

Monteith, ———, his work on planting, 2283. A.D. 1819.

Mollet, André, a French author on gardening, 2284. A.D. 1651.

Mollet, Claude, a French author on gardening, 2284. A.D. 1652.

Morin, Pierre, a French author on gardening, 2284. A.D. 1658.

Moss-houses, as garden structures, 770, — see Edifices.

Mould, finely comminuted earth or soil.

Mould basket, mould scuttle, 620, — see Utensils.

Moer, M——, his works on gardening, 2284. A.D. 1754.

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Moxard, ——, his works on gardening, 2284. A.D. 1815.

Montreuil, a seat of the Princess Gremené, near Paris, 51.

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Moris. His. } Rob. Morison, Historia Plantarum Universalis Oxoniensis.
Moris. S. }

Molucca balm, — see Moluccella.

Moneywort, lysimachia nummularia.

Monkey flower, — see Mimulus.

Monkshood, — see Aconitum.

Moonseed, — see Menispernum.

Moon trefoil, medicago, arborea.

Moonwort, — see Botrychium.

Moschatel, — see Adoxa.

Motherwort, — see Matricaria.

Moving-plant, hedysarum gyrans.

Mountain ebony, — see Bauhinia.

Mouse-ear chickweed, — Cerastium.

Mouse-tail, myosurus minimus.

Monteith's, timber measurer, 1873.

Mousetrap, 622; Planter's mousetrap, 1895.

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Mount-Merion, a seat in Dublin, 2251.
Moorfield, a seat in the county of Cork, 2264.
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Mustel, ———, his work on gardening, 2284. A.D. 1784.
Münchausen, (Monk-house), O. F. Von, his work on gardening, 2285. A.D. 1721.
Müller, J. G. his works on gardening, 2285, A. D. 1792.
Müller, J. C. F. his works on gardening, 2285. A.D. 1797.
Muntiguis, Abraham, his work on gardening, 2287. A.D. 1672.
Muscke, ———, his works on gardening, 2287. A.D. 1817.
Mullera, diadel. decan. and leguminoseæ, a S. tr. Guiana, which grows in loam and peat, and cuttings root in sand under a bell-glass in heat.
Muntingia, polyan. monog. and tiliaceæ, a S. tr. which grows well in light loam, and cuttings root in sand under a hand-glass.
Murraya, decan. monog. and auranteæ, a G. tr. India, which grows best in turfy loam with a little peat, and cuttings root freely in sand under a hand-glass.
Musa, plantain tree, hexan. monog. and musaceæ, S. tr. Ind. and China, which grow in rich loam, kept moist, and require a great deal of room; they are increased by suckers.
Musa, paradisiaca, the common plantain tree, 1590.
Musa sapientum, the banana tree, 1535.
Muscari, grape hyacinth, hexan. monog. and asphodeleæ, H. peren. S. Eur. bulbs of easy culture, 1658.
Mussænda, pentan. monog. and rubiaceæ, a G. tr. China, a climber which grows well in loam and peat, and cuttings root freely in sand under a bell-glass.
Mulberry,—see Morus.
Mustard,—see Sinapis.
Musca, the fly, a dipterous insect,—see musca vomitoria, 1447. 1492.
Mulching, 944 and 1145.
Mushroom,—see Agaricus.
Mushroom-house, 704,—see Structures.
Murr. com. goett. Commentarii Societatis Regiæ Scientiarum Gottingensis.
Mudwort, limosella aquatica.
Mugwort, artemisia vulgaris.
Mules fern, asplenium hemionitis.
Mullein,—see Verbascum.
Munich, public gardens at, 2040.
Myagrum, tetrad. silic. and cruciferæ, H. an. Eur. of the easiest culture.
Myginda, tetran. tetrag. and rhamneæ, S. tr. which grow in loamy soil, and cuttings will root in sand under a hand-glass.
Mylocaryum, buckwheat tree, decan. monog. and ericeæ, a H. tr. which thrives well in loam and peat, requires protection in winter, and ripened cuttings root freely under a hand-glass in sand.
Myoporum, didyn. angios. and myoporineæ, G. tr. which grow in loam and peat, and are readily increased by cuttings in sand under a hand-glass.
Myosotis, scorpion-grass, pentan. monog. and boragineæ, H. peren. and an. of the easiest culture.
Myosurus, mouse-tail, pentan. polyg. and ranunculaceæ, a H. an. Brit. of common culture.
Myrica, candleberry-myrtle, diœc. tetran. and amentaceæ, G. tr. C. B. S. which grow in loam and peat, and cuttings root freely under a bell-glass; the H. tr. Brit. and Amer. prefer a moist peat soil, and are annually increased by seeds or layers.
Myriophyllum, water-milfoil, monœc. polyandr. and naiadeæ, H. peren. Brit. aquatics increased by seeds.
Myristica, the nutmeg, diœc. monad. and myristiceæ, S. tr. Ind. which grow in light loam, and have as yet been little propagated.
Myrodia, monadel. polyan. and malvaceæ, a S. tr. W. Ind. which grows readily in light, rich soil, and cuttings root readily in sand under a bell-glass.
Myrrhis, myrrh, pentan. dig. and umbelliferæ, a H. peren. Brit. of easy culture, 1656.

Myrsine, polyg. diœc. and myrsinaceæ, G. tr. C. B. S. evergreens which grow in loam and peat, and cuttings root readily in sand under a handglass.
Myrsiphyllum, hexan. trig. and smilaceæ G. peren. C. B. S. climbers which thrive in loam and peat, and are increased by division at the root.
Myrtus, myrtle, icos. monog. and myrteaceæ, G. tr. Eur. and W. Ind. which grow freely in rich loam, and are increased by cuttings; m. tomentosa requires the heat of a dry stove, and the cuttings which must not be too old, will root under bell-glasses.
Myrrh,—see Myrrhis.
Myrtle,—see Myrtus.
Mynadoc-castle, Stirlingshire, 2231.

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Nama, pentan. dig. and convolvulaceæ, a S. an. Jamaica, of common culture, 1749.
Nandina, hexan. monog. and berberideæ, a G. tr. China, which thrives well in loam and peat, and ripened cuttings, with their leaves not shortened, will root in sand under a hand-glass.
Napæa, monad. polyan. and malvaceæ, H. peren. Virginia, which grow freely in common soil, and are increased by seeds or dividing the roots.
Naravelia, polyan. polyg. and ranunculaceæ, a S. tr. Ceylon, a climber which grows in loam and peat, and young cuttings planted thinly in a pot of sand, will root under a hand-glass.
Narcissus, hexan. monog. and amaryllideæ, H. peren. Eur. bulbs of common culture, 1658; the daffodil narcissus, the white narcissus, the jonquil and polyanthus narcissus, 1632.
Nardus, mat grass, trian. monog. and gramineæ, H. peren. Eur. grasses of easy culture in wet ground.
Narthecium, hexan. monog. and asphodeleæ, H. peren. Brit. and Amer. of easy culture in peat soil.
Nasturtium, tetrad. siliq. and cruciferæ, H. peren. and an. Eur. two of which are aquatics, and the whole of easy culture.
——— officinale, the common watercress, 1362.
Nauclea, pentan. monog. and rubiaceæ, a S. tr. Ind. which grows well in loam and peat.
Nauenburgia, syngen. polyg. segr. and corymbiferæ, a H. an. S. Amer. of common culture, 1662.
Native or neglected fruits which might be cultivated and improved, 1480.
Naseberry tree, achras sapota, var. β Zapotilla.
Navelwort,—see Cotyledon.
Navestock-hall, Essex, 2151.
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Neal, a seat in the county of Mayo, 2271.
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Newbrook-house, a seat in the county of Mayo, 2271.
Neill, Patrick, Esq. his writings on gardening, 2283. A. D. 1821.
Neale, Adam, his writings on gardening, 2283. A. D. 1799.
Netting for shelter,—see Structures.
Nectoux, ———, his work on gardening, 2284. A. D. 1791.
Nelumbium, sacred bean, polyan. polyg. and hydrocharideæ, S. peren. India, and Carolina, aquatics increased by seeds, and dividing at the root,—see 1751.
Nemesia, didyn. angios. and scrophularineæ, G. peren. and an. C. B. S. which grow in any light, rich soil; and young cuttings planted under a handglass, will soon strike root.
Neottia, gynan. monan. and orchideæ, S. peren. W. Ind. which thrive best in loam and peat with little water, and the plants are increased by dividing at the root.
Nepenthes, pitcher-plant, a S. peren. China, an aquatic as yet scarce in British gardens.
Nepeta, catmint, didyn. gymnos. and labiateæ, H. peren. Eur. of the easiest culture.
Nephelium, monœc. pentan. and corymbiferæ, a S. tr. E. Ind. which grows in light loam, and cuttings root in sand under a hand-glass.
Nephrodium, kidney-fern, cryptog. filice, and filiceæ, S. and H. peren. ferns of common culture.
Nerium, oleander, pentan. dig. and apocyneæ, G. and S. tr. Eur. and Ind.

which thrive in light, rich soil, and cuttings root readily in sand plunged under a hand-glass in a moist heat.

Neuenhahn, K. Ch. Adf. his work on gardening, 2285. A. D. 1796.

Neatness, its importance in gardening, 1071.

Nettle, — see Urtica.

Nettle-tree, — see Celtis.

New Jersey tea, — see Ceanothus.

New Zealand tea, leptospermum scoparium.

New-ground workmen, — see contracting gardeners.

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Nettleworth, a seat in Nottinghamshire, 2179.

Newstead-abbey, Nottinghamshire, 2179.

Nicandra, pentan. monog. and solaneæ, a H. an. Peru, of common culture, 1662.

Nicotiana, tobacco, pentan. monog. and solanaceæ, a G. tr. and peren. and H. an. America and China, which thrive in any light soil, and are readily increased by seeds.

Nigella, fennel-flower, polyan. pentag. and ranunculaceæ, H. an. Eur. and Syria, of common culture, 1662.

Nissolia, diadel. decan. and leguminoseæ, a S. tr. S. Amer. which thrives in sandy loam, and cuttings may be rooted in sand under a hand-glass.

Nitraria, dodec. monog. and ficoideæ, a H. tr. Siberia, which thrives best in sandy loam, with some salt occasionally put round it, being a salt marsh plant; it may be increased by layers or cuttings under a hand-glass in sand.

Nivenia, tetran. monog. and proteaceæ, G. tr. and a peren. C. B. S. which grow in soft loam peat and sand, the pots well drained and placed in any situation; ripened cuttings taken off at a joint without shortening their leaves, will root in sand under a hand-glass, in a cool shady situation.

Niches, in arboriculture, 1799.

Nicol, Mr. Walter, 114; his works on gardening, 2283. A.D. 1798.

Nicker-tree, guilandina bonduc.

Nightshade, — see Solanum.

Nipplewort, — see Lapsana.

Nicol, Mr. George, his writings on gardening, 2283. A.D. 1813.

Nolana, pentan. monog. and borragineæ, a H. an. Peru, of common culture, 1662.

Nolina, hexan. trig. and melanthaceæ, a H. peren. Georgia, which thrives in peat soil, and is increased by seeds or dividing at the root.

Notelæa, decan. monog. and oleineæ, G. tr. Austral. which grow in loam and peat, and ripened cuttings root freely under a hand-glass in sand.

Notoceras, tetrad. siliq. and cruciferæ, a G. an. Canaries, of common culture.

Noctua, the moth, 1310.

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Nonsuch-palace, in Surrey, 107. 127.

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Notre, Mons. Le, a celebrated French landscape gardener and architect, 50. 107.

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Norres, a seat in Hampshire, 2197.

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North-berwick-house, East Lothian, 2219.

Novar, a seat in Rosshire, 2247.

North, ———, his tracts on gardening, 2283. A.D. 1759.

Noisette, Mons. Louis Claude, his works on gardening, 2284. A.D. 181...

Nutmeg, — see Myristica.

Nut-tree, — see Corylus.

Nut-bearing fruit-trees, 1476.

Nursery for trees, its formation and management, 1875.

Nuphar, polan. monog. and hydrocharideæ, H. peren. Eur. and Amer. aquatics of easy culture, and increased by dividing at the root, or by seeds.

Nyctanthes, dian. monog. and jasmineæ, a S. tr. E. Ind. which grows freely in loam and peat, and cuttings, not too ripe, root readily in sand under a hand-glass.

Nymphæa, water-lily, polyan. monog. and hydrocharideæ, S. and H. peren. Eur. and E. Ind. aquatics.

Nyssa, tupelo, polyg. diœc. and santalaceæ, H. tr. N. Amer. which thrive in common soil, but prefer a damp situation; they are increased by layers or seeds.

Nursery, public, its formation, 2044; management, 2119.

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——— gardeners or nurserymen, 2081.

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Oakley-park, Shrophires, 2172.

Oak, — see Quercus.
Oat, — see Avena.
Oatlands, Surrey, 110. 2141.
Obs. Mod. Gard. Whateley's Observations on Modern Gardening.
Ochna, polyan. monog. and guttiferæ, a S. and G. tr. E. Ind. and C.B.S. which grow freely in loam and peat, and cuttings root in sand under a hand-glass.
Ochroma, monad. pentan. and malvaceæ, S. tr. Amer. which grow freely in loam and peat, and cuttings root in sand under a hand-glass.
Ochrus, diadel. decan. and leguminoseæ, a H. an. Eur. of common culture.
Ocymum, didyn. gymnos. and labiateæ, S. tr. bien. and an. and H. an. Ind. and China, of easy culture in light, rich soil, as tender annuals.
————, basilicum and minimum, the sweet basil, 1385.
Octomeria, gynan. monan. and orchideæ, a S. peren. W. Ind. a parasite which requires the same treatment as aërides.
Occupiers of gardens, 2093.
Ochtertyre, a seat in Perthshire, 2236.
Ockenden, ———, Esq. his work on gardening, 2283. A.D. 1770.
Œdera, syngen. polyg. segr. and corymbiferæ, a G. tr. C.B.S. which grows in any light soil, and cuttings root readily under a hand-glass.
Œnanthe, water dropwort, pentan. dig. and umbelliferæ, a G. peren. and H. peren. Eur. and C.B.S. of easy culture, and increased by seeds.
Œnothera, octan. monog. and onagrariæ, H. peren. bien. and an. Amer. of common culture.
Offsets, to propagate by, 377, — see Operations.
Okeham-park, Surrey, 2141.
Oil-nut, hamiltonia oleifera.
Oily-grain, — see Sesamum.
Oily-palm, elais guineensis.
Oldenlandia, tetran. monog. and rubiaceæ, a S. peren. and an. E. and W. Ind. of common culture.
Olea, olive and phillyrea, dian. monog. and oleinæ, G. and H. tr. Eur. and C.B.S. which grow in loam and peat, and ripened cuttings root freely in sand under a hand-glass.
—— europea, the common olive, 1518.
Oliveria, pentan. dig. and umbelliferæ, a H. an. Bagdad, of common culture.
Olyra, monœc. trian. and gramineæ, a S. peren. W. Ind. a grass of easy culture.
Oldacre, Mr. Isaac, 132; his writings on gardening, 2283. A.D. 1816.
Old man's beard, — see Geropogon.
Oleander, — see Nerium.
Oleaster, — see Elæagnus.
Olive, — see Olea.
—— bark-tree, bucida buceras.
Olive-wood, — see Elæodendrum.
Olafsyn, Olaf, his works on gardening, 2288. A.D. 1770.
Omphalea, monœc. monadel. and euphorbiaceæ, a S. tr. Jamaica, which grows in light loam, and cuttings root in sand under a hand-glass in heat, care being taken not to injure the leaves.
Ombersley-court, Worcestershire, 2169.
Oncidium, gynan. monan. and orchideæ, S. peren. Ind. which require the same treatment as aërides.
Onoclea, cryptog. filices, and filiceæ, H. peren. Eur. and Amer. ferns of common culture, 1678.
Ononis, rest-harrow, diadel. decan. and leguminoseæ, G. tr. and peren. Eur. and C.B.S. which thrive in loam and peat, and are increased by seeds or young cuttings under a bell-glass in sand.
Onopordum, cotton-thistle, syngen. polyg. æqual. and cynarocephaleæ, H. peren. bien. and an. Eur. of common culture.
————, acanthium, 1351.
Onosma, pentan. monog. and boragineæ, a G. peren. and H. peren. Br. and S. Eur. which succeed best in rich, light soil, and are increased by cuttings under hand-glasses in sand.
Onosmodium, pentan. monog. and boragineæ, a H. peren. N. Amer. which may be treated as onosma.
Onion, — see Allium.
Oniscus asellus, the wood-louse, 1448.
Operations of gardening, 791; mechanical operations, 792; lifting, 792; carrying, 793; drawing, 794; pushing, 795.
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Operations of rearing and culture, 723.

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Operations for inducing a state of fruitfulness, 982; laying bare the roots, 982; cutting the roots, 983; notching the stem, 984; partial decortication, 985; stripping off pieces of the bark, 986; ringing, 987; renewal of the soil, 991; bending down the branches, 992; application to herbaceous plants, 993.

Operations for retarding vegetation, 994; by the form of surface, 994; by shade, 995; by the ice-cold room, 996.

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Operations of exotic culture in hot-houses, 1014; general management, 1015; dry-stove, 1016; bark-stove, 1017; watering, 1018; insects, 1019.

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by straw-ropes, 1021; nets, 1022; canvas or bunting-screens, 1023; mats, 1024; straw and litter, 1025; oiled paper-frames, 1026; protecting ropes, 1027; transparent covers, 1028; transparent screens, 1029; protection from the enemies of gardens, 1030; from diseases, 1031.

Operations of gathering, preserving, and keeping, 1032; gathering, 1032; gathering fruits, 1033; seeds, 1034; preserving heads or leaves, 1035; roots, 1036; fruits, 1037; ripe fruit, 1038; pears and apples, 1098 to 1042; sweating fruit, 1043; preserving seeds, 1045; roots, cuttings, grafts, 1046.

Operations of gardening, relating to the final products derived of gardens and garden-scenery, vegetable products, 1047; fruits, 1047; seeds, 1048; roots, 1048; stems and stalks, 1050; leaves, 1057; flowers, 1052; barks, 1053; woods, 1054; entire plants, 1055.

Operations of superintendance and management, 1056; head-gardener's duties, 1056; keeping accounts, 1057; time-book, 1057; cash-book, 1058; forest-book, 1059; produce-book, 1062; weather-book, 1063; register of temperature of hot-houses, 1064; of the open air, 1064; record of the growth of plants, 1065; reading-library, 1066.

Operations for the beauty and order of garden-scenery, 1067; order, 1068; propriety, 1069; decorum, 1070; importance of the profession of a gardener, 1072.

Operations of landscape gardening, 1963; on ground, 1964; on wood, 1971; on water, 1978; on rocks, 1989; on buildings, 1991.

Opercularia, tetran. monog. and nyctagineæ, a G. tr. N. S. W. which thrives in loam and peat, and cuttings root freely in sand under a hand-glass.

Ophioglossum, adder's tongue, cryptog. stachyopterides and filiceæ, a S. and H. peren. Brit. W. Ind. ferns of common culture, 1755.

Ophiopogon, snake's beard, hexan. monog. and smilaceæ, a F. peren. Japan, which grows in sandy loam and peat, and is increased by dividing at the root.

Ophioxylon, polyg. monœc. and apocyneæ, a S. tr. E. Ind. which grows in loam and peat, and cuttings root in sand under a hand-glass.

Ophrys, gynan. monan. and orchideæ, a G. peren. and H. peren. Eur. and Barbary, which succeed best in a mixture of loam, peat, and chalk broken small; the best time to transplant them, as well as most other orchideous plants, is when they are growing: they are increased by seeds, which should be sown as soon as they are ripe.

Oramore-castle, a seat in Galway, 2270.

Orchis, gynan. monan. and orchideæ; G. and H. peren. Eur. and Amer. which may be treated like ophrys, only they do not require chalk mixed with the loam and peat.

Origanum, marjoram, didyn. gymnos. and labiateæ, G. and F. tr. and H. peren. Eur. which grow in loam and peat, and cuttings root readily under a hand-glass.

——— onites, marjorana, &c., the garden marjorams, 1351.

Ormosia, decan. monog. and leguminoseæ, a S. tr. W. Ind. which thrives well in loam and peat, and is increased by cuttings in sand under a hand-glass; or seeds from the West Indies, will vegetate freely.

Ornithidium, gynan. monan. and orchideæ, a S. peren. W. Ind. a parasite which may be treated as aërides.

Ornithogalum, star of bethlehem, hexan. monog. and asphodeleæ, G. T. and H. peren. Eur. C. B. S. bulbs of easy culture.

Ornithopus, bird's foot, diadel. decan. and leguminoseæ, a H. peren and an. Eur. of common culture.

Ornitrophe, octan. monog. and sapindeæ, S. tr. E. and W. Ind. which prefer a light loam, and cuttings root in sand under a hand-glass.

Ornus, flowering-ash, dian. monog. and oleineæ, H. tr. Italy, which grow in common soil, and are increased by seeds or budding, or grafting on the common ash, fraxinus excelsior.

Orobanche, didyn. angios. and orobancheæ, H. peren. Brit. parasites which root in the soil, and afterwards attach themselves to, and root into other plants. The common broom-rape, an. major, may be sown or planted at the root of the common broom, (spartium,) and the others at the roots of such plants as they are seen to affect in their wild state.

Ormiston, a seat in East Lothian, 2219.

Orkney and Shetland Islands, as to gardening, 2245.

Orobus, bitter-vetch, diadel. decan. and leguminoseæ, a H. peren. Eur. of easy culture.

——— tuberosus, the tuberous rooted bitter-vetch, 1411.

Orontium, hexan. monog. and aroideæ, H. peren. Amer. and Japan, which grow in light sandy soil, and are increased by division at the root.

Ortegia, trian. monog. and caryophylleæ, H. peren. Eur. which thrive in light rich soil, and cuttings root freely under a hand-glass.

Orthopogon, trian. dig. and gramineæ, a S. tr. W. Ind. of common culture.

Oryza, rice, hexan. dig. and gramineæ, a

S. an. Ethiopia, of easy culture as a marsh-plant.

Order, its importance in gardening, 1068.

Oranienburgh, an imperial residence near Petersburg, 85.

Orchard, formation and planting of one subsidiary to the kitchen-garden, 1110; site, manure, screens, selections of kinds, age of plants from the nursery, temporary and final distances, culture of the soil, 1110; of standard fruit-trees only, 1111; situation and soil, 1112; sorts, 1112; age of the plants, 1113; design for one to surround a kitchen-garden, 1114.

——— general culture and management of, 1140; manuring, 1141; cropping, 1142; watering, 1143; staking and protecting, 1144; mulching and cloathing the stems, 1145; pruning, 1146; aged trees, 1148; season of pruning, 1150; insects and diseases, 1151; gathering and storing orchard fruits, 1152; pears, 1153; packing orchard and other fruits for carriage, 1154; general culture and management, 1155.

Orangery, its construction, 1596.

Orange, — see Citrus.

Orpine, — see Telephium.

Orchards, public, their formation, 2049; management, 2113, 2114, and 2115.

Orchardists, 2077.

Orford-hall, a seat in Lancashire, 2191.

Osbeckia, octan. monog. and melastomeæ, a S. bien. Ceylon, of common culture.

Osmites, syngen. polyg. frustran. and corymbifereæ, a G. tr. C. B. S. which grows well in light rich soil, and cuttings root freely under a hand-glass.

Osmunda, cryptog. schismatopterides, and filiceæ, H. peren. Amer. Brit. and C. B. S. ferns of common culture, 1678.

Osteospermum, syngen. polyg. necess. and corymbifereæ, G. tr. C. B. S. which may be treated as osmites.

Ostrya, hop hornbeam, monœc. polyan. and amentaceæ, H. tr. Italy and N. Amer. which grow in any soil, and are increased by seeds or layers.

Osyris, poet's cassia, diœc. trian. and santalaceæ, a G. tr. S. Eur. which thrives in loam and peat, and ripened cuttings will root in sand under a hand-glass.

Osten, Van, 45. 129; his works on gardening, 2287. A.D. 1703.

Osier, — see Salix.

Oswego-tea, — see Monarda.

Osbaston, a seat in Derbyshire, 2177.

Ossington-hall, Nottinghamshire, 2179.

Osterton-house, Nottinghamshire, 2179.

Ossenfelder, H. A. his works on gardening, 2285. A.D. 1771.

Osbeck, P. A. Toreen, and Captain Eckeberg, their voyage to China, 2288. A.D. 1771.

Otaheite myrtle, securinega nitida.

——— chestnut, in ocarpus edulis.

Othonna, ragwort, syngen. polyg. necess. and corymbifereæ, G. and F. tr. and peren. C. B. S. which grow in any light rich soil, and cuttings root freely under a hand-glass.

Otto, Mr. Frederick, C.M.H.S. inspector of the botanic garden, Berlin, 71.

Owston, a seat in Yorkshire, 2185.

Oxalis, wood-sorrel, decan. pentag. and geraniaceæ, G. and H. peren. C. B. S. bulbs of easy culture.

——— acetosella, the common wood-sorrel, 1367.

Oxyanthus, pentan. monog. and rubiaceæ, a S. tr. Sierra Leone, which thrives well in sandy loam and peat, and cuttings root in sand under a hand-glass.

Oxybaphus, umbrella-wort, trian. monog. and nyctagineæ, S. peren. and an an. S. Amer. which grow in loam and peat, and are increased by young cuttings under a bell-glass in sand.

Oxycoccus, cranberry, octan. monog. and ericeæ, a S. tr. and H. tr. Eur. and Amer. which require a peat soil, and moist situation.

——— palustris and macrocarpus, 1480.

Oxylobium, decan. monog. and leguminoseæ, G. tr. Austral. which grow in sandy loam and peat, and young cuttings root in sand under a hand-glass.

Oxystelma, pentan. dig. and asclepiadeæ, a S. peren. E. Ind. which thrives well in loam and peat, and cuttings root freely in sand under a hand-glass.

Oxytropis, diadel. decan. and leguminoseæ, H. peren. and an. Eur. which prefer a light sandy soil, and are readily increased by seeds.

Ox-eye, — see Buphthalmum.

Ox-eye daisy, chrysanthemum leucanthemum.

Ox-lip, — see Primula.

Ox-tongue, — see Picris.

Oxfordshire, gardens and residences of, 2162.

Oxford botanic garden, 2162.

P.

Pachysandra, monœc. tetran. and euphorbiaceæ, a H. peren. N. Amer. which succeeds well in any common light soil, and increases freely by suckers from the roots.

Pæderia, pentan. monog. and rubiaceæ, a D. S. tr. China, a climber which thrives in loam and peat, and cuttings root readily.

Pæonia, pæony, polyan. dig. and ranunculaceæ, the Chinese tree-pæony, a F. tr. China, with numerous varieties thrives well in any rich light soil; and ripened cuttings slipped off, and planted in the ground in a shady place, without cover,

will root freely. The H. peren. Eur. require a deep, rich, loamy soil, — see 1639.
Palavia, monad. polyan. and malvaceæ, a H. an. Peru, of common culture, 1662.
Pallasia, syngen. poly. frustran. and corymbifereæ, a G. tr. Peru, which thrives in any rich, light soil, and cuttings root freely under a hand-glass.
Panax, polyg. diœc. and araleæ, S. tr. Amer. and China, which thrive well in light loam, and cuttings root readily in sand under a hand glass; the H. peren. grow in similar soil, and are increased by seeds, or dividing at the root.
Pancratium, hexan. monog. and amaryllideæ, S. and G. peren. and H. peren. Eur. Amer. and India, which grow in light loam and vegetable mould, with little water when not in a growing state. They are increased by seeds and suckers.
Pandanus, screw-pine, diœc. monan. and pandanaceæ, S. tr. Ind. and N. S. W. which thrive in loamy soil; but rarely produce growths which admit of removal for propagation.
Panicum, panic-grass, trian. dig. and gramineæ, S. tr. and bien. and H. peren. and an. Ind. Amer. and Eur. grasses of common culture.
Papaver, poppy, polyan. monog. and papaveraceæ, H. peren. Eur. of easy culture, 1656 and 1662.
Pardanthus, trian. monog. and irideæ, a G. peren. China, a bulb which may be treated as ixia.
Pariana, monœc. polyan. and gramineæ, a S. tr. Cayenne, which grows in loam and peat, and cuttings root in sand under a bell-glass.
Parietaria, pellitory, poly. monœc. and urticeæ, a S. peren. and an. and H. peren. Eur. and India, of easy culture in light soil.
Paris, octan. tetrag. and smilaceæ, a H. peren. Brit. which prefers a shady situation in a light sandy loam, and is increased by seed.
Parkinsonia, decan. monog. and leguminoseæ, a S. tr. W. Ind. which thrives in loam and peat, and cuttings root in sand under a bell-glass.
Parnassia, grass of parnassus, pentan. tetrag. and capparideæ, H. peren. Brit. and Amer. marsh plants which thrive best in moist peat soil.
Paronychia, pentan. monog. and amaranthaceæ, G. peren. Eur. which thrive well in loam and peat, and cuttings root freely under a hand-glass; the H. peren. and an. prefer the same soil, and are increased by cuttings or seeds.
Paisley manufacturers, their gardens and florists' meetings, &c. 2238.
Packenham-hall, a seat in Westmeath, 2260.
Parkyns, G. J. his works on gardening, 2283. A. D. 1805.
Parkes, Samuel, F. L. S. his writings on gardening, 2283. A. D. 1819.
Pulissy, Bernard de, a French author on gardening, 2284. A. D. 1563.
Packbush, S. T. his works on gardening, 2283. A. D. 1695.
Panning, forming a pan or saucer-like hollow round newly-planted trees, to receive and retain water, 944. This pan is generally afterwards mulched, or covered with litter. Hence the operation of panning and mulching, directed to be performed by old authors.
Parthenium, syngen. polyg. necess. and corymbifereæ, a H. peren. and an. W. Ind. and Amer. of common culture.
Pascalia, syngen. polyg. frustran. and corymbifereæ, Chili, which grows best in loam and peat, and cuttings root under a hand-glass.
Paspalum, trian. dig. and gramineæ, S. and H. W. Ind. and S. Amer. grasses of easy culture.
Passerina, sparrow-wort, octan. monog. and thymeleæ, G. tr. C. B. S. which thrive best in sandy peat, and cuttings root freely under a bell-glass in sand.
Passiflora, passion-flower, monadel. pentan. and passifloreæ, S. and G. tr. climbers, free growers, and easily managed; they thrive best in loam and peat, and young cuttings root readily in heat under a bell-glass.
—— —— quadrangularis, and other fruit-bearing species, 1533.
Pastinaca, parsnip, pentan. dig. and umbelliferæ, H. bien. and a peren. of common culture.
———— sativa, the garden parsnip, 1324.
Patersonia, monadel. trian. and irideæ, G. peren. N. S. W. which grow in loam and peat, and are increased by dividing at the root.
Pavetta, tetran. monog. and rubiaceæ, a S. tr. E. Ind. which thrives best in loam and peat, and cuttings root readily in sand under a hand-glass.
Paullinia, octan. trig. and sapindeæ, S. tr. W. Ind. which succeed in light loam, and cuttings root best in sand in bottom-heat under a hand-glass.
Pavonia, monadel. polyan. and malvaceæ, S. and G. tr. and a S. an. E. and W. Ind. which grow in loam and peat, and root readily in sand under a hand-glass: most of the species produce abundance of seeds.
Parasitic plants, such as root into other living plants, and derive their nourishment from them; some root into the stem or branches, as viscus, the misseltoe; others attach themselves to the root, as hypocistus; some of the epidendræ, and aëridæ, will grow either on living or dead trees.
Parasitic hardy plants, 1678.
Parasitic exotics, their culture and management, 1754.

Papilio, the butterfly, a lepidopterous insect, 1310.
Papilio machaon, 1615.
Paté d'oye, in planting, 65. 1799.
Parkinson, John, 117. 195. 523; his works on gardening, 2283. A. D. 1629.
Parterre, edgings, 624.
Parterre, (*Fr.*), an even or level piece of ground; a flower-garden. See Flower-garden.
Paddock, puddock, or purrock, a country term, originally applied to a small space inclosed by pales from a park, for hounds to run matches in, now generally applied to the small grass inclosures commonly attached to a park, or kept in the hands of the resident on the demesne.
Park, in gardening, a portion of forest-like scenery attached to a country-house, and devoted to the growth of timber, the harbour of game, deer, or the pasturage of cattle, &c. 2015.
Paultons, a seat in Hampshire, 2197.
Panton-house, Lincolnshire, 2180.
Park-place, Berkshire, 2164.
Panshanger, a seat in Hertfordshire, 1231. 2152.
Pavilion, a regal residence in Brighton, 2145.
Parham, a seat in Sussex, 2143.
Paulet, ——, his works on gardening, 2284. A. D. 1793.
Park par. J. Parkinson Paradisi in Sole Pardisus terrestris.
Pawlosky, an imperial seat near Petersburgh, 88.
Pausillipo, grotto of, near Naples, 107.
Pain's-hill, a seat in Surrey, 109. 2140.
Pæony, — see Pæonia.
Palma christi, — see Ricinus.
Parsley, — see Apium.
Parsnip, — see Pastinaca.
Passion flower, — see Passiflora.
Panic grass, — see Panicum.
Papaw-tree, — see Carica.
Paper mulberry, morus papyrifera.
Paraley piert, alchemilla aphanes.
Pasque flower, — see Pulsatilla.
Pannage, a law term signifying the feed which swine or cattle may derive from the mast, acorns, or herbage of woods.
Penpont, a seat in Brecknockshire, 2216.
Pennycuick-house, Midlothian, 2218.
Perthshire, gardens and residences of, 2236.
Perth nursery, 2236.
Perfect, Thomas, his works on gardening, 2283. A. D. 1759.
Pelée, M. de St. Maurice, a French author on gardening, 2284. A. D. 17....
Peschelius, ——, his works on gardening, 2283. A. D. 1597.
Pelleport-Saune, M——, his work on gardening, 2284. A. D. 1813.
Peterkin, Joshua, his work on planting, 2291. A. D. 1790.
Peters, Richard, his work on gardening, 2291. A. D. 1810.
Pectis, syngen. poly. super. and corymbifereæ, S. an. W. Ind. of common culture, 1749.
Pedalium, didyn. angios. and pedalineæ, S. an. E. Ind. of common culture, 1749.
Pedicularis, lousewort, didyn. angios. and scrophularineæ, F. and H. peren. and an. Eur. and Amer. which succeed best in peat soil and a moist situation, and are increased by seeds.
Peganum, dodec. monog. and rutaceæ, H. peren. Eur. which thrive in rich, light soil, and cuttings root freely under hand-glasses.
Pelargonium, stork's-bill, monadel. heptan. and geraniaceæ, G. tr. peren. and an C. B. S. and some S. tr. and peren. all of easy culture in any rich, light soil, the succulent sorts well drained and not overwatered. See 1711.
Peliosanthes, hexan. monog. and............, S. peren. E. Ind. which grow best in rich loam, and are increased by dividing at the root.
Peltaria, tetrad. silic. and cruciferæ, a H. peren. Austral. of common culture, 1656.
Penæa, tetran. monog. and Jasmineæ, G. tr. C. B. S. which thrive in loam and peat, with the pots well drained, and young cuttings root without difficulty under bell-glasses in sand.
Penicillaria, poly. monœc. and gramineæ, a S. and H. an. E. and W. Ind. of common culture.
Pennisetum, trian. dig. and gramineæ, H. an. Eur. and Ind. grasses of the easiest culture.
Pentapetes, monadel. dodec. and malvaceæ, a S. tr. and a bien. Ind. and N. Spain, which grow freely in light, rich soil, and cuttings root in sand under a bell-glass.
Penthorum, decan. pentag. and sempervivеæ, a H. peren. Virginia, which grows freely in light sandy soil, and is readily increased by dividing at the root, or by young cuttings under a hand-glass.
Pentstemon, didyn. angios. and bignoniaceæ, a F. tr. and H. peren. N. Amer. which grow in light, rich soil, and succeed well in pots. Cuttings root freely under hand-glasses.
Pentsia, syngen. polyg. æqual. and corymbiferеæ, a G. tr. C. B. S. which thrives well in any rich, light soil, and cuttings root freely under a hand-glass.
Peplis, water-purslane, hexan. monog. and salicareæ, a H. an. Brit. a marsh plant of easy culture.
Perdicium, syngen. poly. super. and corymbiferеæ, a H. peren. Siberia, which grows in rich, light soil, and is increased by dividing at the root.
Pergularia, pentan. dig. and asclepiadeæ, S. tr. E. Ind. fragrant climbers which succeed well in loam and peat, and cut-

tings root readily in sand under a hand-glass.
Perilla, didyn. gymnos. and labiateæ, a H. an. India, of common culture, 1662.
Periploca, pentan. dig. and asclepiadeæ, a G. and H. tr. Syria and the Canaries, which grow freely in common soil, and are increased by layers or cuttings.
Pea, — see Pisum.
Peach-tree, — see Amygdalus.
Pearlwort, — see Sagina.
Pear-tree, — see Pyrus.
Pellitory, — see Peltaria.
Pennyroyal, mentha pulegium.
Pennywort, — see Hydrocotyle.
Pepper, — see Piper.
Pepper-vine, cissus stans.
Pepper-wort, — see Lepidium.
Periwinkle, — see Vinca.
Persicaria, polygonum persicaria.
Petrophila, tetran. monog. and proteaceæ, G. tr. N. S. W. which may be treated as proteæ.
Palisade, (palisade, *Fr.*), any fence of pales, a paling; the term is generally used when an ornamental paling is intended.
Penrice castle, Glamorganshire, 2211.
Penguern, a seat in Flintshire, 2209.
Penrhyn castle, Caernarvonshire, 2207.
Pendarves, a seat in Cornwall, 2204.
Peel-hall, Cheshire, 2193.
Penshurst, a seat in Kent, 2148.
Petworth-house, Sussex, 2144.
Pepper Harrow, a seat in Surrey, 2141.
Petersham lodge, Surrey, 2140.
Pentre, a seat in Pembrokeshire, 2212.
Peach-gatherer, 617, — see Implements.
Pear-gatherer, 617, — see Implements.
Perotis, trian. dig. and gramineæ, a S. an. E. Ind. of common culture, 1662.
Persoonia, tetran. monog. and proteaceæ, G. tr. N. S. W. which thrive in loam and peat, and ripened cuttings root in sand under a hand-glass.
Petalostemum, diadel. pentan. and leguminoseæ, H. peren. N. Amer. which thrive in light, rich soil, and are increased by seeds or dividing at the root.
Petiveria, heptan. monog. and chenopodeæ, S. tr. W. Ind. which grow well in light, rich soil, and cuttings root freely under a hand-glass.
Petræa, didyn. angios. and verbenaceæ, a S. tr. Vera Cruz, a climber, which thrives well in loam and peat, and cuttings root in sand under a hand-glass in heat.
Petrocallis, tetrad. silic. and crucifereæ, a H. peren. Pyrenees, a rockwork plant, which grows well in loam and peat, and cuttings root readily under a hand-glass.
Peucedanum, sulphur-wort, pentan. dig. and umbelliferæ, a G. bien. and H. peren. Eur. of common culture.
Peatearth shrubs, 1689; their culture, 1690; final situation, 1691.
Pekra, a seat near Moskwa, 88.
Petrowka, a seat near Moskwa, 88.
Peach-house, its construction, 1161; general culture and management of, 1232, — see Amygdalus.
Persian gardening, 183, 184.
Persoon, Christian Henry, a French botanist, author of Synopsis Plantarum, and other works, 270.
Per. Persoon's Synopsis Plantarum.
Petre, Robert, Lord, an accomplished nobleman and great encourager of gardening in the time of Miller, — see Ingatestone.
Peterhoff, an imperial residence near Petersburg, 62. 84.
Pembrokeshire, gardens and residences of, 2212.
Phœnix-park, Dublin, 2251.
Phillips, Leonard, jun. his works on gardening, 2233. A.D. 1814.
———, Mr. Henry, his works on gardening, 2283. A.D. 1820.
Phaca, bastard vetch, diadel. decan. and leguminoseæ, H. peren. Eur. which succeed in common garden soil, and are increased by seeds. Some of the dwarfer kinds are well adapted for rock-work or growing in pots.
Phalangium, hexan. monog. and asphodeleæ, H. peren. S. Eur. which thrive in rich, light soil, and are readily increased by dividing the root.
Phalaris, canary-grass, trian. dig. and gramineæ, a H. peren. and an. Eur. Egypt, and C. B. S. grasses of easy culture.
Pharnaceum, pentan. trig. and caryophylleæ, a S. and G. tr. and H. an. Eur. and C. B. S. which thrive in sandy loam and peat, and cuttings root in the same soil under a hand-glass.
Pharus, monœc. hexan. and gramineæ, a S. peren. Jam. a grass of easy culture.
Phaseolus, kidney-bean, diadel. decan. and leguminoseæ, S. peren. and an. and H. an. Asia, Amer. and Africa, which thrive in light, rich soil, and may be propagated from cuttings or seeds.
——— vulgaris, the common kidney bean, 1313.
Kidney beans to force, 1282; soil, sorts, sowing, culture, time of beginning to force, temperature, successional supplies, forcing in a hot-house, insects, 1282; forcing in a peach or cherry-house, in a common hot-bed, 1282; crop raised under glass to fruit in the open garden, crop raised on slight heat, 1282.
Phellandrium, water hemlock, pentan. dig. and umbelliferæ, a H. bien. Brit. an aquatic which may be sown in pots and placed in the aquarium, or the seeds scattered in any pond.
Philadelphus, syringa, icos. monog. and myrteaceæ, H. tr. Eur. and Carolina, shrubs of easy culture.
Philoxerus, pentan. monog. and amaranthaceæ, a S. tr. and peren. Amer. which

thrive well in rich soil, and are readily increased by cuttings.
Philydrum, dian. monog. and junceæ, a S. tr. China, of common culture.
Phleum, cats-tail grass, trian. dig. and gramineæ, H. peren. and an. Eur. of common culture.
Phlomis, didyn. gymnos. and labiateæ, H. tr. and peren. Eur. which prefer a light, dry soil, and are increased by cuttings under a hand-glass or seeds.
Phlox, lychnidea, pentan. monog. and polemoniaceæ, H. peren. Amer. mostly border flowers, which prefer a rich loam, and are increased by cuttings or dividing at the roots.
Phœnix, date palm, diœcia trian. and palmeæ, a S. tr. and G. tr. Levant, C. B. S. and E. Ind. which require a light soil, and are increased by seeds.
Phormium, flax lily, hexan. monog. and asphodeleæ, a G. peren. N. Zeal. which thrives in any light, rich soil, and is increased by offsets from the roots.
Phryma, didyn. gymnos. and labiateæ, a H. peren. N. Amer. which thrives well in rich, light soil, and cuttings root freely under hand glasses.
Piercefield, a seat in Monmouthshire, 2170.
Phrynium, monan. monog. and canneæ, S. peren. E. Ind. which thrive in rich, light soil, and are increased by dividing at the root.
Phylica, pentan. monog. and rhamneæ, G. tr. C. B. S. which grow best in sandy peat, and young cuttings root readily under a bell-glass in sand.
Phyllanthus, monœc. monad. and euphorbiaceæ, S. tr. and an. chiefly W. Ind. which succeed well in loam and peat, and cuttings root freely in sand under a hand-glass.
Phyllis, pentan. dig. and rubiaceæ, a G. tr. Canar. which grows in loam and peat, and cuttings root in sand under a hand-glass.
Phylloma, hexan. monog. and asphodeleæ, a S. tr. Bourb. which thrives well in sandy loam, requires very little water, and is increased by suckers.
Physalis, winter cherry, pentan. monog. and solaneæ, S. and G. tr. and H. peren. and an. chiefly N. Amer. which thrive well in rich, light soil, and are increased by young cuttings under a hand-glass, or by seeds.
Phyteuma, rampion, pentan. monog. and campanulaceæ, a G. peren. and H. peren. and a bien. chiefly Europe, which thrive in rich, light soil, do well in pots, and are increased by dividing at the root. The garden rampion is a campanula.
Phytolacca, dodec. decag. and chenopodeæ, S. tr. As. Af. and Amer. which thrive well in loam and peat, and are increased by cuttings or seeds.
Phallus esculentus, the morel, 1418.
Phys. des Arb. Duhamel sur le Physique des Arbres.
Phillyrea, olea alaternus.
Physic-nut, — see Jatropha.
Phalena quercus, the egger-moth, 1912.
Pheasantry, 2001.
Physic or herb-gardens, their formation, 2050.
Physic-gardeners, herbalists, or simplicists, 2075.
Pierre, Louis de, his works on gardening, 2283. A.D. 1772.
Pigott, Richard, his work on gardening, 2283. A.D. 1820.
Piaranthus, pentan. monog. and asclepiadeæ, a D. S. tr. C. B. S. a succulent which grows in loamy soil with old lime rubbish, and sand well drained, and readily increased by cuttings.
Picramnia, diœc. pentan. and ...., a S. tr. Jam. which thrives in loamy soil, and large cuttings root freely in sand under a hand-glass.
Picridium, syngen. polyg. æqual. and cichoraceæ, a H. peren. and an. France and Barb. of common culture.
Picris, syngen. polyg. æqual. and cichoraceæ, H. peren. and an. chiefly Europ. of common culture.
—— hieracioides, hawkweed-like, ox-tongue, 1410.
Pilularia, pillwort, cryptog. hydropter. and marsileaceæ, a H. peren. Brit. an aquatic of common culture.
Pimelea, dian. monog. and thymeleæ, G. tr. Austral. which thrive best in sandy peat, and young cuttings root in sand under a bell-glass.
Pimpinella, burnet saxifrage, pentan. dig. and umbellifereæ, H peren. and an an. chiefly Europ. which grow in rich, light soil, and are increased by seeds.
———— anisum, the anise, 1393.
Pinckneya, pentan. monog. and rubiaceæ, a F. tr. Georgia, which grows in sandy loam and peat, and cuttings root in sand under a hand-glass.
Pinguicula, butterwort, dian. monog. and lentibulareæ, a G. an. Carolin. and H. peren. Europ. which grow naturally in swamps, and succeed in pots of any species of sphagnum, with a little peat at the bottom, like drosera. They are increased by offsets from the heart of the plant, and from seed.
———— vulgaris, the common butterwort, 1415.
Pinus, the pine fir and larch, monœc. monad. and conifereæ, a S. tr. amboyna, G. tr. E. Ind. and H. tr. Eur. and Amer. The S. species succeeds in light loamy soil, and ripened cuttings taken off at a joint will root, though not readily, in sand under a hand-glass: the G. species require the same soil and

roots more freely; the H. species grow in light soil, and are commonly increased by seeds.

Pinus sylvestris, the Scotch or wild pine, and the other pines in common cultivation, 1901.

—— cedrus, and p. larix, the cedar larch, and common-larch, 1906, 1907.

—— abies, the spruce-fir, and other firs in common cultivation, 1908, 1909.

Piper, pepper, dian. trig. and urticeæ, S. tr. chiefly climbers, peren. and an. W. Ind. mostly succulents which grow in sandy loam and peat, and are readily increased by cuttings and suckers.

Piqueria, syngen. polyg. æqual. and corymbifereæ, a G. peren. Mex. which grows freely in any light, rich soil, and cuttings root readily under a hand-glass.

Piscidia, Jamaica dog-wood, diadel. decan. and leguminoseæ, a S. tr. W. Ind. a strong, fast-growing plant in sandy loam, and cuttings root in sand under a hand-glass.

Pisonia, heptan. monog. and nyctagineæ, S. tr. W. Ind. and a G. tr. Austral. which grow in loam and peat, and cuttings root in sand under a hand-glass.

Pistacia, diœc. pentag. and terebintaceæ, G. tr. Barb. and H. tr. S. Eur. the G. species grow in loam and peat, and ripened cuttings root in sand under a hand-glass. The H. tr. are rather tender, but grow in common soil, and are increased by layers or cuttings under a hand-glass in sandy soil.

Pisum, pea, diadelph. decan. and leguminoseæ, a H. peren. Eng. and H. an. S. Eur. of common culture.

——— sativium, the garden-pea, 1311; to force the pea, 1286.

——— maritimum, the sea-pea, 1412.

Pitcairnia, hexan. monog. and bromeleæ, S. tr. W. Ind. and S. Amer. which flower freely in light, rich soil, and are increased by suckers from the root.

Pittosporum, pentan. monog. and pittosporeæ, a S. tr. Guinea, and G. tr. Austral. C. B. S. and E. Ind. which grow in loam and peat, and cuttings root freely in sand under a hand-glass.

Pit, a structure with a glass cover or roof, used as a habitation for plants. Earth-pit, bark-pit, flued-pit, M'Phail's-pit, Alderstone-pit, pit with rising frame, 626; West's-pit, 1164. — see Structures.

—, an excavation in the moist or bark-stove for containing fermentable materials in order to supply bottom-heat.

—, in the conservatory, the bed of earth in which the trees are planted, occupying the principal part of the area of the house.

Pitmaston, a seat near Worcester, 1238.

Pigeon-house, — see Columbarium.

Pigeon-houses of Persia, 158.

Piscinary, — see 748.

Pick, and pick-axe, 616. — see Implements.

Picking, 796. — see Operations.

Pinkie-house, in East-lothian, 1041.

Pindemonte, Hippolito, 28. 108; his works on gardening, 2286. A.D. 1817.

Pisé, or *en pisé*, a mode of building, 627.

Pilewort, ficaria verna.

Pillwort, pilularia globulifera.

Pimpernell, — see Anagallis.

Pine-apple, — see Bromelia.

Pine-tree, — see Pinus.

Pink, — see Dianthus.

Pipe-wort, eriocaulon septangulare.

Pistachia-tree, — see Pistacia.

Pitcher-plant, nepenthes distillatoria.

Pinery, its construction, 1156; general culture and management, 1166. — see Bromelia.

Pilewell-house, Hampshire, 2197.

Picton, a seat in Pembrokeshire, 2212.

Pierard, Charles Francis, his work on gardening, 2284. A.D. 1820.

Picciuoli, Giusseppe, his work on gardening, 2286. A.D. 1783.

Platt, Sir Hugh, his works on gardening, 2283. A.D. 1594.

Plattes, Gabriel, his works on gardening, 2283. A. D. 1633.

Plantago, plantain, tetran. monog. and plantagineæ, a G. tr. and bien. C. B. S. and H. peren. and an. chiefly Eur. all of very easy culture in common soil.

———— coronopus, star of the earth, 1413.

Platanus, plane-tree, monœc. polyan. and amentaceæ, H. tr. Levant, and N. Amer. handsome timber trees which grow in common soil, and are propagated by layers and cuttings.

Platylobium, flat pea, diadel. decan. and leguminoseæ, G. tr. Austral. which grow in sandy loam and peat, and cuttings root in sand under a hand-glass.

Plectranthus, didyn. gymnos. and labiateæ, a S. tr. and an. and G. tr. and a bien. Africa and E. Ind. of easy culture in light soil.

Plectronia, pentan. monog. and rhamneæ, a G. tr. C. B. S. which thrives in loam and peat, and ripened cuttings root under a hand-glass in sand.

Pleea, ennean. trig. and junceæ, a G. peren. Carol. of common culture.

Pleurothallis, gynan. monan. and orchideæ, a S. peren. W. Ind. a parasite which requires to be treated as aërides, &c.

Plocama, pentan. monog. and rubiaceæ, a G. tr. Canar. which grows in loam and peat, and ripened cuttings root in sand under a hand-glass.

Plukenetia, monœc. monad. and euphorbiaceæ, a S. tr. W. Ind. a climber which grows best in loamy soil, and cuttings root in sand under a hand-glass.

Plumbago, leadwort, pentan. monog. and

plumbagineæ, S. tr. E. and W. Ind. a G. tr. C. B. S. and a H. peren. S. Eur. The S. and G. species flower freely in loam and peat, and cuttings root in sand under a hand-glass: the H. species is of easy culture.

Plumeria, pentan. dig. and apocyneæ, S. tr. E. and W. Ind. which flower freely in light, loamy soil, and require but little water, especially when not in a growing state. Large cuttings laid to dry for a considerable time, and stuck in the tan, will root freely.

Planting, — see Arboriculture.

Plantations of trees, their uses, 1771; as to shelter and climate, 1771; improving soils, 1772; shade, 1773; separation, 1774; seclusion, 1775; distinction, 1776; appropriation, 1777; concealment, 1778; to heighten agreeable objects, 1779; direct the eye to objects, 1780; render indifferent objects agreeable, 1781; enhance the value of landed property, 1783; afford profit, 1785.

———, their different kinds, 1798; group clump, 1798; woods, copsewoods, 1799.

———, their disposition in the modern style, 1798; ancient style, 1799.

———, useful, their formation, 1801; preparing the soil, 1802; form, 1803; inclosing, 1804; fences, 1805; species of tree, 1806; mixture, 1807; whether to be sown or planted, 1808; disposition of the plants, 1809; number of plants and distances, 1810; size of the plants, 1811; seasons for planting, 1812; operations of, 1813.

——— ornamental, their formation, 1820; form, 1821; extent, 1822; disposition, 1823; general form, 1824; situation, 1824; arrangement of species, 1826; size of plants, 1827.

——— useful and ornamental, their culture and management, 1829; culture of the soil, 1829; filling up blanks, 1830; pruning, 1831; for utility, 1832; for ornament, 1833; seasons for, 1834; implements for, 1835; resinous trees, 1836; non-resinous trees, 1837; heading-down trees, 1838; pruning for bends, 1839; coppices, 1840; osier holts, 1841; strips and screens, 1842; trees for shade, 1843; trees in parks, 1844; in pleasure-grounds and lawns, 1845; thinning, 1846.

———, neglected to improve, 1848; neglected hedge-rows, 1849; hedge-row timber, 1850; neglected ornamental plantations, 1852.

———, valuation of, 1871.

Planting, different modes of performing the operation, 923 to 944, — see Operations.

——— in arboriculture, operation of, 1813; by pitting, 1814; by the diamond dibber, 1815; by the planter's-mattock, 1816; by the planter, 1817; by slitting, 1818.

Plat, or plot, a piece of ground of determinate form, small compared with a field, but larger than a border, bed, or stripe.

Pleacher, (from plecto, to plait or weave,) an arbour-maker, — see Topiarius.

Plunkenet, Leonard, a celebrated English botanist, who died about 1705; 118. 523.

Plants, — see Vegetables.

———, as indicative of soils, 550.

——— used in tarts, confectionary, and domestic medicine, 1301. 1390.

——— used as preserves and pickles, 1301, 1404.

Plans of gardens and garden objects, how to form, 819—829; to transfer them to ground, 829—844; to execute them, 844—864.

Pleasure-ground, garden scenery devoted to shew and recreation, generally placed near the house, 2014.

Ploughed-gardens and their management, 2111.

Plane-tree, — see Platanus.

Plank-plant, bossiæa scolopendrium.

Plaintain, — see Plantago.

——— tree, — see Musa.

Plowman's spikenard, — see Baccharis.

Plum-tree, — see Prunus.

Plant. grass. Histoire des Plantes Grasses. Par A. P. Decandolle.

Plenck ic. Icones Plantarum, &c. or figures of plants, &c. by Dr. J. J. Plenck.

Pluck. alm. Leon. Plukenett Almagestum Botanicum.

——— phyt. L. Plukenett Phytographia.

Plans of ground, how to form, 819—827; for improving country residences, 2053; important uses, of, 2054.

———, how to carry into execution, 2055.

Planner, (Scotch,) a maker of plans, — see Horticultural Artichect.

Plas Newydd, a seat in Anglesea, 2206.

Plumpton, scenery of, in Yorkshire, 2185.

Pluviometer, or rain-gauge, 613. 623.

Plenck, J. J. his work on gardening, 2285, A. D. 1784.

Plaz, Anthony William, his works on gardening, 2285. A. D. 1764.

Poa, meadow-grass, trian. dig. and gramineæ, S. peren. and an. E. Ind. and H. peren. and an. Eur. and N. Amer. all of the easiest culture.

Podalyria, decan. monog. and leguminoseæ, G. tr. C. B. S. pretty plants which grow in loam and peat, and are increased by ripened cuttings in sand, under a hand-glass or by seeds.

Podolepis, syngen. polyg. super. and corymbifereæ, G. peren. Austral. which thrive well in loam and peat, and are increased by dividing at the root.

Podocarpus, monœc. monadel. and conifereæ, G. tr. China and C. B. S. which grow in loam and peat, and ripened cut-

tings root readily under a hand-glass in sand.
Podolobium, decan. monog. and leguminoseæ, a G. tr. N.S.W. a handsome plant which grows in loam and peat, and young cuttings may be rooted in sand under a bell-glass.
Podophyllum, duck's-foot, polyan. monog. and papaveraceæ, a H. peren. N. Amer. which thrives in rich, light soil, and is increased by dividing at the root.
Pogonia, gynan. monan. and orchideæ, a G. peren. and H. peren. N. Amer. which grows best in peat, and is increased by offsets from the bulbs.
Poinciana, Barbadoes flower-fence, decan. monog. and leguminoseæ, S. tr. E. Ind. which require a strong heat to make them flower well; they grow in loam and peat, and are increased by cuttings in sand under a hand-glass or by seeds.
Polemonium, Greek valerian, pentan. monog. and polemoniaceæ, H. peren. N. Amer. and Brit. of the easiest culture.
Pollichia, monan. monog. and chenopedeæ, a G. bien. C.B.S. of easy culture.
Polianthes, tuberose, hexan. monog. and hemerocallideæ, a G. peren. E. Ind.—see 1638.
Polycarpon, all-seed, tetran. trig. and caryophylleæ, a H. an. Engl. of common treatment, 1662.
Polycnemum, trian. monog. and chenopodeæ, a H. an. S. Eur. of common culture, 1662.
Polygala, milkwort, diadelph. octan. and pediculareæ, G. tr. C.B.S. and H. tr. peren. and an. Eur. and N. Amer.; the g. sp. grow in peat soil, and young cuttings root freely in sand, under a bell-glass; the hardy sorts prefer a similar soil, and are increased by dividing at the root or by seeds.
Polygonatum, Solomon's seal, hexan. monog. and smilaceæ, H. peren. Brit. and Amer. of easy culture, 1656.
———, vulgare, 1411.
Polygonum persicaria, octan. trig. and polygoneæ, a S. peren. and G. bien. E. Ind. and H. tr. peren. and an. Eur. and N. Amer. of easy culture.
Polymnia, syngen. polyg. necess. and corymbifereæ, a S. bien. Afr. and H. peren. Amer. of common culture.
Polypodium, polypody, cryptog. filices, and filiceæ, S. peren. W. Ind. and H. peren. Brit. of easy culture, 1678.
Polypogon, trian. dig. and gramineæ, a H. peren. Brit. a grass of the usual culture.
Pomaderris, pentan. monog. and rhamneæ, G. tr. N. Holl. which thrive in loam and peat, and cuttings root freely in sand, under a hand-glass.
Powers-court, a seat in Wicklow, 2252.
Powel, Anthony, Esq. his work on gardening, 2283. A.D. 1769.
Pontey, Mr. William, his works on garden. 2283. A.D. 1800.
Pongamia, diadel. decan. and leguminoseæ, a S. tr. E. Ind. which thrives in loam and peat, and cuttings root in sand under a hand-glass.
Pontederia, hexan. monog. and asphodeleæ, a S. peren. E. Ind. and H. peren. N. Amer. aquatics of common culture.
Ponthieva, gynan. monan. and orchideæ, a S. peren. W. Ind. which grows in sandy loam and peat well drained, and little water given when it is not in a growing state.
Populus, poplar, dioec. octan. and amentaceæ, H. tr. N. Amer. and Eur. of easy culture in moist deep soil, and increased readily, some by cuttings, others by layers, and all by cuttings of the root.
——— alba, and other species grown as timber trees, 1940 to 1945.
Porcelia, polyan. polyg. and annoneaceæ, H. tr. N. Amer. which grow in loam and peat, and are increased by layers.
Portlandia, pentan. monog. and rubiaceæ, S. tr. W. Ind. beautiful plants which thrive in sandy loam and peat, and cuttings, with their leaves not shortened, root readily under a hand-glass.
Portulaca, purslane, dodec. monog. and portulaceæ, a S. bien. and an. E. and W. Ind. and H. an. S. Amer. and Eur. of common culture.
——— oleracea, the garden purslane, 1370.
Portulacaria, purslane tree, pentan. pentag. and portulaceæ, a G. tr. Afr. a succulent which thrives in sandy loam and brick rubbish, and is easily increased by cuttings.
Potamogeton, pond-weed, tetran. tetrag. and alismaceæ, H. peren. Brit. aquatics of easy culture.
Potentilla, cinquefoil, (five leaves,) icos. polyg. and rosaceæ, H. tr. peren. and a bien. chiefly Eur. of easy culture.
——— anserina, the wild tansey or goose-grass, 1411.
Poterium, burnet, monœc. polyan. and rosaceæ, G. tr. S. Eur. and H. peren. Eur. of common culture.
——— sanguisorba, the common burnet, 1366.
Pothos, tetran. monog. and aroideæ, S. peren. W. Ind. and a H. peren. N. Amer. all of which thrive well in loamy soil, and are increased by dividing the roots, or by seed.
Potatoe,—see Solanum.
Pot herbs and garnishes, 1301. 1369; to force pot herbs, 1287.
Poisonous plants, of common occurrence, in Britain, 1416.
Ponds, their formation, 744, in landscape gardening, 1980.
Porches, 765,—see Edifices.

Porticoes, 765, — see Edifices.
Potsdam, gardens of, 65.
Poniemenia, a seat at Grodno, 90.
Policie, the Scotch term for pleasure-ground.
Powys-castle, a seat in Montgomeryshire, 2214.
Poscharskey, Ch. F. his works on gardening, 2285. 1818.
Possi, George, his works on the vine, 2286. A. D. 1810.
Polish and Russian works on gardening, 2289.
Poet's cassia, osyris alba.
Poison nut, strychnos nux vomica.
Poison oak, rhus toxicodendron.
Polypody, — see Polypodium.
Pomegranate, — see Punica.
Pond weed, — see Potamogeton.
Poplar, — see Populus.
Poppy, — see Papaver.
Port Elliot, a seat in Cornwall, 2204.
Pontilly-castle. Cornwall, 2204.
Powdersham castle, Devonshire, 2203.
Portswood-house, Hampshire, 2197.
Ponsonby hall, Cumberland, 2196.
Poynton, a seat in Cheshire, 2193.
Ponty-pool, a seat in Monmouthshire, 2170.
Polesdon, a seat in Surrey, 2140.
Poinsot, ——, his work on gardening, 2284. A. D. 1804.
Pom. Brit. Pomona Britannica, by Henry Phillips.
Prasium, didyn. gymnos. and labiateæ, F. tr. S. Eur. which thrives in light rich soil, and young cuttings root under a hand-glass.
Prenanthes, syngen. polyg. æqual. and cichoraceæ, a F. tr. Barb. and H. peren. and a bien. N. Amer. and Eur. of common culture.
Primula, primrose, pentan. monog. and primulaceæ, H. peren. Eur. beautiful little plants: the hardier sorts grow in loamy soil in shaded situations, and the alpines thrive best in peat and loam in pots; all require to be frequently parted and replanted.
—— auricula, the auricula, 1641.
—— vulgaris var. polyanthos, the polyanthus, 1642.
—— vulgaris, the primrose, 1643.
—— veris, the cowslip, 1644.
—— elatior, the oxlip, 1645.
Prinos, winter berry, hexan. monog. and rhamneæ, a F. and H. tr. N. Amer. which grow well in light soil, but prefer peat, and are increased by layers or seeds.
Priva, didyn. angios. and verbenaceæ, S. peren. Mex. and E. Ind. which grow in loam and peat, and cuttings root readily under a hand-glass.
Prosopis, decan. monog. and leguminoseæ, a S. tr. E. Ind. a prickly plant of which the pods are eaten as a spice in India; it grows in loam and peat, and cuttings root in sand under a hand-glass.
Prostanthera, didyn. gymnos. and labiateæ, a G. tr. N. S. W. a beautiful plant which thrives in loam and peat, and cuttings root in the same soil under a hand-glass.
Protea, tetran. monog. and proteaceæ, G. tr. C. B. S. magnificent plants which grow best in light turfy loam, with one-third fine sand; the pots well drained, and furnished with a stratum of sherds or gravel; care must be taken not to let the plants droop for want of water, as they will seldom recover. Ripened cuttings taken off at a joint, and pared quite smooth, and thinly planted in pots of sand, will root under a hand-glass, but not plunged; damp must be avoided by wiping the glasses frequently.
Prunella, self-heal, didyn. gymnos. and labiateæ, H. peren. and an. N. Amer. and Eur. which thrive in light rich soil, and are well adapted for rock work or pots: they are increased by dividing at the root.
Prunus, the plum and cherry, icos. dipentag. and rosaceæ, S. G. and F. tr. W. and E. Ind. and H. tr. Eur. and N. Amer. The G. and F. sp. grow in loam and peat, and cuttings root in sand under a hand-glass: the h. sorts grow in any loamy soil, and are increased by all the modes of propagating trees.
—— domestica, the common plum, 1453; to force the plum, 1455.
—— cerasus, the cherry, 1457; cherry-house, 1162; and to force the cherry, 1240.
—— spinosa, the sloe, 1480; p. padus, the bird-cherry, 1480.
—— avium, the gean, 1929.
Preston-hall in East Lothian, 1247.
Pruning, different modes of, 950, — see Operations.
Price, Uvedale, Esq. 111; his writings on gardening, 2283. A. D. 1794.
Praslin, formerly Vaux le Vicompte and now V. le Villars, a seat near Paris, 50.
Poederle, —— L'aine, his works on gardening, 2287. A.D. 1772.
Propagation, different modes of, 875. — see Operations.
Protecting vegetables, 1020, — see Operations.
Preserving vegetables, 1032, — see Operations.
Propriety, as a requisite beauty in gardening, 1069.
Primrose, primula vulgaris.
Princes feather, amaranthus hypochondriacus.
Privet, — see Ligustrum.
Promenades, public, 2037; equestrian, 2337; pedestrian, 2038 and 2040; mountain promenade, 2039.
Proprietors of gardens, 2094.

Priory, a seat in Hampshire, 2197.

Prestwood-hall, Leicestershire, 2176.

Prestwood, a seat in Staffordshire, 2173.

Priory, a seat in Surrey, 2140.

Prospect towers, their use in gardening, 763.

Prick, a small dibber, — see Dibber.

Pricking, or pricking out, transplanting very young plants or seedlings, with a prick or small dibber.

Props for plants, different kinds of, used in gardening, 624.

Pronville, Augustus de, his work on gardening, 2284. A. D. 1818.

Preaudeau-Chemilly, E. his works on gargening, 2284. A. D. 1794.

Preserving vegetables, operation of, 1035 to 1046.

Professional police of gardening, 2293.

Psiadia, syngen. polyg. necess. and corymbifereæ, a S. tr. Maurit. which grows freely in rich light soil, and cuttings will root readily under a hand-glass.

Psidium, guava, icos. monog. and myrteaceæ, S. tr. W. Ind. grown there for their fruit: here they thrive in loam and peat, and ripen fruit readily; they are increased by cuttings in sand, under a hand-glass, or by layers.

Psidium, pyriferum, pomiferum, &c. 1524.

Psilotum, cryptog. stachyopt. and lycopodineæ, a S. peren. W. Ind. a fern which grows in loam and peat, and cuttings will root under a hand-glass in sand.

Psoralea, diadelph. decan. and leguminoseæ, a S. bien. and G. tr. and peren. chiefly C. B. S. which grow freely in loam and peat, and are increased by cuttings in sand under a bell-glass, or by seeds, which they ripen abundantly.

Psoralea esculenta, the breadroot, 1541.

Psychotria, pentan. monog. and rubiaceæ, S. tr W. Ind. which grow in loam and peat, and cuttings root in sand under a hand-glass.

Pteris, brake, cryptog. filices and filiceæ, a S. tr. and peren. W. Ind. G. peren. Mad. N. S. W. and H. peren. Brit. and N. Amer. all of easy culture.

Pterocarpus, diadelph. decan. and leguminoseæ, S. tr. E. and W. Ind. which thrive in light loamy soil, and cuttings not deprived of their leaves, root in sand under a hand-glass.

Pteronia, syngen. polyg. æqual. and cyna rocephaleæ, G. tr. C. B. S. which thrive in loam and peat, and cuttings root freely under a hand-glass.

Pterospermum, monad. dodec. and malvaceæ, G. tr. E. Ind. which thrive well in light loam, and cuttings not deprived of their leaves, root freely in sand under a hand-glass.

Pterostylis, gynan. monan. and orchideæ, a G. peren. N. S. W. which thrives in sandy loam and peat, without much water after it has done flowering.

Pterygodium, gynan. monan. and orchideæ, a G. peren. C. B. S. which may be treated as pterostylis.

Public gardens, 2037.

Public parks, their formation, 2041; management, 2124.

Public squares, their formation, 2041; management, 2123.

Pultenham Priory, Surrey, 2140.

Pullein, Samuel, M. A. his work on gardening, 2283. A. D. 1760.

Pumps for wells, 717. — see Edifices.

Punnet, a small flat basket of from four to twelve inches in diameter, and one to three inches deep, formed of split wood or shavings of timber. — see Basket.

Public laws relative to gardening, 2296.

Pulmonaria, lungwort, pentan. monog. and boragineæ, H. peren. Eur. and N. Amer. of easy culture in light soil.

Pulsatilla, pasque flower, polyan. polyg. and ranunculaceæ, H. peren. Eur. which grow best in light sandy soil, and may be increased by division at the root.

Pultenæa, decan. monog. and leguminoseæ, S. tr. Austral. which grow in sandy loam and peat, and cuttings root readily under a bell-glass in sand.

Punica, pomegranate, icos. monog. and myrteaceæ, a G. peren. W. Ind. H. tr. S. Europ. of easy culture in light soil, and increased by cuttings.

——— granatum, the common pomegranate.

Pupalia, pentan. monog. and amaranthaceæ, a S. tr. and peren. E. Ind. which grows readily in light rich soil, and cuttings root freely under a hand-glass in heat.

Pulhawa, a seat near Lublin, in Poland, 90. 94.

Pulteney, Richard, F. R. S. author of various botanical works, and of Sketches of the Progress of Botany in England, 2 vols. 8vo. 1790. He died in 1801. 117.

Puddling, to hold water, 854.

——— or mudding the roots of plants.

Pumps used in gardening, 717.

Puccoon, sanguinaria canadensis.

Pumpkin, cucurbita pepo.

Purslane, — see Portulaca.

Purslane tree, portulacaria afra.

Pursh, Fl. Amer. Flora Americæ Septentrionalis; or, A Systematic Description and Arrangement of the Plants of North America, by Frederick Pursh.

Pycnanthemum, didyn. gymnos. and labiateæ, H. peren. S. Amer. which thrive in light rich soil, and are increased by dividing at the root.

Pyrethrum, feverfew, syngen. polyg. super. and corymbifereæ, G. tr. Teneriffe and Canaries, and H. peren. Europ. of easy culture.

Pyrola, winter-green, decan. monog. and ericeæ, H. peren. Brit. rather difficult to cultivate; they do best in sand or

gravel, in a shady situation, and are increased by seeds or young cuttings under a hand-glass.
Pyrus, the apple, pear, service, &c. icos. dipentag. and rosaceæ, H. peren. chiefly Eur. of easy culture, and increased by seeds, layers, cuttings, &c.
——— malus, the apple tree, 1421.
——— communis, the pear, 1483.
——— aucuparia, the mountain ash, 1480. 1923.
——— domestica, the true service, 1441.
——— torminalis, the wild service, 1481.
——— aria, the white beamtree, 1924.
Pyxidanthera, pentan. monog. and ericeæ, a H. peren. Carolin. which thrives in peat soil, and may be increased by cuttings under a hand-glass.
Pyrola pomonelle, 1498.
Pyr, H. Esq. his ideas on laying out public squares. 2041.
Pyt-house, Wiltshire, 2199.
Pye, Mrs. Hampden, her works on gardening, 2283, A. D. 1775.

Q.

Quassia, decan. monog. and magnoliaceæ, S. tr. W. Ind. which flower freely in loam and peat, and ripened cuttings, taken off at a joint, not defoliated, root readily in sand under a hand-glass.
Quercus, oak, monœc. polyan. and amentaceæ, H. tr. N. Amer. and Eur. which grow in loamy soil, and are increased by seeds, and some sorts by layers and grafting.
——— robur, and pedunculata, the common oak, 1911.
——— q. cerris, the luccombe oak, and the Turkey oak, 1912.
Queria, trian. monog. and caryophylleæ, a H. an. Spain, of common culture.
Quisqualis, decan. monog. and combretaceæ, S. tr. E. Ind. climbers, which grow in loam and peat, and root freely in sand under a hand-glass.
Quercitron, the dyer's oak, 1912.
Quincunx, a mode of planting or disposing of objects, 1799.
Quintinie, Jean de la, 57, his writings on gardening, 2284. A. D. 1696.
Quair, (*Scotch*), a quire of paper, a poem, by James I. of Scotland, 107.
Quaking-grass, — see Briza.
Quillwort, isoetes lacustris.
Quince tree, — see Cydonia.
Queenby-hall, Leicestershire, 2167.
Queensborough, a seat in Galway, 2270.
Querber, J——, his works on gardening, 2284. A. D. 1800.

R.

Radiola, all-seed, tetran. tetrag. and sempervireæ, a H. an. Brit. of easy culture.
Rafnia, diadel. decan. and leguminoseæ, a G. bien. C. B. S. of common culture.
Rajania, diœc. hexan. and dioscoreæ, a S. peren. W. Ind. which thrives well in rich loam, and is increased by dividing at the roots.
Ramonda, pentan. monog. and solanaceæ, a H. peren. Pyrenees, which thrives in dry rockwork or in pots, in loam and peat, and is increased by dividing at the root or by seeds.
Randia, pentan. monog. and rubiaceæ, S. tr. Afr. and W. Ind. which grow best in sandy loam and peat, and cuttings root in sand under a hand-glass, in moist heat.
Ranunculus, crowfoot, polyn. polyg. and ranunculaceæ, H. peren. bien. and an. of easy culture in common garden-soil, some requiring a moist situation, and others, as r. aquatilis, to be planted in shallow water.
——— asiaticus, the garden ranunculus, 1629.
Raphanus, radish, tetrad. siliq. and cruciferæ, a H. peren. bien. and an. Eur. of easy culture.
——— sativus, the garden radish, 1329; to force the radish, 1287.
Rapistrum, tetrad. silic. and cruciferæ, H. an. Egypt and Eur. of common culture.
Rauwolfia, pentan. monog. and apocyneæ, S. tr. S. Amer. and Jamaica, which grow in loam and peat, and cuttings may be rooted in sand under a hand-glass.
Radish, — see Raphanus.
Ragged robin, lychnis floscuculi.
Ragwort, — see Othonna.
Raby-castle, Durham, 2188.
Ranft, I. F. his works on gardening, 2285. A. D. 1718.
Rauch, B. A. his works on gardening, 2204. A. D. 1801.
Ramoon tree, — see Trophis.
Rampion, — see Campanula, and Phyteuma.
Ramson, allium ursinum.
Rape, brassica napus.
Raspberry, rubus idæus.
Rafflesia arnoldii, and R. horsfieldii, 1754.
Rana arborea, or tree-frog, 1566.
Ransleben, 75. 705, his essay on gardening, 2285. A. D. 1811.
Ramsay, Mr. James, a Scotch landscape gardener, 114.
Ray, John, an eminent botanist, 118. 193; his works on gardening, 2283. A. D. 1660.
Raith, a seat in Fifeshire, 133; described, 2235.
Rarities, as garden decorations, 783.
Rake, (rateau, *Fr.*) 616, — see Implements.
Raking, 806, — see Operations.
Ravensworth castle, Durham, 2187.

Rainham, a seat in Norfolk, 2160.
Radnorshire, gardens of, 2213.
Rathfarnham-castle, a seat in the county of Dublin, 2251.
Rastillion, a seat in the county of Cork, 2264.
Rapin, René, a French writer on gardening, 2284. A. D. 1665.
Rain-gage, or pluviometer, 613 and 623.
Red-castle, a seat in Ross-shire, 2247.
Repton, Humphrey, Esq. 109, 111; his writings on gardening, 2283. A. D. 1795.
Renault ———, a French writer on gardening, 2284. A. D. 17...
Rails, or railings, used in gardening, 625. 762, — see Edifices and Kitchen-garden.
Ressous, Jean Baptiste Deschiens de, a French author on gardening, 2284. A. D. 1717.
Reaumuria, polyan. pentag. and ficoideæ, a F. tr. Syria, a handsome flowering plant in sandy loam and peat, and young cuttings root under a hand-glass.
Relhania, syngen. polyg. super. and corymbiferæ, a G. tr. C. B. S. which grows in rich light soil, and cuttings root under a hand-glass.
Reseda, dodec. trig. and capparideæ, G. tr. Spain, and C. B. S.; and H. peren. bien. and an. Eur. all of easy culture.
——— odorata, the mignonette, 1654; tree mignonette, 1654.
Restio, rope-grass, diœc. trian. and restiaceæ, a G. peren. C. B. S. which thrives in peat soil, and is increased by dividing at the root.
Retzia, pentan. monog. and convolvulaceæ, a G. tr. C. B. S. which thrives in any rich soil, and cuttings root freely in sand under a hand-glass.
Red cedar, juniperus virginiana.
Reed, — see Arundo.
Rest-harrow, — see Ononis.
Rem. on Hot. Remarks on Hot-houses, — see 2283. A. D. 1803.
Retarding vegetation, operations for, 944.
Rea, John, gent. 117. 127.; his works on gardening, 2283. A. D. 1665.
Reid, John, 133; his work on gardening, 2283. A. D. 1683.
Regent's Park, London, 143.
Religion, its influence on gardening, 182.
Renfrewshire, gardening of, 2228.
Re, Philip, his works on gardening, 2286. A. D. 1809.
Regina Claudia, reine claude, *Fr.* Queen Claudine, a plum, the green-gage of this country, — See Prunus.
Resinous timber trees, the most useful sorts described, 1901.
Residences, the formation and laying out of, 2018; mansion and demesne, 2019; villa, 2020; villa farm, 2021; ferme ornée, 2022; temporary residences, 2023; cottage ornée, 2024; citizens' villa, 2026; suburban villa, 2027; suburban house, 2028; house with carriage entrance, 2029; house with covered entrance, 2030; house and conservatory, 2031; house and flower-garden entrance, 2032; house and French parterre, 2033; common front street garden, 2034; farmer's garden, 2035; labourer's cottage garden, 2036.
Red-Rise, a seat in Hampshire, 2197.
Retreat, Devonshire, 2203.
Rendcome, a seat in Gloucestershire, 2168.
Redgrave-hall, Suffolk, 2159.
Rendlesham-hall, Suffolk, 2159.
Reeds, coverings of, used in gardening, 624.
Redouté, J. P. and C. A. *Thory*, their works on gardening, 2284. A. D. 1819.
Regnault, ——, his writings on gardening, 2284. A. D. 1817.
Red spider, — see Acarus.
Rendilla, Prospera, his work on gardening, 2286. A. D. 1629.
Rhodora, decan. monog. and rhodoraceæ, a H. tr. N. Amer. which may be treated like rhododendron.
Rhopala, tetran. monog. and proteaceæ, S. tr. which grow in sandy loam, with a little peat, and cuttings root in sand under a hand-glass.
Rhus, sumach, pentan. trig. and terebintaceæ, S. and G. tr. chiefly C. B. S. and H. tr. N. Amer. The G. sorts thrive well in loam and peat, and cuttings root freely under a hand-glass in sand: the H. kinds grow in common soil, and are increased by cuttings of the roots or layers.
Rhynchospora, trian. monog. and cyperaceæ, H. peren. Brit. grasses of easy culture.
Rhubarb, — see Rheum.
Rheed. mal. Hortus Indicus Malabaricus. Adornatus per Henr. van Rheede van Drakenstein.
Rishon, Mr. George, F. H. S. his writings on gardening, 2283. A. D. 1817.
Ritter, Charles, his works on gardening, 2285. A. D. 1804.
Riedel, J. C. his works on gardening, 2285. A. D. 1751.
Risso, A. and A. Poiteau, their works on gardening, 2284. A. D. 1818.
Richard, ——, his works on gardening, 2284. A. D. 1802.
Ringing, to induce a state of fruitfulness, different modes of performing the operation, 987 to 993.
Ringing for maturation of fruits, 988.
Rieffelson, Pt. his works on gardening, 2285. A. D. 1810.
Rhagadiolus, syngen. polyg. æqual. and cichoraceæ, H. an. Eur. of common culture.
Rhagodia, polyg. monœc. and chenopodeæ, a G. tr. N. S. W. which thrives in loam and peat, and cuttings root freely under a hand-glass.
Rhamnus, buck-thorn, pentan. monog. and rhamneæ, G. tr. China, C. B. S.

and H. tr. Eur. and N. Amer.; the G. sorts thrive in loam and peat, and cuttings root freely in sand under a hand-glass; the H. species grow in common soil, and are increased by layers or seeds; some of these are evergreens, others decumbent.

Rhapis, polyg. monœc. and palmeæ, a S. tr. and G. bien. China and Carolina, which thrive in sandy loam, and are increased by suckers.

Rheum, rhubarb, ennean. trig. and polygoneæ, H. peren. Eur. and Asia, of easy culture.

——— rhaponticum, common culinary or tart-rhubarb, 1393; to force rhubarb, 1793.

Rhexia, octan. monog. and melastomeæ, a S. tr. S. Amer. and F. and H. peren. N. Amer. beautiful plants which grow best in peat soil, and are readily increased.

Rhinanthus, yellow-rattle, didyn. angios. and scrophularineæ, a H. an. which prefers a peat-soil, and a moist situation.

Rhipsalis, icosan. monog. and cacteæ, D. S. tr. W. Ind. and S. Amer. succulents of easy culture.

Rhodiola, rosé-root, diœc. octan. and sempervivеæ, a H. peren. Brit. of easy culture in dry soil.

Rhododendron, decan. monog. and rhodoraceæ, G. F. and H. tr. chiefly N. Amer. which prefer peat soil, and are increased by layers or seeds, 1689.

Ribes, the currant and gooseberry, pentan. monog. and cacteæ, H. tr. Eur. and N. Amer. of easy culture.

——— grossularia, the gooseberry, 1466.

——— nigrum, the black currant, 1470.

——— rubrum, the red currant, 1471.

——— spicatum, the acid or tree currant, 1480.

Richardia, hexan. monog. and rubiaceæ, a S. tr. Vera Cruz, which grows in loam and peat, and cuttings root in sand under a hand-glass.

Ricinus, palma christi, monœc. monad. and euphorbiaceæ, S. bien. and an. and G. tr. E. Ind. and Africa, of easy culture: the tr. species root from cuttings taken off at a joint, and planted under a hand-glass.

Ricotia, tetrad. silic. and cruciferеæ, a H. an. Egypt, of common culture, 1662.

Rivina, tetran. monog. and chenopodeæ, S. tr. W. Ind. which grow freely in light rich soil, and are readily increased by cuttings or seeds.

Rib-grass, plantago lanceolata.

Rice, — see Oryza.

Rivers, to improve in garden-scenery, 1984; to imitate their effects on plants in an aquarium, 1609.

Ring-fence, — see Kitchen-garden.

Rivenhall-place, a seat in Essex, 1963.

Rills, how to form or improve in garden-scenery, 1984.

Riding, a carriage-road or indicated path fit for horses and carriages, made for the display of the scenery of a residence, 2017.

Ribstone hall, Yorkshire, 2185.

Richmond-park, Surrey, 107; described, 2142.

Richmond-hill, Surrey, 2140.

Riviere, de la, and *Du Moulin*, their work on gardening, 2284. A. D. 1739.

Ridging, 803, — see Operations.

Roxburghshire, gardens of, 2221.

Ross-shire, gardens of, 2247.

Roxburgh-house, a seat in Ross-shire, 2247.

Rose, John, 107; his works on gardening, 2283. A.D. 1666.

Robertson, Mr. Duncan, his writings on gardening, 2283. A.D. 1815.

——— the Rev. J. M. his writings on gardening, 2283. A.D. 1821.

Rogers, Mr. Thomas, his writings on gardening, 2283. A.D. 1821.

Rodenhurst, T ——, his work on gardening, 2283. A.D. 1784.

Rocque, Bartholomew, his work on gardening, 2283. A.D. 1753.

Robinson, ——, his work on gardening, 2283. A.D. 1798.

Root-cellar, 710. — see Edifice.

Rosenburg, O —— F ——, his works on gardening, 2285. A.D. 1808.

Rössig, K. Glo. his works on gardening, 2285. A.D. 1807.

Rocholl, A ——, his works on gardening, 2285. A.D. 1803.

Römer, J. Jacques, his works on gardening, 2285. A.D. 1791.

Rode, ——, his works on gardening, 2285. A.D. 1788.

Roads, to form, 861.

Robinia, diadel. decan. and leguminoseæ, S. tr. E. and W. Ind. and H. tr. Siberia. The S. species grow in sandy loam, and are increased by seeds from India or young cuttings planted in sand under a bell-glass; the h. sorts grow freely in common soil, and are increased by layers or grafting on r. pseudo-acacia, or from seeds.

——— pseudacacia, the common acacia, 1925.

Roella, pentan. monog. and campanulaceæ, a G. tr. peren. and an. C. B. S. which grow in loam and peat, and are increased by seeds or young cuttings, under a hand-glass.

Rolandra, syngen. polyg. segr. and cynarocephaleæ, a S. tr. W. Ind. which thrives in light rich soil, and is readily increased by cuttings.

Rondeletia, pentan. monog. and rubiaceæ, G. tr. W. Ind. which grow in loam and peat, and cuttings root in sand under a hand-glass.

Rosa, rose, icos. polyg. and rosaceæ, G. Fr. and H. tr. China and Europe. The tender species grow in light rich soil, and cuttings root readily under a hand-glass; the H. sorts grow best in good rich soil, and are increased by layers or by budding or grafting, — see 1683; table of the most ornamental sorts, 1684; propagation, 1685; final situation, 1686; general culture, 1687; forcing, 1688; insects, 1688.

Rosmarinus, rosemary, dian. monog. and labiateæ, a G. tr. Chili and H. tr. Eur. of easy culture in dry, light soil, and increased by cuttings.

——— officinalis, the common rosemary, 1386.

Rothia, syngen. polyg. æqual. and cichoraceæ, a H. bien. and an. S. Eur. of common culture, 1660 and 1662.

Rottboellia, hard-grass, trian. digyn. and gramineæ, H. an. Eur. of the easiest culture.

Rottlera, diœc. icos. and .... a G. tr. E. Ind. which grow in loam and peat, and cuttings root in sand under a hand-glass.

Roxburghia, octan. monog. and salicareæ, a S. peren. E. Ind. a climber which grows in loam and peat, and may be increased, but not readily, by dividing at the root.

Royena, decan. dig. and ebenaceæ, G. tr. C. B. S. which thrive in loam and peat, and ripened cuttings root readily in sand, under a hand-glass.

Rocambole, allium scorodoprasum.

Rocket, — see Hesperis.

Rock rose, — see Cistus.

Rope grass, — see Restio.

Rose, — see Rosa.

Rose-acacia, robinia hispida.

Rose-campion, — see Agrostemma.

Rosemary, — see Rosmarinus.

Rose of Jericho, anastatica hierochuntica.

Rose root, — see Rhodiola.

Rough chervil, — see Anthriscus.

Roots of wild plants, edible, 1301. 1411.

Rock work, how to form and plant, 1671.

Rotation of crops, rationale of, 576; new opinions on, 577; in kitchen gardens, 1118.

Rotting ground in nurseries, 1876.

Rocks, as decorations of gardening, 781; natural rocks, how to operate on, in garden scenery, 1989.

Roller, 621, — see Implements.

Rolling, 811, — see Operations.

Roads, 862.

Roxb. cor. Plants of the coast of Coromondel, by Will. Roxburgh.

Royal gardener, 2069.

——— gardens, and their management, 211.

——— of Britain; at Carleton-house, Hampton-court, Kensington, and Pimlico, 2137; at Kew and Richmond, 2142; at Windsor and Frogmore, 2165; at Brighton, 2145.

Roche-Great-Court, Wiltshire, 2199.

Rotheras, a seat in Herefordshire, 2171.

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Rookery, a seat in Surrey, 2140.

Rook's-nest, a villa in Surrey, 2140.

Roslyn-house, Middlesex, 2134.

Roux, Augustin, his works on gardening, 2284. A.D. 1750.

Royer, Johann, his work on gardening, 2285. A.D. 164...

Roard, J. L. his tract on gardening, 2284. A.D. 1805.

Robin, C——, his works on gardening, 2284. A.D. 1801.

Rossignoll, l'Abbé de, his works on gardening, 2284. A.D. 1797.

Roulet, Jean Antoine, his work on gardening, 2285. A.D. 1817.

Rusborough, a seat in Wicklow, 2252.

Rutter, James, and Daniel *Carter*, their works on gardening, 2283. A.D. 1767.

Rudolphi, J. C——, his works on gardening, 2285. A.D. 1802.

Rubia, madder, tetran. monog. and rubiaceæ, G. tr. and H. peren. Europ. of easy culture in light rich soil.

Rubus, bramble, icos. polyg. and rosaceæ, a S. tr. and G. tr. E. Ind. and H. tr. Europ. and N. Amer.; the tender kinds thrive in rich light soil, and cuttings root under a hand-glass; the H. sp. are chiefly prickly trailers, which grow in any soil, and are increased by suckers or seeds, and some sorts by cuttings.

——— idæus, the raspberry, 1474; r. fruticosus, the common bramble, r. chamæmorus, the cloud-berry, r. arcticus, the crimson bramble, and r. cæsius, the dew-berry, 1480.

Rudbeckia, syngen. polyg. frustran. and corymbifereæ, F. and H. peren. and an. N. Amer. of easy culture.

Ruellia, didyn. angios. and acanthaceæ, S. tr. and G. peren. Ind. and Amer. pretty plants of easy culture in light rich soil.

Ruizia, monad. polyan. and malvaceæ, a S. tr. Bourb. which grows in loam and peat, and cuttings root in sand under a hand-glass.

Rumex, dock, hexan. trig. and polygoneæ, S. and G. tr. and peren. Afr. and H. peren. and an. Eur. of easy culture.

——— scutatus and acetosa, the garden-sorrels, 1334.

——— patientia, patience-dock, or spinach dock, 1335.

Ruppia, tetran. tetrag. and naiadeæ, a H. peren. Brit. a submarine aquatic, which should be grown in sand, kept moist, and occasionally strewed with salt.

Ruscus, butcher's broom, diœc. monad. and smilaceæ, a G. and H. tr. Eur. under shrubs, evergreens, which will grow in shady situations, and are increased by dividing at the root.

Russelia, didyn. angios. and scrophularineæ, a S. tr. S. Amer. a pretty plant which thrives in light rich soil, and cut-

tings root readily under a hand-glass in heat.
Russel-square, London, 2041.
Ruta, rue, decan. monog. and rutaceæ, G. and H. tr. and peren. Eur. and Afr. under-shrubs, evergreens which prefer light soil, and are readily increased by cuttings or seeds.
Rue, — see Ruta.
Rupture-wort, — see Herniaria.
Rush, — see Juncus.
Rushbroom, viminaria denudata.
Rush-nut, cyperus esculentus.
Rye, — see Secale.
Rye-grass, lolium perenne.
Ruins as objects in garden scenery, 782. and 1995.
Runners, to propagate by, 880.
Rum. Amb. Ge. Everh. Rumphii Herbarium Amboinense.
Rutlandshire, gardens and residences of, 2182.
Rushton-hall, Northamptonshire, 2183.
Rushbrook-hall, Suffolk, 2159.
Rudbeck, Olaus, 73; his work on gardening, 2288. A.D. 1664.
——————, filius, his works on gardening, A.D. 1686.

S.

Sabal, hexan. trig. and palmeæ, a S. peren. Florida, which grows in light sandy loam, and may be occasionally increased by suckers.
Sabbatia, pentan. monog. and gentianeæ, H. bien. N. Amer. of easy culture, 1660.
Saccharum, sugar-cane, trian. digy. and gramineæ, a S. peren. Ind. which grows in rich loam, and is increased by suckers or cuttings of the stem.
Sagina, pearlwort, tetran. tetrag. and caryophylleæ, H. an. Brit. of easy culture.
Sagittaria, arrow-head, monœc. polyan. and alismaceæ, S. and G. peren. China and Amer. and H. peren. Brit. and Amer. aquatics of easy culture.
———— sagittifolia, common arrow-head, 4111.
Sagus, sago-palm, monœc. hexan. and palmeæ, a S. tr. which requires a sandy loam and a strong moist heat.
Salicornia, glasswort, monan. monog. and chenopodeæ, a G. tr. Arabia, and a H. tr. peren. and an. Brit. succulent salt-marsh plants, which grow in rich light soil not over-watered.
———— herbacea, samphire, 1409.
Salisburia, monœc. polyan. and podocarpeæ, a H. tr. Japan, which grows in sheltered situations, in common garden soil, and is increased by layers.
Salix, willow, diœc. monan. and amentaceæ, a S. tr. E. Ind. and H. tr. Eur. and N. Amer. which grow mostly in moist soil, and are readily increased by cuttings.
Salix alba, the Huntington and other tree willows grown for timber, 1946.
—— viminalis, the common osier, and other basket and hoop willows, 1957.
St. Anne's hill, a seat in Surrey, 3140.
Sandon, a seat in Staffordshire, 2173.
Sandwell-park, Staffordshire, 2173.
Sandbeck, a seat in Yorkshire, 2186.
St. Laurence's-cottage, Hampshire, 2197.
Saltram, a seat in Devonshire, 2203.
Salton-hall, a seat in East Lothian, 113. 2219.
St. Mary's Isle, a seat in Kircudbrightshire, 2225.
Sang, Mr. Edward, his works on gardening, 2283. A.D. 1810.
Sanderson, Mr. William, his writings on gardening, 2283. A.D. 1814.
Sabine, Joseph, Esq. F.R.S. 132; his writings on gardening, 2283. A.D. 1816.
Salter, J——, his work on gardening, 2283. A.D. 1816.
Saxe Weimar, Charles Augustus, Grand Duke of, his paper on gardening, 2283. A.D. 1819.
Saint Etienne, Claude de, a French author on gardening, 2284. A.D. 1660.
Sausai, le Sieur de, a French writer on gardening, 2284. A.D. 1722.
Saint-Peravi, Guermeau de, his works on gardening, 2284. A.D. 1765.
Saint Simon, Marquis de, his works on gardening, 2284. A.D. 1768.
Samroff, Cp. L. his works on gardening, 2285. A.D. 1768.
Salzmann, F. Z. his works on gardening, 2285. A.D. 1781.
Saussure, Nicolas de, his works on gardening, 2285. A.D. 1775.
Sacconi, Agostino, his work on gardening, 2285. A.D. 1697.
Savi, Gætano, his work on gardening, 2286. A.D. 1811.
Sartorelli, G. B. his works on gardening, 2286. A.D. 1816.
Samboursky, ——, his poem on gardens, 2289. A.D. 1788.
Salsola, saltwort, pentan. dig. and chenopodeæ, a G. tr. S. Eur. and a H. peren. and an. Eur. and Afr. which may be treated like salicornia.
Salvia, sage, dian. monog. and labiateæ, S. and G. tr. and peren. and H. tr. peren. and an. all of easy culture in light sandy soil.
——— officinalis, the common sage, 1380.
——— sclarea, clary, 1381.
Sambucus, elder, pentan. trig. and caprifoleæ, H. tr. and a peren. Eur. and Amer. of easy culture, and increased by cuttings or seeds.
———— nigra, the common elder, as a fruit tree, 1465, and as a forest tree, 1934.
Somolus, brook-weed, pentan monog. and

primulaceæ, a G. peren. N. S. W. and H. peren. Brit. The first grows in loam and peat, and cuttings root under a hand-glass; the other prefers a moist situation, and is increased by dividing at the root.

Samyda, decan. monog. and homalineæ, S. tr. W. Ind. which grow, though shyly, in loam and peat, and cuttings root in sand, under a hand-glass.

Sanguinaria, puccoon, polyan. monog. and papaveraceæ, a H. peren. which grows best in light sandy soil, and increases by seeds, or offsets from the root.

Sanguisorba, great burnet, tetran. monog. and rosaceæ, H. peren. Brit. and Amer. of common culture.

Sanicula, sanicle, pentan. dig. and umbelliferæ, H. peren. Brit. and Amer. of easy culture.

Sanseviera, hexan. monog. and hemerocallideæ, S. peren. and a H. peren. E. Ind. and China, succulents increased by suckers.

Santalum, sandal-wood, tetran. monog. and santalaceæ, a S. tr. E. Ind. which grows in light loam, and cuttings root in sand, under a hand-glass.

Santolina, lavender-cotton, syngen. polyg. æqual. and corymbiferæ, H. tr. and per. Eur. which grow in common garden soil, and are readily increased by cuttings.

Sanvitalia, syngen. polyg. super. and corymbiferæ, a H. an. Mexico, of easy culture, 1662.

Sapindus, soapberry, octan. trig. and sapindiaceæ, a S. tr. and G. tr. Amer. which thrive well in loam and peat, and large cuttings root in sand, under a hand-glass.

Sapium, monœc. monad. and euphorbiaceæ, a S. tr. W. Ind. which grows in loam and peat, and cuttings root in sand, under a hand-glass.

Saponaria, soapwort, decan. digy. and caryophylleæ, H. peren. and an. Eur. of easy culture.

Sarcophyllum, diadel. decan. and leguminoseæ, a G. tr. C. B. S. a succulent which grows in loam and peat, not over watered, and cuttings root readily in sand, under a bell-glass.

Sarcostemma, pentan. dig. and asclepiadeæ, a S. tr. E. Ind. a climber which grows in loam and peat, and cuttings root in sand, under a hand-glass.

Sarracenia, side-saddle flower, polyan. monog. and ...., F. peren. N. Amer. which grow in pots, with turfy peat at the bottom, and the upper part filled with sphagnum, in which the plants must be set, and then placed in pans of water in a shady situation.

Sacred bean, — see Nelumbium.

Satureja, savory, didyn. gymnos. and labiateæ, a S. tr. G. tr. and H. peren. and an. Eur. and N. Amer. of easy culture.

Satureja montana and hortensis, winter and summer garden savory, 1384.

Satyrium, gynan. monan. and orchideæ, G. peren. S. Eur. which grow in sandy loam and peat, with little water, when not in a growing state, and are increased by seeds.

Saururus, lizard's tail, heptan. tetrag. and naiadeæ, a H. peren. an aquatic increased by parting at the root.

Saxifraga, saxifrage, decan. dig. and saxifrageæ, F. and H. peren. and an. Eur. and N. Amer. chiefly alpines, and well adapted for rock-work; but some, as S. nivalis, hirculus, &c. are marsh plants; all are of easy culture.

——— crassifolia, as a tea plant, 1414.

Sage, — see Salvia.

Sago-palm, sagus rumphii.

St. Andrew's cross, ascyrum crux Andreæ.

Saintfoin, — see Hedysarum.

St. John's wort, — see Hypericum.

St. Peter's wort, symphoria glomerata.

Salt-tree, robinia halodendron.

Salt-wort, — see Salsola.

Salsify, — see Tragopogon.

Samphire, — see Crithmum and Inula.

Sandal-wood, santalum album.

Sandbox-tree, — see Hura.

Sand-wort, — see Arenaria.

Sanicula, — see Sanicule.

Sassafras-tree, laurus sassafras.

Savannna-flower, echites suberecta.

Savin, juniperus sabina.

Savory, — see satureja.

Saw-wort, — see serratula.

Saxifrage, — see Saxifraga.

Salads, from wild plants, 1413.

Sallows, 1729, — see Salix.

Salisbury, Richard Anthony, Esq. F. R. S. 122; his writings on gardening, 2283. A.D. 1791.

Salisbury, William, his writings on gardening, 2283. A.D. 1797.

Salisbury-craig, a hill at Edinburgh, 2039.

Sans souci, a royal palace at Potsdam, 62.

Saltzmann, Mr. gardener to the King of Prussia, 65.

Salt, as a manure, 414.

Sam, Samouelles Entomologist's Useful Companion.

Salad-plants, — see Acetarious Plants.

Small salads, 1368; to force, 1287.

Saughton-hall, near Edinburgh, 113.

Saw, 617, — see Implements.

Sawing, 813, — see Operations.

Sabb. hort. Sabbati, (liberatus,) Hortus romanus.

Scabiosa, scabious, tetran. monog. and dipsaceæ, G. tr. C. B. S. and H. peren. and an. Eur. all of easy culture in common light soil.

Scævola, pentan. monog. and goodenoveæ, a S. tr. and G. tr. and peren. W. Ind. and Austral. which grow freely in loam and peat, and cuttings root readily under a hand-glass.

Scandix, cicely, pentan. dig. and umbelliferese, H. an. Eur. and Persia, of easy culture, 1662.

Schæfferia, diœc. tetran. and ...., a S. tr. W. Ind. which grows in loam and peat, and may be increased by layers or cuttings in sand under a bell-glass.

Scheuchzeria, hexan. trig. and alismaceæ, a H. peren. Engl. a marsh-plant increased by seeds.

Schinus, diœc. decan. and terebintaceæ, G. tr. and a H. tr. S. Amer. which grow in loam and peat, and ripened cuttings, with their leaves not shortened, will root freely in sand under a hand-glass.

Schisandra, monœc. pentan. and menispermeæ, a G. tr. N. Amer. a climber which grows in sandy peat and loam, and ripened cuttings root in sand under a bell-glass.

Schkuhria, syngen. polyg. super. and corymbifereæ, a H. an. Mex. of common culture, 1662.

Schœnus, bog-rush, trian. monog. and cyperaceæ, H. peren. Brit. of the easiest culture in marshy ground.

Schotia, decan. monog. and leguminoseæ, S. tr. C. B. S. which grow in loam and peat, and cuttings in pots of sand plunged in mould (not in tan) under a hand glass, will soon strike root.

Schrankia, polyg. monœc. and leguminoseæ, a S. peren. and G. peren. N. and S. Amer. which grow in loam and peat, and cuttings will root in sand under a bell-glass.

Schwenkia, dian. monog. and scrophularineæ, a S. bien. Guinea, of easy culture.

Scilla, squill. hexan. monog. and asphodeleæ, a G. peren. and H. peren. Eur. and C. B. S. bulbs of easy culture.

Scirpus, clubrush, trian. monog. and cyperaceæ, a S. peren. E. Ind. and H. peren. Brit. marsh-grasses, of easy culture.

Scirpus tuberosus, the rush-nut, 1542.

Scleranthus, knawel, decan. dig. and portulaceæ, a H. peren. and an. Brit. which grow best in light sandy soil, and are easily propagated.

Sclerocarpus, syngen. polyg. frust. and corymbifereæ, a G. an. Guinea, of common culture.

Sclerothamnus, decan. monog. and leguminoseæ, a G. tr. N. Holl. which grows in sandy loam and peat, and young cuttings root in sand under a bell-glass.

Scleroxylon, pentan. monog. and sapoteæ, a G. tr. C. B. S. which grows in loam and peat, and ripened cuttings root in sand under a hand-glass.

Scolopendrium, hart's tongue, cryptog. filices, and filiceæ, H. peren. Brit. of easy culture in peat earth in the shade, or in pots.

Scolymus, golden thistle, syngen. polyg. æqual. and cichoraceæ, a F. bien. and H. peren. and an. Eur. As. and Afr. of easy culture.

Scoparia, tetran. monog. and scrophularineæ, a S. an. Jamaica, of common culture.

Scopolia, pentan. monog. and thymeleæ, a S. tr. E. Ind. which grows in loam and peat, and cuttings root in sand under a hand-glass.

Scorpiurus, caterpillar, diadelph. decan. and leguminoseæ, H. an. S. Eur. of common culture.

Scorzonera, viper's grass, syngen. polyg. æqual. and cichoraceæ, H. peren. and bien. Eur. of common culture.

——— hispanica, the garden viper's grass, 1327.

Scottia, diadel. decand. and leguminoseæ, a G. tr. N. Holl. which thrives in loam and peat, and young cuttings taken off at a joint, root in sand under a bell-glass.

Scrophularia, fig-wort, didyn, angios. and scrophularineæ, G. bien. and an. and F. and H. peren. Europ. and Amer. of easy culture.

Scutellaria, scull-cap, didyn. gymnos. and labiateæ, a S. peren. and G. tr. W. Ind. and Crete, and H. peren. Eur. of common culture.

Scabious, — see Scabiosa.

Scammony, — see Convolvulus scammonia.

Scorpion grass, — see Myosotis.

Scorpion-senna, coronilla emerus.

Screw-pine, — see Pandanus.

Screw-tree, — see Helicteres.

Schabol, Jean-Roger, his works on gardening, 2284. A. D. 1767.

Schiller, I. K. his works on gardening, 2285. A. D. 1795.

Schmahling, L. C. his works on gardening, 2285. A. D. 1786.

Schmutzer, ——, his works on gardening, 2285. A. D. 1785.

Schmidt, I. C. E. his works on gardening, 2285. A. D. 1776.

Schæffer, I. C. his works on gardening, 2285, A. D. 17 .

Schmersall, I. F. his works on gardening, 2285. A. D. 1761.

Schreiber, I. C. his work on gardening, 2285. A. D. 1820.

Schmidt, Christian Francis, his work on gardening, 2288. A. D. 178...

Scunk-weed, pothos fœtida.

Scurvy-grass, — see Cochlearia.

Scrivelsby, a seat in Lincolnshire, 1762.

Scone-palace, Perthshire, 2236.

Sceaux, gardens of, near Paris. 50.

Schwobber, gardens of, in Hanover, 61. 75.

Schoenbrunn, (fine brook, or well,) gardens of, at Vienna, 69, 70.

Screen plantations, 1110.

Sculptures, 786.

Scions for grafting, (scion, *Fr.*) 906.

Schk. Hand. Botanisches Handbuch. Von Christ. Schkuhr.

Scotland, gardens and residences of, 2217.
Scougal, Mr. James, his writings on gardening, 2283. A.D. 1812.
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Screens for shelter, — see Structures.
Sculptures in gardening, — see Edifices. 786,
Screens for sifting earth, 620, — see Utensils.
Scythe, different sorts used in gardening, 617. 621.
Scares, for birds and vermin, used in gardening, 622.
Sebæa, tetran. monog. and gentianeæ, a H. an. C.B.S. of common culture.
Secale, rye, trian. dig. and gramineæ, a H. bien. and an. of easy culture.
Secamone, pentan. dig. and asclepiadeæ, a S. and G. tr. Egypt and Ind. which grow in loam and peat, and cuttings root freely in sand under a hand-glass.
Securidaca, diadel. octan. and leguminoseæ, a S. tr. W. Ind. a climber which grows in loam and peat, and cuttings root in sand under a bell-glass.
Securinega, otaheite myrtle, diœc. pentan. and euphorbiaceæ, a S. tr. which flowers freely in loam and peat, and cuttings root readily in sand under a hand-glass.
Sedum, stone-crop, decan. pentag. and semperviveæ, G. and F. tr. Madeira, and H. peren. bien. and an. Eur. and N. Amer. mostly succulents, which answer well in pots or in rockwort, and are readily increased by cuttings or dividing the plant.
—— telephium, the true orpine, 1413.
Seed room, 708, — see Edifices.
Selago, didyn. gymnos. and verbenaceæ, G. tr. C.B.S. which grow in loam and peat, and cuttings root freely in the same soil under a hand-glass.
Selinum, milk-parsley, pentan. dig. and umbelliferæ, H. peren. and an. Eur. of easy culture, and increased by dividing at the root or seeds.
Selkirkshire, as to gardening, 2222.
Sempervivum, houseleek, dodec. dodecag. and semperviveæ, G. tr. H. peren. and an. Asia, C.B.S. and Eur. succulents, which answer well treated as sedum.
Senacia, pentan. monog. and rhamneæ, a S. tr. Bomb. which requires the same treatment as celastrus.
Senecio, groundsel, syngen. polyg. super. and corymbiferæ, a S. peren. G. tr. and bien. C. B. S. and H. peren. bien. and an. Eur. which grow in light soil, and are easily increased by the ordinary means.
Septas, heptan. heptag. and semperviveæ, G. peren. C. B. S. succulents which grow in loam and peat, require little water when not in a growing state, and are increased by dividing at the roots.
Serapias, gynan. monan. and orchideæ, G. peren. S. Eur. which thrive in loam and peat, and are increased by dividing at the root or by seeds.
Seriana, octan. trig. and sapindeæ, S. tr. S. Amer. which thrive in sandy loam, and cuttings root in sand under a hand-glass.
Seriola, syngen. polyg. æqual. and chichoraceæ, H. peren. S. Eur. of easy culture.
Serissa, pentan. monog. and rubiaceæ, a G. tr. Japan, which grows in loam and peat, and cuttings root freely under a hand-glass in sand.
Serpicula, monœc. tetran. and onagrareæ, a G. peren. C. B. S. a creeper, which grows in loam and peat, and cuttings root freely under a hand-glass in sand.
Serratula, saw-wort, syngen. polyg. æqual. and cynarocephaleæ, H. peren. Eur. of common culture.
Serruria, tetran. monog. and proteaceæ, G. tr. and a H. tr. C. B. S. free flowerers, which require the same treatment as protea.
Sersalisia, pentan. monog. and sapoteæ, a G. tr. N. Holl. which grows in sandy loam and peat, and cuttings root readily in sand under a hand-glass.
Sesamum, oily grain, didyn. angios. and bignoniaceæ, S. an. of easy culture.
Sesbana, diadel. decan. and leguminoseæ, a S. tr. bien. and an. E. Ind. of common culture. The S. species is a beautiful plant.
Seseli, meadow-saxifrage, pentan. dig. and umbelliferæ, H. peren. bien. and an. Eur. and N. Amer. of easy culture.
Sesleria, trian. monog. and gramineæ, H. peren. Eur. of easy culture.
Sesuvium, icos. di-pentag. and ficoideæ, S. peren. and an. W. Ind. and S. Amer. succulents which grow in loam and peat, and are easily propagated.
Sea-buckthorn, — see Hippophae.
Sea-heath, — see Frankenia.
Sea-holly, eryngium maritimum.
Sea-cale, crambe maritima.
Sea-lavender, — see Statice.
Sea-parsnip, — see Echinophora.
Sea-rocket, cakile maritima.
Sea-side grape, — see Coccoloba.
——— laurel, phyllanthus latifolius.
——— oat, — see Uniola.
Self-heal, — see Prunella.
Sensitive plant, mimosa sensitiva.
Septfoil, — see Tormentilla.
Service-tree, — see Pyrus.
Sedi, Le Sieur de, a nurseryman at Lyons, 57. 59.
Seats, as garden decorations, 769, — see Edifices.
Seed gardens, their formation, 2051; management, 2112.
Seed gardeners, 2072.
Seed merchants or seedsmen, 2073.
Seeds, physiology of, 320. 403; duration of the vegetative principle in common

garden seeds, 2120; management of the seed department in the nursery business, 2120.

Seed market, in Mark-lane, London, 2131.

Selwood-park, Berkshire, 2164.

Sedmere, a seat in Yorkshire, 2185.

Seton, Alexander, Esq. his writings on gardening, 2283. A.D. 1817.

Sepulchral structures, as garden buildings, 757.

Seidel, C——, F——, his works on gardening, 2285. A.D. 1786.

Seligmann, J. M. his works on gardening, 2285. A.D. 1750.

Sereau, J. B. E. B. his works on gardening, 2284. A.D. 181...

Sherardia, field-madder, tetran. monog. and rubiaceæ, H. an. Brit. of common culture, 1662.

Shallot, allium ascalonicum.

Sheep's beard, — see Arnopogon.

——— scabious — see Jasione.

Shepherd's purse, thlaspi bursa pastoris.

———— club, verbascum thapsus.

Shield-fern; — see Aspidium.

Shore-weed, littorella lacustris.

Shrubby trefoil, ptelea trifoliata.

Shrubbery, forming the, 1580; situation, 1581. 2013; soil, 1582; walks, 1583; fence, 1584; reserve ground, 1585.

————, planting of, 1586; in the mingled manner, 1587; select manner, 1588; systematic manner, 1589; general practice, 1590; fruit-trees in shrubberies, 1591; decorations, 1592.

————, its culture and management, 1607; times of planting and sowing, 1609; pruning, training, thinning, and dressing, 1610; grass plats, 1611; protecting, 1612; water, 1613; insects, 1614.

Shrubs, ornamental, 1682; select, 1682; deciduous, 1692; evergreen, 1693; climbing, 1694; selection for particular purposes, 1694; for concealing vertical and horizontal defects, 1695; of rapid and bulky growth, 1696; which thrive under the shade and drip of trees, 1697; for margins of water, 1698; rocks, 1699; edgings and hedges, 1700; highly odoriferous, 1701; ornamental by their fruit as well as flowers, 1702; for botanical or economical purposes, 1703; for shrubberies of limited extent, 1704.

———, their uses in landscape gardening, 1796.

Shobden-court, Herefordshire, 1251.

Shepherd of Banbury, 610.

Shenston, William, 51. 109; his writings on gardening, 2283. A.D. 1764.

Shelter, 998; in arboriculture.

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Sherwood-lodge, Surrey, 2140.

Shrub-hill, Surrey, 2140.

Sheffield-place, Sussex, 2142.

Short-grove, Essex, 2151.

Shardeloes, a seat in Buckingshamshire, 2154.

Sherbourne-castle, Oxfordshire, 2162.

Sherborne-house, Gloucestershire, 2168.

Shugborough-house, Staffordshire, 2173.

Shobden-court, Herefordshire, 2171.

Shipley, a seat in Derbyshire, 2177.

Shincliffe-hall, Durham, 2187.

Sherborne-castle, Dorsetshire, 2201.

Shaw-park, a seat in Clackmannanshire, 2233.

Shanbally, a seat in Tipperary, 2265.

Sharrock, Robert, LL.D. his works on gardening, 2283. A.D. 1660.

Shaw, James, his work on gardening, 2283. A.D. 1794.

——, William, his work on gardening, 2283. A.D. 1807.

Shepherd, John, his work on gardening, 2283. A.D. 1808.

Sherrief, John, Esq. his writings on gardening, 2283. A.D. 1810.

Shirbrook, ——, Esq. his writings on gardening, 2283. A.D. 1815.

Shovel, 606, — see Implements.

Shears, garden, different sorts of, 617.

Shewhing, or shoughing, a Scotch term for the operation of earthing in or laying in plants, by the heels, or for temporary purposes.

Shrotter, J. Sm. his works on gardening, 2285. A.D. 1802.

Shovelling, 798.

Shifting, the transplanting of plants in pots, different methods of performing, 948 and 949.

Sibbaldia, pentan. pentag. and rosaceæ, H. peren. Eur. Alpines, which grow in loam and peat, and may be increased by cuttings, under a hand-glass.

Sibthorpia, didyn. angios. and scrophularineæ, a H. peren. Eng. which grows well in peat and loam, in rockwork or in pots, and is increased by dividing at the root.

Sicyos, single-seeded cucumber, monœc. monad. and cucurbitaceæ, a H. an. Amer. of common culture.

Sida, monad. polyan. and malvaceæ, S. and G. tr. bien. and an. E. and W. Ind. C. B. S. and S. Amer. which flower freely in rich light soil, and are readily increased by seeds; or cuttings will root in sand under a hand-glass.

Sideritis, ironwort, didyn. gymnos. and labiateæ, G. and F. tr. peren. and an. S. Eur. and E. Ind. which grow freely in rich light soil, and are readily increased by cuttings.

Siderodendrum, iron-tree, tetran. monog. and rubiaceæ, a S. tr. W. Ind. which grows in loam and peat, and cuttings root in sand under a hand-glass,

Sideroxylon, iron-wood, pentan. monog. and sapoteæ, a G. tr. C. B. S. which thrives in loam and peat, and cuttings, a little ripened, root in sand under a hand-glass.

Siegesbeckia, syngen. polyg. frustan. and corymbifereæ, H. an. India and Peru, of common culture, 1662.

Silene, catchfly, decan. trig. and caryophylleæ, G. bien. and H. peren. bien. and an. a numerous genus, which thrive in light soil, suit well for rock-work or pots, and are readily increased by division, seeds, or cuttings.

Silene inflata, the bladder catchfly, 1350.

Sickler, T. Volkman, his works on gardening, 2285. A. D. 1794.

Sickler, Francis Karl Ludwig, his works on gardening, 2285. A. D. 1802.

Siemssen, A. C. his work on gardening, 2285. A. D. 1797.

Segelsteiner, George, his works on gardening, 2285. A. D. 1702.

Silva, Sigismondo, his work on gardening, 2286. A. D. 1803.

Silphium, syngen. polyg. necess. and corymbifereæ, H. peren. N. Amer. robust, unsightly plants, easily increased.

Sinapis, mustard, tetrad. siliq. and cruciferæ, a G. tr. and a H. peren. bien. and an. Eur. and E. Ind. of easy culture.

——— arvensis, field-mustard, 1410.

Sison, honewort, pentan. dig. and umbelliferæ, H. peren. and an. Brit. and Siber. of easy culture.

Sisymbrium, tetrad. siliq. and cruciferæ, a G. tr. Canaries, and H. peren. bien. and an. Eur., which grow in any soil, but most of them prefer a moist situation: S. tenuifolium, however, grows on old walls.

——— officinale, common water-cress, 1410.

Sium, water-parsnip, pentan. dig. and umbelliferæ, H. peren. Eur. and China, chiefly aquatics.

——— sisarum, the skirret, 1326.

Side-saddle flower, — see Sarracenia.

Silk cotton tree, — see Bombax.

Silver-tree, leucadendron argenteum.

Single-seeded cucumber, sicyos angulata.

Sion-house, Middlesex, 118. 120.

Site, (situs, *Lat.*) the situation or ground on which a building, garden, or other object stands, 1110.

Simplicists, — see Physic Gardeners.

Sinclair, Sir John, his writings on gardening, 2283. A. D. 1813.

Sieve, garden, — see Utensils.

Sion, — see Scion.

Sion-hill, a seat in Middlesex, 2135.

Sion-house, Middlesex, 2136.

Sinclair, Mr. George, his writings on gardening, 2283. A. D. 1814.

Simson, the Rev. John, his writings on gardening, 2283. A. D. 1815.

Siegel, ——, his works on gardening, 2284. A. D. 1802.

Skirret, sium sisarum.

Skull-cap, — see Scutellaria.

Skelton-castle, Yorkshire, 2186.

Skibo, a seat in Sutherlandshire, 2246.

Silverlock, Mr. Henry, his writings on gardening, 2283. A. D. 1820.

Sloanea, polyan. monog. and tiliaceæ, a S. tr. S. Amer. which thrives in loam and peat, and cuttings may be rooted in sand under a hand-glass.

Slipperwort, — see Calceolaria.

Slopes, a shrubbery at Windsor, 1592.

Slip, a stripe of ground, 1091.

Sluices, their form and situation, 856.

Slo. jam. / Slo. hist. { A voyage to the islands Madeira, Barbadoes, Nieves, St. Christopher's, and Jamaica; with the natural history of the last of those islands. By Hans Sloane.

Sloane-square, London, 2041.

Slaines-castle, a seat in Aberdeenshire, 2239.

Slaine-castle, a seat in Eastmeath, 2259.

Sligo, county of, as to gardening, 2273.

Slips, to propagate by, 878.

Slug, — see Limax.

Smilacina, hexan. monog. and smilaceæ, H. peren. N. Amer. which succeed best in light sandy soil, and are increased by dividing the root.

Smilax, diœc. hexan. and smilaceæ, G. and F. tr. and peren. which grow freely in loam and peat on rich light soil, and are increased by dividing at the root, and the woody kinds also by cuttings.

Smithia, diadel. decan. and leguminoseæ, a S. an. E. Ind. of easy culture.

Smyrnium, alexanders, pentan. dig. and umbelliferæ, H. peren. and a bien. Eur. and N. Amer. of easy culture.

——— olusatrum, the garden alexanders or alisanders, 1348.

Smith, Sir James Edward, M.D. F.R.S. 193; his writings on gardening, 2283. A.D. 1792.

Smut, — see Ustilago.

Smith, Mr. James, of Keith-hall, his writings on gardening, 2283. A. D. 1810.

——— Mr. James, of Ormiston-hall, his writings on gardening, 2283. A. D. 1810.

Small, Mr. Joseph, his writings on gardening, 2288. A. D. 1813.

Smith, Mr. James, of Glasgow, his writings on gardening, 2283. A. D. 1813.

Snail, — see Helix.

Snake's-beard, ophiopogon japonicus.

Snake's-tongue, lygodium scandens.

Snake-wood, cecropia peltata.

Snap-dragon, antirrhinum majus.

Snap-tree, justicia hyssopifolia.

Sneeze-wort, achillea ptarmica.

Snowberry, chiococca racemosa.

Snow-drop, galanthus nivalis.

Snow-flake, — see Leucojum.
Snow, 605.
Snow, T. his works on gardening, 2283. A.D. 1715.
Solandra, pentan. monog. and solaneaceæ, S. tr. Jamaica, free-growing plants, which, when it is intended they should flower, must be put in a state of rest by withholding water till their leaves drop. Cuttings root easily.
Solanum, nightshade, pentan. monog. and solaneæ, S. and G. tr. peren. and an. and H. peren. and an. all of easy culture, in light rich soil.
——— tuberosum, the potatoe, 1315; to force the potatoe, 1283.
——— lycopersicum, the love-apple, 1404.
——— melongena, the egg-plant, 1405.
Soldanella, pentan. monog. and primulaceæ, H. peren. Germ. alpines. pretty little plants, which grow well in rock-work or in pots, in two-thirds peat and one-third sandy loam; they are increased by parting the root.
Solidago, golden rod, syngen. polyg. super. and corymbiferæ, H. peren. N. Amer. and Eur. large cumbersome plants of the easiest culture.
Sonchus, sow-thistle, syngen. polyg. æqual. and cichoraceæ, G. tr. and H. peren. Madeira, N. Amer. and Eur. of easy culture.
——— oleraceus, the common sow-thistle, 1410.
Sophora, decan. monog. and leguminoseæ, a S. tr. India, H. tr. Japan, and H. peren. Eur.; the tender species thrive well in light loam, and cuttings root in sand under a hand-glass; the hardy herbs require a rich loam, and are increased by seeds or dividing at the root.
Sorghum, polyg. monœc. and gramineæ, a S. bien. and H. peren. and an. As. and Eur. of easy culture.
Sorocephalus, tetran. monog. and proteaceæ, G. tr. C. B. S. which require to be treated as protea.
Sowerbæa, hexan. monog. and asphodeleæ, a G. peren. N. S. W. which thrives in peat soil with plenty of water, and is increased by dividing at the root.
Somersetshire, gardens and residences of, 2202.
Soft-wooded timber-trees, 1937.
South-lodge, Middlesex, 2134.
Southgate-grove, Middlesex, 2134.
Southam-house, Gloucestershire, 2168.
Society of gardeners, their work on gardening, 2283. A.D. 1730.
Sowerby, James, F.L.S. his works on gar- 2283. A.D. 1789.
Society of Practical Gardeners, their works on gardening, 2283. A.D. 1802.
Sonnini, C. S. his works on gardening, 2284. A.D. 1804.
Sod, a turf, or thin layer of earth, covered with grasses, taken from a lawn or pasture with a spade.
Sowing, different modes of performing the operation, 923 to 925.
Soderini, G. and Bernardo *Davazati*, their work on gardening, 2286. A.D. 1622.
Soderini, G. his works on gardening, 2286. A.D. 1811.
Somerfeldt, Christian, his work on gardening, 2288. A.D. 178 .
Soap-berry, — see Sapindus.
Soap-wort, — see Saponaria.
Soft-grass, — see Holcus.
Soldier-wood, inga purpurea.
Solomon's-seal, — see Polygonatum.
Sorrel, — see Rumex.
Sour-gourd, adansonia digitata.
Southern-wood, artemisia abrotanum.
South-sea tea, ilex vomitoria.
Sow-thistle, sonchus.
Sophiowski, a fine seat in Podolia, now much neglected, 84.
Soil, 509. 548. 633; mixed soils, 510; aquatic soils, 511; earthy soils, 572; vegetable soils, 513.
Soils, their nomenclature and classification, 549; calcareous, argillaceous, silicious, ferruginous, aquatic, peaty, saline, 549; uses of soil to vegetables, 556; improvement of soils, 563; by pulverization, 564; aeration, 565; alteration, 566; removal of superabundant ingredients, 567; incineration, 568; changing the condition of lands as to water, 569; draining, 569; embanking, 570; subterraneous irrigation, 571; irrigation, 573; changing the condition of lands in respect to atmospherical influence, 574; solar influence, 574; shelter, 575; rotation of crops, 576; Sir H. Davy's opinion, 576; Grisenthwaite's opinion, 577.
Soils, as indicated by spontaneous vegetables growing on them, 550.
Spananthe, pentan. dig. and umbelliferæ, a S. bien. Caraccas, of easy culture.
Sparaxis, trian. monog. and irideæ, G. peren. C. B. S. bulbs which require the same treatment as ixia.
Sparganium, bur-reed, monœc. trian. and aroideæ, H. peren. Brit. marsh plants, of easy culture, 1670.
Sparrmannia, polyan. monog. and tiliaceæ, a G. tr. C. B. S. which grows in loam and peat, and cuttings root readily under a hand-glass.
Spartium, broom, diadel. decan. and leguminoseæ, G. and H. tr. Eur. and Afr. which thrive in loam and peat, and are readily increased by seeds, or by young cuttings in sand, under a bell-glass.
Spatalla, tetran. monog. and proteaceæ, G. tr. C. B. S. which require the same treatment as protea.
Spathelia, pentan. trig. and terebintaceæ, a S. tr. Jamaica, which thrives in light

loam, and cuttings root readily under a hand-glass.

Spergula, spurrey, decan. pentag. and caryophylleæ, H. peren. and an. of easy culture in soft moist soil.

Spermacoce, button-weed, tetran. monog. and rubiaceæ, a S. tr. peren. and bien. As. and Afr. which grow freely in loam and peat, and are increased by cuttings, under a hand-glass, or seeds.

Sphæranthus, syngen. polyg. segreg. and cynarocephaleæ, a S. peren. E. Ind. and G. an. C. B. S. of easy culture.

Sphærolobium, decan. monog. and leguminoseæ, G. tr. N. Holl. pretty plants, which grow in sandy loam and peat, and young cuttings root readily in sand under a bell-glass.

Sphenogyne, syngen. polyg. frustran. and corymbifereæ, G. tr. and a H. an. C. B. S. which thrives well in light rich soil, and cuttings, in the shade, under a hand-glass, root freely.

Spielmannia, didyn. angios. and verbenaceæ, a G. tr. C. B. S. which may be treated as sphenogyne.

Spigelia, worm-grass, pentan. monog. and gentianeæ, a S. an. W. Ind. and H. peren. Amer. which are best grown in loam and peat, and are readily increased by cuttings.

Spilanthes, syngen. polyg. æqual. and corymbifereæ, a S. peren. bien. and an. E. Ind. and S. Amer. which grow in rich light soil, and are readily increased either by seeds or cuttings.

Spinacia oleracea, the common spinage, 1330.

Spiræa, icos. di-pentag. and rosaceæ, H. tr. and peren. Eur. and N. Amer. all of easy culture.

——— filipendula, drop-wort, 146.

Spondias, hog-plum, decan. pentag. and terebintaceæ, S. tr. W. Ind. which grow freely in loam and peat, and large cuttings root in sand under a hand-glass.

Sporobolus, trian. dig. and gramineæ, a H. an. India, of the easiest culture.

Sprengelia, pentan. monog. and epacrideæ, a G. tr. N. S. W. which thrives in sandy peat, with the pots well drained, and kept rather in a shady aspect; young cuttings root in sand under a bell-glass.

Spanish-elm, cordia geraschanthus.

Spanish nut, moræa sisyrinchium.

Sparrow wort, — see Passerina.

Speedwell, — see Veronica.

Spiderwort, — see Tradescantia.

Spignell, — see Athamanta.

Spike-rush, — see Eleocharis.

Spinage, spinacia oleracea.

Spindle-tree, — see Euonymus.

Spleenwort, — see Asplenium.

Spring-grass, — see Anthoxanthum.

Spurge, — see Euphorbia.

Sponge-tree, mimosa farnesiana.

Spurrey, — see Spergula.

Sphinx-elpenor, the elephant hawk moth, 1613.

Spinaceous plants, 1301, 1330.

Spikenard, valeriana satamansi. V. celtica and officinalis, may be used as substitutes for those who prefer this sort of perfume.

Speechly, Mr. William, 130. his works on gardening, 2283. A. D. 1779.

Spade, spit or spitter, (spada, *Lat.* and *Sax.* spade, *Dan.*) an implement for penetrating and breaking up the soil, 616, — see Implements.

Shropshire, gardens and residences of, 2172.

Spring Grove, Middlesex, 2134.

Spofforth, a residence near Wetherby, Yorkshire, 2185.

Spratsborough-hall, Yorkshire, 2185.

Spring-garden, a seat in Galway, 2270.

Speirs, Colonel, his writings on gardening, 2283. A. D. 1814.

Sprengel, Kurt, his Gazette of Gardening, 2285. A. D. 1804.

Spitz, A. C., his work on gardening, 2285. A. D. 1798.

Spider, red, — see Acarus.

Spardoni, Paulo, his work on gardening, 2286. A. D. 1810.

Squash, cucurbito melopepo.

Squill, — see Scilla.

Squares, public, laid out as gardens, 2041. Russel square, Sloane-square, Edward's-square, &c. 2041.

Stackpool-Court, a seat in Pembrokeshire, 2212.

Strahan, Mr. Charles, his writings on gardening, 2283. A. D. 1819.

Staavia, pentan. monog. and rhamneæ, G. tr. C. B. S. which thrive in sandy peat, and young cuttings root in sand under a bell-glass.

Stachys, hedge-nettle, didyn. gymnos. and labiateæ, a G. tr. and peren. S. Amer. and C. B. S. and H. peren. and an. Eur. of the easiest culture.

Stachytarpheta, bastard vervain, dian. monog. and verbenaceæ, S. tr. bien. and an. and a G. bien. W. Ind. and S. Amer. pretty plants, which thrive in rich light soil, and cuttings root readily under a hand-glass in heat.

Stæhelina, syngen. polyg. æqual. and cynarocephaleæ, G. tr. and a H. tr. S. Eur. which grow in rich light soil, and cuttings root freely under a hand-glass.

Stapelia, pentan. dig. and asclepiadeæ, D. S. tr. C. B. S. succulents which grow in sandy loam and old lime, with brick rubbish, with little water. In light rich soil they grow more luxuriantly, but are very apt to damp off if they happen to get too much water; they are readily increased by cuttings, and some by suckers.

Staphylea, bladder-nut, pentan. trig. and rhamneæ, H. tr. which grow in any soil,

and are readily increased by seeds or layers.

Starkea, syngen. polyg. super. and corymbifereæ, a S. peren. Jamaica, which thrives in rich light soil, and cuttings root readily under a hand-glass.

Statice, sea-lavender, pentan. pentag. and plumbagineæ, G. tr. and peren. C. B. S. and S. Eur. F. and H. peren. Afr. and Eur. The tender kinds grow in sandy loam and peat, the others in light soil, and all are increased by dividing the root, or by seeds.

Stauracanthus, diadel. decan. and leguminoseæ, a F. tr. Portugal, which grows in loam and peat, and is increased by seeds or young cuttings in sand under a bell-glass.

Stelis, gynan. monan. and orchideæ, S. peren. W. Ind. a parasite which may be treated as aërides, and increased by dividing at the root.

Stellaria, stitch-wort, decan. trig. and caryophylleæ, H. peren. and an. Eur. of easy culture in sandy soil.

Stellera, octan. dig. and thymeleæ, a H. tr. S. Eur. which grows in light soil, and may be increased by cuttings under a hand-glass or by layers.

Stemodia, didyn. angios. and scrophularineæ, a S. peren. S. Amer. which thrives in light rich soil, and cuttings root freely under a hand-glass in heat.

Stenanthera, pentan. monog. and epacrideæ, a G. tr. N. S. W. a beautiful plant which grows in loam and peat well drained, and young cuttings root in sand under a bell-glass.

Stenochilus, didyn. angios. and myoporineæ, a G. tr. N. Holl. which grows in loam and peat, and cuttings root freely in sand under a bell-glass.

Sterculia, monœc. monad. and sterculiaceæ, S. tr. and a G. tr. E. and W. Ind. which thrive in loam and peat, and ripened cuttings, not deprived of their leaves, root readily in sand under a hand-glass in moist heat.

Stevia, syngen. polyg. æqual. and corymbiferеæ, a F. peren. H. peren. and an. Mexico, which answer best in loam and peat, in pots, and cuttings root readily under a hand-glass.

Stilago, diœc. trian. and terebintaceæ, S. tr. E. Ind. which grow in loamy soil, and cuttings may be rooted in sand under a hand-glass.

Stillingia, monœc. monad. and euphorbiaceæ, a G. tr. G. peren. and H. tr. China and N. Amer. which grow in loam and peat, and cuttings root under a hand-glass; the tender kinds in sand.

Stipa, feather-grass, trian. dig. and gramineæ, a H. an. S. Amer. and H. peren. Eur. of easy culture.

Stizolobium, cow-itch, diadel. decan. and leguminoseæ, S. tr. W. and E. Ind. which thrive well in light rich soil, and young cuttings root in sand under a bell-glass.

Stobæa, syngen. polyg. æqual. and cynarocephaleæ, a G. tr. C. B. S. which may be treated as stizolobium.

Stœbe, syngen. polyg. segreg. and corymbifereæ, G. tr. C. B. S. which may be treated as stizolobium.

Stokesia, syngen. polyg. æqual. and cynarocephaleæ, a G. peren. Carolin. a pretty plant which grows in rich light soil, and roots freely under a hand-glass.

Stratiotes, water-soldier, diœc. dodec. and hydrocharideæ, a H. peren. Eng. an aquatic which only requires to be thrown into a pond or aquarium.

Strelitzia, pentan. monog. and musaceæ, S. tr. C. B. S. which grow in sandy loam, and are increased slowly by suckers. By rubbing the pollen on the stigmas, when the plants are in bloom, perfect seeds are readily obtained. *Sweet.*

Streptopus, hexan. monog. and smilaceæ, H. peren. Hung. and N. Amer. which succeed best in light sandy soil, and are increased by dividing at the root.

Strumaria, hexan. monog. and amaryllideæ, G. peren. C. B. S. bulbs which thrive in sandy loam and decayed leaves, require little water when not in a growing state, and are increased by offsets or seeds.

Struthiola, tetran. monog. and thymeleæ, G. tr. C. B. S. which grow in sandy peat, and young cuttings root freely in sand under a bell-glass.

Strychnos, pentan. monog. and apocyneæ, S. tr. E. Ind. which grow in sand and peat, and cuttings root in sand under a bell-glass.

Stuartia, monad. polyan. and tiliaceæ, H. tr. N. Amer. handsome plants which thrive in peat soil or very sandy loam; they flower after attaining a good size, and are increased by layers in peat.

Stylidium, gynan. dian. and stylideæ, a G. tr. and peren. Austral. which grow in sandy loam and peat, and are increased by seeds or parting at the root: the shrubby species by cuttings under a hand-glass.

Styphelia, pentan. monog. and epacrideæ, G. tr. N. S. W. beautiful plants which grow in sandy loam and peat, and young cuttings root in sand under a bell-glass.

Styrax, storax, decan. monog. and ebenaceæ, H. tr. Italy and N. Amer. which thrive and flower freely in light sandy loam, and are increased by layers or seeds.

Staff-tree, — see Celastrus.

Star-apple, — see Chrysophyllum.

Star of bethlehem, — see Ornithogalum.

Star of the earth, plantago coronopus.

Star-thistle, centaurea calcitrapa.

Star-wort, — see Aster.

Stinking horehound, — see Ballota.

Stitchwort, — see Stellaria.
Stock, — see Mathiola.
Stone-crop, — see Sedum.
Storax, — see Styrax.
Stork's-bill, — see Pelargonium.
Strapwort, corrigiola littoralis.
Strawberry, — see Fragaria.
——— blite, — see Blitum.
——— tree, — see Arbutus.
Stramonium, datura stramonium.
Stone-fruits, 1442.
Stove-plants, — see Bark-stove and Dry-stove.
Stove, moist, or bark-stove, 1600; culture of, 1625, — see Bark-stove.
Stove-dry, 1559, — see Dry-stove.
Stirring the soil, use of, 1130.
Stoke-hole, the excavation, in one side of which hot-house furnaces are often built, and the hole contains fuel for its supply.
Star in planting, 1799.
Stole, (from stolo, onis, a shoot or twig,) trees which, when cut over by the surface shoot up again, 1789.
Stowe, a seat in Buckinghamshire, 85. 109; described, 2155.
Sternber, ——, his works on gardening, 2285. A.D. 181.
Staffordshire, gardens and residences of, 2173.
Strawberry-hill, Middlesex, 2134.
Stanmore-house, Middlesex, 2135.
Streatham, Surrey, 2140.
Stanstead-house, Sussex, 2143.
Stoke-park, Buckinghamshire, 2154.
Stoke-house, Gloucestershire, 2168.
Stout's-hill, Gloucestershire, 2168.
Stowels, a seat in Gloucestershire, 2168.
Stoke, a seat in Herefordshire, 2171.
Stamford-court, Worcestershire, 2169.
Stanton-harold, Leicestershire, 2176.
Staunton, Nottinghamshire, 2179.
Stutthorpe, Yorkshire, 2185.
Stokeld, Yorkshire, 2185.
Studley-royal, Yorkshire, 2185.
Stub-house, Durham, 2187.
Stoneham-park, Hampshire, 2197.
Stratton-park, Hampshire, 2197.
Stoke-park, Wiltshire, 2200.
Stourhead, a seat in Wiltshire, 2200.
Stradmore-vale, a seat in Cardiganshire, 2210.
Stout-hall, Glamorganshire, 2211.
Stradballey-hall, in Queen's-county, 2257.
Stokestown, a seat in the county of Roscommon, 2269.
Stewart-hall, a seat in Tyrone, 2277.
Staines-castle, a seat in Antrim, 2282.
Standish, Arthur, a writer on gardening, 2283. A.D. 1613.
Stephenson, David, M. A. his work on gardening, 2283. A.D. 1746.
Stillingfleet, Benjamin, his writings on gardening, 2283. A.D. 1759.
Steel, Richard, his work on gardening, 2283. A.D. 1793.
Stevenson, Robert, Esq. F.R.S.E. his writings on gardening, 2283. A.D. 1810.
Stewart, Mr. James, his writings on gardening, 2283. A.D. 1811.
——— Mr. Alexander, his writings on gardening, 2283. A.D. 1814.
Stephanus, Morinus, a French author on gardening, 2284. A.D. 1658.
Straw coverings used in gardening, 624.
Stiper, J. A. his works on gardening, 2285. A.D. 1697.
Stocks for grafting, 404. 904.
Stable-dung, 864.
Structures in gardening, 625; portable or moveable structures, 625; canvas-screen, canvas-curtain, oiled paper frame netting-screen, common glass-case, glass-tent, common hot-bed frame, separating frame, moveable bottomed frame, Mallet's frame, 625.

Structures, partly moveable, 626; earth-pit, bark-pit, flued-pit, M'Phail's pit, Alderstone pit; pit with rising frame, 626; West's pit, 1164.

Fixed structures, 627; garden-walls, brick stone or mud-walls, brick and stone wall, solid brick wall, flued wall, cellular wall, mud or earth wall, boarded wall, wavy wall, angular wall, zigzag-wall, square pier wall, nurseryman's wall, piered wall, sheltering piers, arched or roofed walls, espalier rails, wooden espaliers, framed wooden espalier rail, cast-iron espalier rail, horizontal espalier rail, oblique espalier rail, 627.

Permanent horticultural structures, 628; hot-house, accuminated semi-globe, 636; accuminated semi-dome, 637; semi-elipse, 638; parallelogram with curved roof and ends, 639; with ridge and furrow roof, 640; polyprosopic hot house, 641; mushroom houses, 704; flued mushroom-house, 704; German mushroom house, 705.

——— ———, their further improvement, 790.
Streams of water, how to improve in garden scenery, 1986.
Stones, how to operate with in gardening scenery, 1989 and 1990.
Statistics of British gardening, 2059; different conditions of men engaged in the the practice and pursuit of gardening, 2059; operators or serving gardeners, 2060; tradesman-gardeners, 2070; garden-counsellors or artists, 2082; patrons of gardening, 2088.
——— ———, different kinds of gardens, 2094; private British gardens, 2095; commercial gardens, 2111; public gardens, 2122; leading gardens of the different counties particularised, 2128.
Street-gardens, 2034; their management 2098.
Suckers to propagate by, 881.
Subularia, awlwort, tetrad. silic. and cruciferæ, a H. an. Brit. an aquatic of easy culture.

Succowia, tetrad. silic. and cruciferæ, a H. an. Minorca, of common culture.

Sutherlandia, diadel. decan. and leguminoseæ, C. B. S. which thrives in loam and peat, and is readily increased by seeds.

Succory, — see Cichorium.

Sugar-cane, — see Saccharum.

Sulphur-wort, — see Peucedanum.

Sumach, — see Rhus.

Sundew, — see Drosera.

Sun-fern, polypodium phegopteris.

Sun-flower, — see Helianthus.

Sun-rose, — see Helianthemum.

Supple-jack, paullinia polyphylla.

Succisæ repullulant, (from succido, ĕre, to cut down, and repullulo, āre, to bud or sprout), trees which stole, or which being cut over, spring again, 23. 1789.

Suffocation, a disease of plants, 496.

Suburban villa, 2027; suburban house, 2028; their management, 2098. and 2102.

Surveyor of trees and timber, 2083.

Surrey, gardens and residences of, 2183.

Sussex, gardens and residences of, 2143.

Suffolk, gardens and residences of, 2159.

Summer-hill, a seat in Kent, 2148.

Sudborne-hall, Suffolk, 2159.

Sufton-court, Herefordshire, 2171.

Stirlingshire, gardens of, 2231.

Sutherlandshire, gardens of, 2246.

Suir-castle, a seat in Tipperary, 2265.

Sun-dials, as garden decorations, 729.

Swertia, felwort, pentan. dig. and gentianeæ, a H. peren. Eng. a marsh plant which prefers a peat soil.

Swietenia, mahogany tree, decan. monog. and meleaceæ, S. tr. W. and E. Ind. which grow in loam and peat, and ripe cuttings, with their leaves not shortened, root freely in sand under a hand-glass in moist heat.

Swallowwort, — see Asclepias.

Sweet-flag, acorus calamus.

Sweet-gale, myrica gale.

Sweet-gum tree, liquidambar styraciflua.

Sweet-pea, lathyrus odoratus.

Swine's-succory, — see Hyoseris.

Sweet herbs, 1301. 1379.

Switzer, Mr. Stephen, 113; his works on gardening, 2283. A. D. 1815.

Swinden, N. his work on gardening, 2283. A. D. 1778.

Swinburne, Sir John Edward, his writings on gardening, 2283. A. D. 1814.

Sweet, Mr. Robert, F. L. S. his writings on gardening, 2283. A. D. 1818.

—— Mr. John, his writings on gardening, 2283. A. D. 1818.

Swaine, the Rev. George, his writings on gardening, 2283. A. D. 1821.

Swings as garden decorations, 773, — see Edifices.

Sweeping, 808.

Syrian-rue, peganum harmala.

Syringa, — see Philadelphus.

Symphoria, St. Peterswort, pentan. monog. and caprifoleæ, a H. tr. N. Amer. a dwarf shrub which grows in the shade of other trees in any soil, and is increased by cuttings in the open ground.

Symphytum, comfrey, pentan. monog. and boragineæ, H. peren. Eur. of easy culture.

Synedrella, syngen. polyg. frustran. and corymbiferæ, a S. an. W. Ind. of common culture, 1749.

Syringa, lilac, dian. monog. and oleineæ, H. tr. Persia and China, of easy culture.

Syringe, garden, 620.

T.

Tabernæmontana, pentan. dig. and apocyneæ, S. tr. W. and E. Ind. which thrive well in loam and peat, and cuttings root in sand under a hand-glass.

Tacca, hexan. monog. and aroideæ, S. peren. E. Ind. which grow in loam and peat with little water, and are increased by suckers.

Tagetes, syngen. polyg. super. and corymbiferæ, a G. peren. and H. an. S. Amer. of common culture.

Talinum, dodec. monog. and portulaceæ, S. tr. and bien. W. Ind. and S. Amer. of a succulent nature, which grow in light sandy loam, and cuttings root freely.

Tamarindus, tamarind-tree, monad. trian. and leguminoseæ, a S. tr. W. Ind. which grows in loam and peat, and cuttings root under a bell-glass in sand.

Tamarix, tamarisk, pentan. trig. and portulaceæ, a S. tr. E. Ind. and H. tr. Eur. of easy culture, and increased by cuttings.

Tamus, black briony, diœc. hexan. and smilaceæ, a G. tr. C. B. S. and H. peren. Eur. The G. species t. elephantipes, or elephant's foot, is a curious plant which thrives in light rich soil, not-overwatered when the plant is in a dormant state. *Sweet* recommends "young cuttings to be taken off at a joint, and placed in pots of sand in bottom heat under a hand-glass." *Bot. Cult.* 262. The H. sorts are of easy culture.

Tamus communis, the common black briony, 1410.

Tanacetum, tansy, syngen. polyg. super. and corymbiferæ, G. tr. C. B. S. and H. peren. and an Eur. of easy culture in common soil.

———— vulgare, the common tansy, 1388.

Tarchonanthus, African fleabane syngen. polyg. æqual. and corymbiferæ, a G. tr. C. B. S. of easy culture.

Taxus, yew-tree, diœc. monad. and coni-

fereæ, a G. tr. China, and H. tr. Brit. the exotic species grow in loam and peat, and roots, not without difficulty, by cuttings, in sand, under a bell-glass; the common yew is increased only by seeds, — see 1936.
Tan, 864, — see Bark for the use of tanners.
Taille d'éte, summer pruning, 1284.
Taurida, gardens of, 85.
Tacamahac, populus balsamifera.
Tallow-tree, stillingia sebifera.
Tamarind, — see Tamarindus.
Tamarisk, — see Tamarix.
Tansey, — see Tanacetum.
Tare, — see Ervum.
Tabern. ic. Icones, plantarum (eadem ac in tabernæmontani Krauterbuch.)
Tatton-park, Cheshire, 2194.
Tavistock, a seat in Devonshire, 2203.
Tan-y-Bwlch-hall, a seat in Merionethshire, 2215.
Taliaris, a seat in Carmarthenshire, 2217.
Taymouth, a seat in Perthshire, 2236.
Taylor, Adam, his works on gardening, 2283. A.D. 1769.
Talleys, or naming instruments, different kinds of, 619.
Tatin, A. his works on gardening, 2284. A.D. 18....
Taking vegetables or crops, — see Gathering.
Tectona, teak-wood, pentan. monog. and verbenaceæ, a S. tr. E. Ind. which grows in loam and peat; ripened cuttings root freely in sand under a hand-glass.
Teedia, didyn. angios. and scrophularineæ, G. bien. C. B. S. of easy culture.
Teesdalia, tetrad. silic. and cruciferеæ, a H. an. Brit. of common culture.
Telephium, orpine, pentan. trig. and portulaceæ, a H. peren. S. Eur. well adapted for rock-work, and easily increased.
Telopea, waratah, tetran. monog. and proteaceæ, a G. tr. N. S. W. one of the most beautiful of greenhouse plants, which grows in equal parts of loam, peat, and sand, well drained, not over-watered, and placed in an airy situation; ripened cuttings, taken off at a joint, just before growth commences, root in sand under a hand-glass, but not plunged in heat.
Templetonia, diadel. decan. and leguminoseæ, a G. tr. N. Holl. which grows in sandy loam and peat, and young cuttings root freely under a bell-glass in sand.
Tephrosia, diadel. decan. and leguminoseæ, S. and G. tr. peren. and bien. C. B. S. Ind. and Amer. which thrive in loam and peat, and are increased by cuttings in sand under a bell-glass.
Terminalia, polyg. monœc. and combretaceæ, S. tr. E. Ind. which grow in sandy loam, and ripened cuttings, not defoliated, root in sand under a bell-glass.
Tetragonia, icos. di-pentag. and ficoideæ, G. tr. peren. bien. and an. C. B. S. and Austral. somewhat succulent, which prefer sandy soil, and root readily by cuttings.
———— expansa, New Zealand spinach, 1546.
Tetragonotheca, syngen. polyg. super. and corymbifereæ, a H. peren. Virgin. which grows in light rich soil, and is increased by dividing at the root or by seed.
Tetratheca, octan. monog. and tremandreæ, a G. tr. N. S. W. a pretty plant, which thrives in loam and peat, and cuttings root in sand under a bell-glass.
Teucrium germander, didyn. gymnos. and labiateæ, G. F. and H. tr. and H. peren. and an. Eur. and Amer. of easy culture in almost any soil.
Tea-tree, camellia bohea and c. viridis.
Teak-wood, tectona grandis.
Teasel, — see Dipsacus.
Teredo pinorum, 498.
Temples, 764, — see Edifices.
Temple Grove, formerly Sheen Grove near East Sheen, Surrey; the seat of Sir William Temple's horticultural operations referred to by Evelyn and himself. The house is now a boarding-school, 127.
Temple, Sir William, 2. 108. 127. 183; his works on gardening, 2283. A. D. 1685.
Terebinthinate trees, such as have a resinous, or turpentine odor, 10.
Tenthredinideæ, a natural order of insects, 1469.
Terraces, 2008.
Temporary country residence, 2023.
Tetseady Park, Cornwall, 2204.
Templemore, a seat in Tipperary, 2265.
Tessier, H. A. his works on gardening, 2284. A. D. 1791.
Terebration, a mode of grafting, 902.
Thalia, monan. monog. and canneæ, a G. peren. S. Carolin. an aquatic, rather hardy, and increased by dividing at the root.
Thalictrum, meadow rue, polyan. polyg. and ranunculaceæ, H. peren. Eur. and N. Amer. some of which are adapted for rock-work, or growing in pots, and all are of easy culture.
Thapsia, deadly carrot, pentan. dig. and umbelliferеæ, H. peren. Eur. of easy culture.
Thelygonum, monœc. polyan. and urticeæ, a H. an. S. Eur. of easy culture.
Thelymitra, gynan. monan. and orchideæ, a G. peren. N. S. W. which grows in sandy loam and peat, and requires little water when not in a growing state.
Theobroma, chocolate-nut, polyad. decan. and malvaceæ, S. tr. S. Amer. which grows in light rich soil, and cuttings root in sand under a hand-glass.
Thermopsis, decan. monog. and leguminoseæ, a H. peren. Siberia, a pretty plant, rather difficult of culture; it grows best in light loam, and is increased by seed.

Thesium, bastard toad-flax, pentan. monog. and santalaceæ, a G. tr. and H. peren. Eur. Amer. and C. B. S. of which the H. species grow best in chalky soil, and are increased by seeds, and the G. tr. is of common culture in light loam.

Thlaspi, shepherd's purse, tetrad. silic. and cruciferæ, H. peren. bien. and an. of easy culture.

Thrinax, hexan. monog. and palmeæ, a S. tr. E. Ind. which thrives in sandy loam, and is increased by (imported) seeds.

Thrincia, syngen. polyg. æqual. and cichoraceæ, a H. peren. and an. Eur. and Africa, of common culture.

Thuja, arbor vitæ, monœc. monad. and coniferæ, a G. and F. tr. and H. tr. As. Afr. and Amer. The tender kinds grow in loam and peat, and are increased by cuttings under a bell-glass in sand; the hardy species grow in any soil, and are increased by seeds.

Thunbergia, didyn. angios. and acanthaceæ, a S. tr. E. Ind. a pretty climbing plant, in flower the greater part of the year, which grows in loam and peat, and young cuttings root readily under a hand-glass.

Thymbra, didyn. gymnos. and labiateæ, S. and G. tr. S. Eur. which grow in light soil, and cuttings root freely under a hand-glass.

Thysanotus, hexan. monog. and asphodeleæ, a G. peren. N. S. W. which grows in loam and peat, and is increased by dividing at the roots.

Thistle, — see Carduus.

Thorn-apple, — see Datura.

Thrift, — see Statice.

Throatwort, — see Trachelium.

Thyme, — see Thymus.

Thymus, thyme, didyn. gymnos. and labiateæ, G. F. and H. tr. Eur. very low shrubs all of easy culture, in dry soil, and increased by cuttings or seeds

——— vulgaris, the common thyme, 1379.

Thuilleries, (tile grounds, or tile-kilns,) gardens of, at Paris, 49.

Thouin, Mons. Gabriel, 28. 51. 108; his works on gardening, 2284. A.D. 1819.

Thier-garten, (wild beast garden,) a public park at Berlin, 63.

Thornbury-castle, in Gloucestershire, 127.

Thouin, Mons. Jean, his works on gardening, 2284. A.D. 1816.

Thrips, a genus of hemipterous insects, 1477.

Thorndon-hall, Essex, 2151.

Theobalds, a seat in Hertfordshire, 2152.

Thame-park, Oxfordshire, 2161.

Thorngrove, a seat in Worcestershire, 2169.

Thoresby park, Nottinghamshire, 2179.

Thrickelby-hall, Yorkshire, 2185.

Thurso-castle, a seat in Caithness, 2244.

Thompson, John, his work on gardening, 2283. A.D. 1757.

Thomson, Mr. Thomas, of Wemys-castle, his writings on gardening, 2283. A. D. 1811.

Thomson, Mr. Thomas, of Smylham-park, his writings on gardening, 2283. A. D. 1811.

Thumb-pot, a garden pot of the least size.

Thermometer, 614 and 623.

Thouin, André le Chevalier de, his works on gardening, 2284. A.D. 1737.

Thierrat, ——, his works on gardening, 2284. A.D. 1760.

Thory, Claude Antoine, his works on gardening, 2284. A.D. 189...

Theuss, Theodore, his works on gardening, 2285. A.D. 1805.

Thunberg, Sir Charles Peter, M.D. his works on gardening, 228. A.D. 1799.

Tiarella, decan. dig. and saxifrageæ, a F. peren. and H. peren. N. Amer. which grow in light soil, rock-work or small pots, and are increased by dividing at the root.

Tigridia, tiger-flower, monad. trian. and irideæ, a H. peren. Mex. a splendid plant which thrives in common soil, but the bulbs must be taken up as soon as they have done flowering, kept dry and free from frost during winter, and planted again in the following spring.

Tilia, lime-tree, polyan. monog. and tiliaceæ, H. tr. Eur. and N. Amer. which grow in any soil, and are increased by layers.

—— europæa, and other species of lime-tree, 1938.

Tillandsia, hexan. monog. and bromeleæ, S. peren. S. Amer. and W. Ind. of which some species are parasitical, and may be treated as aërides, the others may be treated like the pine apple or pitcairnia.

Tickseed, — see Corispermum.

Tiger flower, — see Tigridia.

Tile-root, — see Geissorhiza.

Timber measurer, 618; Monteith's, 1873.

Timber, different kinds and qualities of, 1786.

Tipula oleracea, 1310. 1613.

Tilburster-hill, a seat in Surrey, 2140.

Tiken-hill, a seat in Worcestershire, 2169.

Tillibodie, a seat in Clackmannanshire, 2233.

Tipperary, gardens of, 2265.

Tofieldia, hexan. trig. and melanthaceæ, H. peren. Brit. and N. Amer. which do best in a peat soil in a moist situation, and are increased by dividing the root.

Tolpis, syngen. polyg. æqual. and cichoraceæ, a H. an. France, of easy culture.

Tordylium, hartwort, pentan. dig. and umbelliferæ, H. an. Eur. and Persia, of common culture.

Tormentilla, septfoil, icos. polyg. and rosaceæ, H. peren. Brit. of common culture, in light or peat soil.

Tournefortia, pentan. monog. and boragineæ, S. and G. tr. and a H. peren. which grow in rich light soil, and cuttings root freely in sand under a hand-glass.

Tourrettia, didyn. angios. and bignoniaceæ, a S. an. Peru, of common culture, 1749.
Tozzettia, trian. dig. and gramineæ, a H. an. of common culture.
Toad flax, — see Linaria.
Tobacco, — see Nicotiana.
Tonquin-bean, dipterix odorata.
Toothach-tree, — see Zanthoxylum.
Toothpick, visnaga daucoides.
Toothwort, lathræa squamaria.
Touch me not, impatiens nolitangere.
Tower mustard, — see Turritis.
Tools of gardening, 616, — see Implements.
Toolhouse, — see Edifices.
Towers, — see Edifices.
Tozzetti, Octavius Targioni, M. D. 40; his work on gardening, 2286. A. D. 1777.
Toulon, botanic garden of, 55.
Tourn. it. Relation d'un Voyage du Levant. Par M. Pitton Tournefort.
Topography of British gardening, 2128.
Toddington-house, Gloucestershire, 2168.
Townley-hall, Lancashire, 2191.
Tottenham-park, Wiltshire, 2199.
Tollagh-palace, in the county of Dublin, 2251.
Tod, George, his work on gardening, 2283. A. D. 1812.
Torbron, Mr. Thomas, his writings on gardening, 2283. A. D. 1820.
Toustain, de Limsey, Charles Francois, his work on plantations, 2284. A. D. 1769.
Tournon, ———, his works on gardening, 2284. A. D. 1811.
Tremadoc-house, a seat in Merionethshire.
Trozelius, Charles Blechort, his work on gardening, 2288. A. D. 1780.
Trachelium, throatwort, pentan. monog. and campanulaceæ, a G. tr. and H. bien. France and Brit. of common culture.
Tradescantia, spider-wort, hexan. monog. and commelineæ, a S. tr. and H. peren. and an. E. and W. Ind. and N. and S. Amer. all of easy culture in light rich soil.
Tragia, monœc. tetran. and euphorbiaceæ, a S. tr. peren. and an. and a H. an. W. and E. Ind. which grow in light soil, and cuttings root freely.
Tragopogon, goat's-beard, syngen. polyg. æqual. and cichoraceæ, H. bien. Eur. of easy culture, 1660.
———— porrifolius, the salsify, 1328.
Trapa, water caltrops, tetran. monog. and hydrocharideæ, a G. peren. and H. an. aquatics of easy culture.
Trevirana, didyn. angios. and scrophularineæ, a S. peren. Jamaica; which flowers freely in sandy loam and peat, the pots being kept dry as soon as the flowering season is over till the roots begin to vegetate.
Trewia, diœc. polyan. and ...., a S. tr. E. Ind. which grows in loam and peat, and cuttings root in sand under a hand-glass.
Trianthema, decan. dig. and portulaceæ, S. an. E. and W. Ind. of common culture.
Tribulus, caltrops, decan. monog. and rutaceæ, a S. peren. and an. and H. an. Eur. and Amer. which grow in light soil, and cuttings root freely in sand under a hand-glass.
Trichilia, decan. monog. and meleaceæ, S. tr. W. Ind. which thrive in loam and peat, and cuttings root in sand under a hand-glass in heat.
Trichodesma, pentan. monog. and boragineæ, a S. an. and H. an. E. Ind. and C. B. S. of common culture.
Trichodium, trian. dig. and gramineæ, H. peren. N. Amer. and Brit. of easy culture.
Trichomanes, cryptog. filices, and filiceæ, a H. peren. Brit. of easy culture in loam and peat in the shade.
Trichonema, trian. monog. and irideæ, G. peren. and a H. peren. bulbs which may be treated as ixia.
Trichophorum, trian. monog. and cyperaceæ, H. peren. Brit. and N. Amer. grasses of easy culture in moist soil.
Trichosanthes, snake-gourd, monœc. monad. and cucurbitaceæ, a S. peren. and F. an. The S. species thrive best in rich sandy loam, and cuttings root freely under a hand-glass in a moist heat; the others may be treated as cucumis.
Trichostema, didyn. gymnos. and labiateæ, a H. bien. and an. N. Amer. of common culture.
Trientalis, winter-green, heptan. monog. and primulaceæ, a H. peren. Brit. and N. Amer. which grow best in light soil, and are increased by dividing at the root or by seeds.
Trifolium, trefoil, diadelph. decan. and leguminoseæ, H. peren. bien. and an. Eur. Afr. and N. Amer. of easy culture, and increased by dividing the roots or by seeds.
Triglochin, arrow-grass, hexan. trig. and alismaceæ, a G. peren. and H. peren. C. B. S. and Brit. marsh plants of easy treatment.
Trigonella, fenugreek, diadel. and leguminoseæ, S. an. and H. peren. bien. and an. E. Ind. and Eur. of easy culture.
Trillium, hexan. trig. and smilaceæ, a G. peren. and H. peren. N. Amer. which do best in a bed of peat in a moist shady situation, and are increased, though slowly, by dividing at the root.
Triodia, trian. dig. and gramineæ, a H. peren. Brit. of easy culture.
Triosteum, feverwort, pentan. monog. and caprifoleæ, H. peren. N. Amer. which grow freely in rich light soil, and are increased by cuttings under a hand-glass, or by dividing the root.
Tripsacum, monœc. trian. and gramineæ, a H. peren. N. Amer. of easy culture.

Trisetum, trian. dig. and gramineæ, a H. peren. and an. Eur. of common culture.

Tristania, polyad. icos. and myrteaceæ, G. tr. N. S. W. which grow in sandy loam and peat, and cuttings, not too much ripened, root readily in sand under a hand or bell-glasses.

Triticum, wheat-grass, trian. dig. and gramineæ, H. peren. and an. Eur. and Asia, of common culture.

Tritoma, hexan. monog. and hemerocallideæ, a F. peren. C. B. S. which thrive best in peat soil, and are increased by dividing at the root.

Tritonia, trian. monog. and irideæ, Br. G. peren. C. B. S. bulbs which may be treated as ixia.

Triumfetta, dodec. monog. and tiliaceæ, S. tr. and an. E. and W. Ind. which grow in loam and peat, and cuttings root in sand under a hand-glass.

Trollius, globe-flower, polyan. polyg. and ranunculaceæ, Eur. and N. Amer. of easy treatment.

Tropæolum, indian cress, octan. monog. and geraniaceæ, G. tr. bien. and an. Peru, which grow in light rich soil, and are of easy increase by cuttings or seeds.

———— majus, common indian cress, 1376.

Trophis, ramoon tree, diœc. tetran. and ...., S. tr. E. and W. Ind. which grow freely in loam and peat, and cuttings root under a hand-glass in sand.

Troximon, syngen. polyg. æqual. and cichoraceæ, H. peren. N. Amer. which grow freely in rich light soil, and are increased by seeds.

Treacle mustard, clypeola ionthlaspi.

Tree celandine, bocconia frutescens.

Tree mallow, lavatera arborea.

Trefoil, — see Trifolium.

Trumpet flower, — see Bignonia.

Trees, their uses individually, 1759; in civil architecture, 1758; military architecture, 1759; naval architecture, 1760; construction of machines, 1761; implements, 1762; utensils, 1763; fuel, 1764; tanning, 1765; dyeing, 1766; various uses, 1767; food, 1768; medicine, 1769; poison, 1770.

——, classification of, according to their uses, 1786; for timber, 1785; bark, 1787; charcoal, ashes, 1787; pales and fencing, 1788; hoops, &c. 1789; shelter, 1790; shade, 1791; improving bad soil, 1792; separation and defence, 1793; seclusion, 1794.

——, their uses in ornamental scenery, 1795; magnitude, form, mode of growth, duration, and expression, 1795.

——, their wounds, bruises, casualties, and defects, 1853.

——, insects and vermin, by which they are infested, 1854.

——, their products, 1855; prunings, 1856; thinnings, 1857; seeds, 1858; osier-grounds, 1859; coppice woods, 1860.

Trees, season for cutting, 1861; mode of cutting, 1862; barking, 1863; pollards, 1864; period of felling, 1865; operation of felling, 1866; season of felling, 1867.

——, uses of their roots, 1869; method of charring, 1870.

——, valuation of, 1871; as plantations, 1871; as timber, 1872; measurement of, 1873.

——, nursery, — see Nursery.

——, their nursery culture, coniferous, 1879; nutbearing, 1880; berry bearing, 1884; berries, and capsule bearing trees, with small seeds, 1887; with leguminous seeds, 1889; small seeds, 1890; general culture of, 1891.

Tree transplanter, 621.

Trenching, 802, — see Operations.

Transplanter, 616.

Transplanting, different methods of performing, 928 to 949.

Training, 967; — see Operations.

Trianon, petit, a royal garden near Paris, 50.

———, grand, a royal garden near Paris, 51.

Trew ehret. Plantæ selectæ, quarum Imagines pinxit, Ge. Dion. Ehret. Collegit et illustravit Christ. Jac. Trew.

Truncheon, (troncon, *Fr.* from truncus, *Lat.*) a pole or rod cut to the length of a staff or longer, sometimes adopted in making willow plantations, — see Salix.

Travelling gardener, 2067.

Tradesman gardener, 2070.

Tree surveyor, 2083.

Tradesmens' villas, 2027; their management, 2099.

Trent-place, Middlesex, 2135.

Tring-park, Hertfordshire, 2152.

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Trentham, a seat in Staffordshire, 2173.

Trumpton-hall, Cornwall, 2204.

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Trasternaugh, a seat in Westmeath.

Tradescant, John, 118; his writings on gardening, 2213. A. D. 1656.

Triewald, Martin, his writings on gardening, 2283. A.D. 1729, and 2288. A.D. 1740.

Trowel, Samuel, his work on gardening, 2283. A. D. 1739.

Trotter, Mr. David, his writings on gardening, 2283. A. D. 1814.

Trowel, 616.

Traps for vermin, different sorts of, used in gardening, 622.

Training trees and plants, different methods of, 967 to 980, — see Operations.

Tshoudi, I. B. L. Baron de, his work on gardening, 2284. A. D. 1768.

Tulbagia, hexan. monog. and hemerocallideæ, H. peren. C. B. S. which grow in sandy loam, and are increased by offsets from the bulbs.

Tulipa, tulip, hexan. monog. and liliaceæ, H. peren. bulbs, Eur. which grow best in sandy soil, and are increased by offsets.

——— gesneriana, the common tulip, 1628.

Tupistra, hexan. monog. and aroideæ, a peren. Amboyna, which may be grown in loam and peat.

Turnera, pentan. trig. and portulaceæ, S. tr. an. and a H. an. which grow in rich light soil, and are increased by cuttings under a hand-glass or by seeds.

Turritis, tower mustard, tetrad. siliq. and cruciferææ, H. peren. and an. Eur. of easy culture.

Tussilago, colt's-foot, syngen. polyg. super. and corymbifereæ, a S. bien. and H. peren. W. Ind. and Eur. of easy culture. T. fragrans, is a desirable plant for a green-house during winter on account of the odour its flowers diffuse at that season.

Tuberose, polyanthes tuberosa.

Tulip, — see Tulipa.

Tulip-tree, — see Liriodendron.

Tupelo, — see Nyssa.

Turmerick, — see Curcuma.

Turnep, — see Brassica.

Turnsole, — see Heliotropium.

Tuber cibarium, the truffle, 1419.

Turf, the superiority of British, 158.

Turfing, or laying down turf, 859.

Turner, Mr. John, F. H. S. his writings on gardening, 2283. A. D. 1810.

———, Mr. John, F. L. S. his writings on gardening, 2283. A. D. 1819.

Turf, racer, 616.

Turfing-iron, 616.

Typha, cats-tail, monœc. trian. and aroideæ, H. peren. Brit. marsh plants of easy treatment.

Tynningham, a seat in Haddingtonshire, 696; described, 2219.

Tyford-house, Middlesex, 2134.

Tway-blade, listera ovata.

Twickenham, village of, in Middlesex, 168 and 2134.

Twickenham-park, Middlesex, 2134.

Twinstead-hall, Essex, 2150.

Tweedale, county of, as to gardening, 2223.

Tweedie, Mr. John, his writings on gardening, 2283. A. D. 1813.

Tsaritzina, or Zaritzina, an imperial residence near Moskwa, 88. 93.

U.

Ulex, furze, diadel. decan. and leguminoseæ, H. tr. Brit. which grow best in dry soil, and are increased by seeds, — see 1568.

Ulmus, elm-tree, pentan. dig. and amentaceæ, H. tr. Brit. and N. Amer. and a G. tr. China, all of which thrive in loamy soil, and the G. species is increased by cuttings under a hand-glass.

Ulmus campestris, and other species grown as timber-trees, 1915.

Ulva lactuca, 1420.

Udum salictum, (udus, a, um, wet or moist, and salictum, i, a willow-ground,) a proper situation for growing willows, 23.

Umbrella-wort, — see oxybaphus.

Uniola, sea-side oat, trian. dig. and gramineæ, H. peren. N. Amer. of easy culture.

Unona, polyan. polyg. and anonaceæ, a S. tr. Java, which grows best in light loam, and ripened cuttings root in sand under a hand-glass.

Underley-park, near Kirby Lonsdale, 696.

Underwood, Mr. Walter, his writings on gardening, 2283. A. D. 1814.

Ungehauer, J. A. his works on gardening, 2285. 1741.

Upsal, botanic garden of, 74.

Up-park, Sussex, 2143.

Urania, hexan. monog. and musaceæ, a S. tr. E. Ind. which thrives in loamy soil with plenty of water and a strong heat, and is increased by imported seeds.

Urena, monad. polyan. and malvaceæ, S. tr. and a G. tr. E. Ind. and Surinam, which grow in loam and peat, and are increased by seeds or cuttings.

Uropetalon, hexan. monog. and asphodeleæ, G. and F. peren. C. B. S. bulbs which may be treated as ixia, &c.

Urtica, nettle, monœc. tetran. and urticeæ, S. tr. and peren. W. Ind. and F. and H. peren. and an. Eur. all of which grow well in rich light soil, and are readily increased by the usual means.

——— dioica, the common stinging nettle, 1410.

Ustilago, a small fungus, which is thought to occasion the smut, 489.

Utricularia, hooded milfoil, dian. monog. and lentibulareæ, H. peren Brit. marsh plants, which prefer peat soil, or they will grow in pots of sphagnum with a little peat-earth at bottom, set in pans of water.

Utility, as expressive of design in gardening, 1954.

Utensils of gardening, 620.

Uvularia, hexan. monog. and melanthaceæ, H. peren. N. Amer. which grow in light sandy soil, and are increased by dividing at the root.

Uvaria, polyan. polyg. and annonaceæ, S. E. and W. Ind. which thrive best in sandy loam, and ripened cuttings root in sand under a hand-glass in heat.

V.

Vaccinium, whortlebery, decan. monog. and ericeæ, G. and H. tr. Brit. and N. Amer. which thrive best in peat soil, or sand and peat, and are increased by layers, young cuttings under a bell-glass, or by seeds.

Vaccinium macrocarpon, and other fruit-bearing species, 1480.

Valantia, polyg. monœc. and rubiaceæ, a H. peren. and an. Brit. of easy culture.

Valeriana, valerian, trian. monog. and dipsaceæ, H. peren. and an. Eur. of easy culture; the smaller sorts grow best in light soil, and answer well for pots or rock-work.

——— lacusta, or lamb-lettuce, — see Fedia.

Vanguiera, pentan. monog. and rubiaceæ, a S. tr. India, which grows in sandy loam and peat, and cuttings root freely in sand in heat under a hand-glass.

Vanilla, gynan. monan. and orchideæ, S. tr. trailers and parasites which root at every joint into the bark of the trees on which they grow. They may be treated as aërides, and are readily increased by cuttings.

Van Sterbeck, Francis, his works on gardening, 2287. A.D. 1682.

Valerian, — see Valeriana.

Van Kempen, et fils, their works on gardening, 2287. A.D. 1760.

Vanes, 780.

Van Diemen's Land, gardening of, 174.

Valentines, a seat in Essex, 2151.

Valleyfield, a seat in Fifeshire, 151; described, 2236.

Various, authors, who have touched incidentally on gardening, 2283. A. D. 1760.

Van Mons, Jean Baptiste, M.D. his writings on gardening, 2283. A.D. 1815.

Vachell, Mr. Richard, his writings on gardening, 2283. A.D. 1821.

Valemont, l'Abbé de, a French writer on gardening, 2284. A.D. 1705.

Vander Groen, J. his work on gardening, 2288. A.D. 1669.

Vegetable kingdom, origin and progress of the study of, 191; among the ancients, 192; in modern times, 193; in the present day, 194.

——— glossology, or the names of the parts of plants, 196; terms used in general description, 197; outer surface, 197; state of vegetation, 198; terms used in particular description, 199; seed, 199; pappus, 200; arillus, 201; root, 202; intermediate stem, 203; ascending stem, 204; scape, 205; stipe, 206; shoot, 207; sarment, 208; leaf-stalk, 209; flower-stalk, 210; bristle, 211; inflorescence, 212; whirl, 213; head, 214; glomerule, 215; ear, 216; spike, 217; raceme, 218; fascicle, 218; umbel, 220; rays, 221; cyme, 222; corymb, 223; panicle, 224; thyrse, 225; spadix, 226; catkin, 227; mass, 228; leaves, 229; frond, 230; appendages or props, 231; stipules, 232; rament, 233; floral-leaves, 234; sheath, 255; spathe, 236; roll, 237; bottle, 238; bladder, 239; strap, 240; involucre, 241; fungi, 242; little cap, 243; envelope, 244; cover, 245; tendril, 246; bud, 247; moss-bud, 248; knot, 249; gland, 250; thorn, 251; prickle, 252; awn, 253; hair, 254; flower, 255; calyx, 256; corolla, 257; petal, 258; nectary, 259; stamens, 260; pistil, 261; fruit, 262; base, 263.

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——— organology, or the external structure of plants, 278; perfect plants, their conservative organs, 279; root, 279; trunk, 280; branches, 281; leaf, 282; frond, 283. Conservative appendages, 284; germs, 285; glands, 286; tendrils, 287; stipulæ, 288; ramenta, 289; armature, 290; pubescence, 291; anomalies, 292. Reproductive organs, 293; flower, 294; flower-stalk, 295; receptacle, 296; inflorescence, 297; fruit, 298. Reproductive appendages, 299; appendages proper to the flower, 300; of the fruit, 301. Imperfect plants — Felices equisitaceæ and lycopodineæ, 302, 303; conservative organs, 304; reproductive organs, 305. Imperfect plants — Musci, 306; conservative organs, 307; reproductive organs, 308. Imperfect plants — Hepaticæ, 309; conservative organs, 310; reproductive organs, 311. Imperfect plants — Algæ and lichens, 312; conservative organs, 313; reproductive organs, 314; utility of the algæ, 315. Imperfect plants — Fungi, 316; conservative organs, 317; reproductive organs, 318; uses of the fungi, 319.

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Vegetable pathology, or the diseases and casualties of the lives of plants, 477; wounds, and bruises, 477; incisions, 477; boring, 478; girdling, 479; fracture, 480; pruning, 481; grafting, 482; felling, 483; buds destroyed, 484; leaves destroyed, 485; decortication, 486. Diseases, 487; blight, 488; smut, 489; mildew, 490; honey-dew, 491; dropsy, 492; flux of juices, 493; gangrene, 496; etiolation, 495; suffocation, 496; contortion, 497; consumption, 498. Natural decay, 499; of the temporary organs, 500; flower, 501; fruit, 502; permanent organs, 503.

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———— to form new varieties of, 545.

———— sculptures, their formation, 787.

Vegetation, to retard, operations for, 994—996.

———— to accelerate or force, operations for 997—1019.

Velezia, pentan. dig. and caryophylleæ, a H. an. Spain, of common culture.

Veltheimia, hexan. monog. and hemerocallideæ, G. peren. C. B. S. bulbs, which grow in light loam, and are readily increased by offsets; or the leaves pulled off close to the bulb, and planted, will deposit bulbs at their base, as will many other scaly and coated bulbs.

Veratrum, polygam. monœc. and melanthaceæ, H. peren. Eur. and N. Amer. which grow best in rich sandy soil, and are increased by dividing at the root, or by seeds, which should be sown as soon as ripe.

Verbascum, mullein, pentan. monog. and solaneæ, G. peren. and bien. and H. peren. bien. and an. all of easy culture on light soil.

Verbena, vervain, didyn. angios. and verbenaceæ, H. peren. bien. and an. Eur. and N. Amer. which thrive in any common soil, and are increased by dividing at the root.

Verbesina, syngen. polyg. super. and corymbiferæ, S. an. and a tr. E. and W. Ind. and G. peren. and H. peren. Amer. which grow in common soil, and are readily increased by cuttings, seeds, or dividing at the root.

Vernonia, syngen. polyg. æqual. and corymbiferæ, a S. bien. E. Ind. and H. peren. N. Amer. which grow well in rich loam, and make a fine show in autumn.

Veronica, speedwell, dian. monog. and scrophularineæ, G. tr. and peren. N. Hol. and H. peren. and an. Eur. all of easy culture in any soil: the G. species are propagated by cuttings under a hand-glass, and all the rest by seeds, or dividing the root.

———— beccabunga, brooklime, 1363.

———— spicata, British tea, 1414.

Vesicaria tetrad. silic. and cruciferæ, H. peren. and a bien. S. Eur. of common culture.

Vestia, pentan. monog. and polemoniaceæ, a G. tr. Chili, which thrives in loam and peat, and cuttings root freely under a hand-glass.

Venus's comb, scandix, pecten.

——— flytrap, dionæa, muscipula.

Vervain, — see Verbena.

Vetch, — see Vicia.

Vespa vulgaris, the common wasp, 1447.

Venerie, a royal residence at Turin, 28.

Vent. mal. Jardin de la Malmaison. Par E. P. Ventenat.

Venables, the Rev. James, his writings on gardening, 2283. A. D. 1816.

Vermin, traps and snares used for, in gardening, 622.

Viburnum, pentan. trig. and caprifoleæ; a G. tr. Canaries, and H. tr. Eur. and N. Amer. which thrives well in common soil, and are increased by layers or cuttings, under a hand-glass, in a shady situation; both the G. and H. kinds are early flowerers, which render them very desirable.

Vicia, vetch, diadel. decan. and leguminoseæ, a S. an. E. Ind. G. peren. C.B. S. and H. peren. Eur. of easy culture in light soil.

—— faba, the common bean, 1312.

Villarsia, pentan. monog. and gentianeæ, a G. peren. and H. peren. aquatics which flower freely.

Viminaria, rush-broom, decan. monog. and leguminoseæ, a G. tr. which grows in sandy loam and peat, and is readily increased by seeds or cuttings under a bell glass in sand.

Vinca, periwinkle, pentan. monog. and apocyneæ, a S. tr. and an. E. Ind. and H. peren. and a shrub, Eur. The S. species grows in light rich earth, and flowers the greater part of the year, and cuttings root in sand under a hand-glass. The H. sorts are trailers, and are increased by cuttings, layers, or dividing at the root.

Viola, violet, pentan. monog. and violaceæ, a G. tr. and H. peren. and an. N. Amer. and Eur. which grow in light soil, are well adapted for rockwork or pots, and are readily increased by seeds or parting the root.

Virgilia, decan. monog. and leguminoseæ, G. tr. Afr. and a H. tr. N. Amer. which thrive in loam and peat, and young cuttings root in sand under a bell-glass.

Viscum, misseltoe, diœc. tetran. and caprifoleæ, a H. tr. Eng. a parasite, — see 1703 and 1704.

Visnaga, toothpick, pentan. dig. and umbelliferæ, a H. an. S. Eur. of common culture

Visnea, dodec. trig. and ebenaceæ, a G tr. Canaries, which grows in loam and peat, and ripened cuttings root in sand under a hand-glass.

Vitex, chaste tree, didyn. angios. and verbenaceæ, S. and G. tr. E. Ind. which grow in loam and peat, and cuttings root freely in sand under a hand-glass.

Vitis, vine, pentan. monog. and viteaceæ, a S. tr. Ind. and H. tr. N. Amer. of easy culture, and readily increased by cuttings or layers.

—— vinifera, the common grape-vine, 1482; culture in the open air in various

ways, 1482; in the vinery and other hot-houses, 1215.
Vittaria, cryptog. filices, and filiceæ, a S. peren. Amer. of easy culture in loam and peat, and increased by dividing the root or by seeds.
Vinery, its construction, 1159; general culture of the grape in the vinery, 1215.
Vigne de la Reine, a seat near Turin, 28.
Viper's bugloss, — see Echium.
——— grass, — see Scorzonera.
Virginian poke, phytolacca decandra.
Virgin's bower, — see Clematis.
Violet, — see Viola.
Vine, — see Vitis.
Villaneuve, a seat near Warsaw, 90. 94.
Villa farm, 2021; management of, 2103.
—— residence, 2020; management of, 2103.
Vineyard-nursery, at Hammersmith, 2132.
Vine, a seat in Hampshire, 2197.
Vispre, Francis Xavier, his dissertation on gardening, 2283. A.D. 1786.
Viart, ——, his works on gardening, 2284. A.D. 1819.
Vibert, J. P. his work on gardening, 2284. A.D. 1820.
Volkameria, didyn. angios. and verbenaceæ, S. tr. W. Ind. which thrive well in loam and peat, and cuttings root freely under a hand-glass.
Von Sponeck, his works on gardening, 2285. A.D. 1810.
Voerhelm, George, his work on gardening, 2287. A.D. 1752.
Valkamer, Johann Cristoph. 84; his works on gardening, 2285. A. D. 1700.
Von Brocke, H. C. his works on gardening, 2285. A.D. 1768.
Von Dieskau, C. J. F. his works on gardening, 2285. A.D. 1776.
Von Wilke, G. W. C. his works on gardening, 2285. A.D. 1783.
Von Vothman, J. G. his works on gardening. 2285. A.D. 1784.
Von Burgsdorf, F. A. L. his works on gardening, 2285. A.D. 1783.
Von Sierstorpff, K H. his work on gardening, 2285. A.D. 1790.
Von Hass, J. A. his works on gardening, 2285. A.D. 1793.
Von Derczen, J. his work on gardening, 2285. A.D. 1796.
Von Weiss, K. his work on gardening, 2285. A.D. 1800.
Von Hagen, F. W. his works on gardening, 2285. A.D. 1805.
Vredmannus, J. F. his works on gardening, 2285. A.D. 1647.

W.

W. — C. L. Wildenow's Species Plantarum.
Wachendorfia, trian. monog. and hemodoraceæ, G. peren. C. B. S. bulbs which grow in sandy loam and peat, with little or no water when not in a growing state, and are increased by offsets.
Waldsteinia, icos. di-pentag. and rosaceæ, a H. peren. Hungary; very suitable for rock-work or pots; it grows in loam and peat, and is increased by parting at the roots.
Waltheria, monad. pentan. and tiliaceæ, S. tr. and a bien. E. Ind. and S. Amer. which grow in light rich soil, and cuttings root in sand under a hand-glass.
Watsonia, trian. monog. and irideæ, G. peren. C. B. S. which may be treated as ixia in the green-house, or like the common ranunculus in the open air.
Wall-cress, — see Arabis.
Wall-flower, — see Cheiranthus.
Walnut, — see Juglans.
Wampee-tree, cookea punctata.
Warratah, telopea speciosissima.
Wart-cress, — see Coronopus.
Wart-wort, euphorbia helioscopia.
Water-caltrops, — see Trapa.
——— chickweed, montia fontana.
——— dropwort, — see Œnanthe.
——— hemlock, phellandrium aquaticum.
——— horehound, — see Lycopus.
——— leaf, — see Hydrophyllum.
——— lily, — see Nymphæa.
——— milfoil, — see Myriophyllum.
——— parsnip, — see Sium.
——— plantain, — see Alisma.
——— soldier, stratiotes aloides.
——— starwort, callitriche aquatica.
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Watson, Sir William, M.D. F.R.S. his writings on gardening, 2283. A. D. 1744.
Walpole, Horace, Earl of Orford, his writings on gardening, 2283. A.D. 1780.
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Walker, Mr. John, his writings on gardening, 2283. A.D. 1816.
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Webera, pentan. monog. and rubiaceæ, S. tr. E. Ind. which thrive in loam and peat, and cuttings root in sand under a hand-glass.
Wendlandria, hexan. polyg. and menispermeæ, a H. tr. N. Amer. which grows in peat soil, and is increased by layers.
Westringia, didyn. gymnos. and labiateæ, G. tr. Austral. which thrive in sandy loam and peat, and young cuttings root freely under a bell-glass in sand.
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Willdenovia, diœc. trian. and restiaceæ, a G. peren. C. B. S. which grows in sandy loam and peat, and is increased by dividing at the root.
Witheringia, tetran. monog. and solanaceæ,

a S. peren. S. Amer. which grows in loam and peat, and cuttings root in sand under a bell-glass.
Witsesia, trian. monog. and irideæ, a G. peren. C. B. S. a bulb which requires the same treatment as ixia.
Widow-wail, cneorum tricoccum.
Wild basil, — see Clinopodium.
—— bugloss, — see Lycopsis.
—— cumin, lagœcia cuminoides.
—— liquorice, abrus precatorius.
—— plants, fit for culinary purposes, 1415.
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Winter aconite, eranthis hyemalis.
——— berry, — see Prinos.
——— cherry, — see Physalis.
——— cress, — see Barbarea.
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Woodsia, cryptog. filices, and filiceæ, H. peren. Brit. and Amer. of easy culture in pots of loam and peat.
Woodwardia, cryptog. filices, and filiceæ, H. peren. and a G. peren. N. Amer. and Madeira, of easy culture.
Wood, — see Isatis.
Wolfsbane, — see Aconitum.
Woodbine, lonicera periclymenum.
Woodruff, — see Asperula.
Woodsage, teucrium scorodonia.
Woodsorrel, — see Oxalis.
Worm-grass, — see Spigelia.
Worm-wood, — see Artemisia.
Worm, the common, lumbricus terrestris. Worms are best destroyed by picking them up by hand very early in the morning, or late in the evening during moist weather.
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X.

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Xanthochymus, polyad. polyan. and guttiferæ, a S. tr. E. Ind. a fine-looking plant, which thrives in light loam, and cuttings root in sand under a hand-glass in heat.
Xanthorrhæa, hexan. monog. and asphodeleæ, G. peren. N. S. W. which thrive well in loam and peat, and are increased by offsets.
Xeranthemum, syngen. polyg. super. and corymbiferæ, H. an. S. Eur. of common culture, 1662.
Ximenesia, syngen. poly. super. and corymbiferæ, a G. bien. Mexico, of easy culture, and increased by cuttings.
Xiphidium, trian. monog. and hæmodoraceæ, S. tr. peren. W. Ind. which thrive in sandy loam and peat, and are increased by dividing the roots.

Xylomelum, tetran. monog. and proteaceæ, a G. tr. N. S. W. which may be treated as banksia.
Xylophylla, pentan. trig. and euphorbiaceæ, H. tr. Eur. which grow in common soil, and are increased by layers, or ripened cuttings under a hand-glass.
Xylopia, polyan. polyg. and anoniaceæ, S. tr. W. Ind. which grow in sandy loam, and cuttings root in sand under a hand-glass.
Xyris, trian. monog. and restiaceæ, a G. peren. and H. peren. N. S. W. and Carol. pretty plants, which thrive in peat soil, and are readily increased by dividing at the root.
Xysmalobium, pentan. dig. and asclepiadeæ, a G. tr. C. B. S. which grows in loam and peat, and cuttings root in sand under a hand-glass.
Xystus, a terrace, 14.

Y.

Yucca, adams-needle, hexan. monog. and liliaceæ, S. G. and H. tr. As. and S. Amer. which grow in rich loam, and are increased by suckers from the roots.
Yam, dioscorea sativa.
Yarrow, achillea millefolium.
Yellow-birds nest, monotropa hypopithys.
Yellow-rattle, rhinanthus crista-galli.
Yellow-root, zanthorhiza apiifolia.
Yellow-wort, chlora perfoliata.
Yew-tree, — see Taxus.
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Z.

Zacintha, syngen. polyg. æqual. and cichoraceæ, a H. an. S. Eur. of common culture.
Zaluzania, syngen. polyg. super. and corymbifereæ, a. F. peren. Mex. which grows in rich, light soil, and cuttings root readily under a hand-glass.
Zamia, diœc. polyan. and cycadeæ, S. and G. tr. C. B. S. W. Ind. and Austral. which grow in light sandy soil, and some species may be increased by suckers.
Zannichellia, pond-weed, monœc. monan. and naideæ, a H. an. an aquatic.
Zanthorhiza, yellow root, pentan. polyg. and ranunculaceæ, a H. tr. which grows in common soil, and is increased by suckers.
Zanthoxylum, tooth-ach tree, diœc. pentan. and terebintaceæ, a S. and G. tr. and a H. tr. The tender species grow in sandy loam, and cuttings will root in sand under a hand-glass; the hardy sorts in any soil, and cuttings of the roots will shoot into plants in bottom heat.
Zapana, didyn. angios. and verbenaceæ, a S. and G. peren. W. Ind. and Amer. which grow in light rich soil, and cuttings root freely under a hand-glass.
Zarskoje-selo, or tzarskoje-selo, an imperial residence near Petersburg, 85.
Zaritzina, or tzaritzina, a palace and gardens near Moskwa, 88., 93.
Zamoyst, a seat in Poland, 90.
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Zea, Indian corn, monœc. trian. and gramineæ, a H. an. Amer. of easy culture.
Zedoary, curcuma zerumbet.
Zieria, tetran. monog. and rutaceæ, a G. tr. N. S. W. a pretty plant, which grows in sandy loam and peat, and young cuttings root in sand under a bell-glass.
Zingiber, ginger, monan. monog. and scitamineæ, S. peren. which grow in light rich soil, and are increased by dividing at the root.
Zinnia, syngen. polyg. super. and corymbifereæ, H. an. S. and N. Amer. of common culture, 1662.
Zizania, monœc. hexan. and gramineæ, a H. an. N. Amer. an aquatic which only require to be sown in shallow water or on the margin of a pond.
Ziziphora, dian. monog. and labiateæ, H. tr. peren. and an. Eur. which grow freely in rich light soil, and are increased by seeds or cuttings.
Zizyphus, pentan. monog. and rhamneæ, S. G. and H. tr. As. Af. and Eur. of which the tender kinds grow well in loam and peat, and cuttings root in sand under a hand-glass; the H. species are increased by seeds or ripened cuttings under a hand glass.
Zœgea, syngen. polyg. frustr. and cynarocephaleæ, a H. an. Levant, of the usual culture, 1662.
Zornia, diadel. decan. and leguminoseæ, a S. tr. and an. E. Ind. which grow freely in rich light soil, and cuttings root easily under a hand-glass.
Zorn. ic. Icones plantarum medicinalium. Von Joh. Zorn.
Zoph, H. his work on gardening, 2285. A. D. 1798.
Zygophyllum, bean caper, decan. monog. and rutaceæ, G. tr. and a H. peren. C. B. S. which thrive in loam and peat, and cuttings root readily under a hand-glass.

THE END.

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